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September 30, 2022

VIA ELECTRONIC FILING

Public Utility Commission of Oregon
Filing Center
P.O. Box 1088
201 High Street S.E., Suite 100
Salem, OR 97308-1088

Re: Docket No. PCN 5 – In the Matter of Idaho Power Company's Petition for Certificate of Public Convenience and Necessity.

Attention Filing Center:

Attached for filing in the above-referenced docket is Idaho Power Company's Petition for a Certificate of Public Convenience and Necessity. Confidential copies are being sent via Huddle or encrypted zip file to the Filing Center and parties who have signed Protective Order No. 22-309.

Please contact this office with any questions.

Thank you,

Alisha Till

Alisha Till
Paralegal

Attachments

BEFORE THE PUBLIC UTILITY COMMISSION OF OREGON

PCN 5

In the Matter of IDAHO POWER COMPANY'S PETITION FOR CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY.	**IDAHO POWER COMPANY'S PETITION FOR CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY**

In accordance with Oregon Revised Statute (ORS) 758.015 and Oregon Administrative Rule (OAR) 860-025-0030, OAR 860-025-0035, and OAR 860-025-0040,[1] Idaho Power Company (Idaho Power or Company) petitions the Public Utility Commission of Oregon (Commission) for a Certificate of Public Convenience and Necessity (CPCN) authorizing construction of a 300-mile long, overhead, 500-kV high voltage transmission line between the proposed Longhorn Station near Boardman, Oregon, to the existing Hemingway Substation in southwest Idaho (B2H project). In support of this Petition, Idaho Power relies in part on the pre-filed testimony and exhibits of Jared L. Ellsworth, Transmission, Distribution & Resource Planning Director, and Lindsay Barretto, 500-kV and Joint Projects Senior Manager.

I. INTRODUCTION

Idaho Power is an energy company engaged in the generation, transmission, delivery, sale and purchase of electricity and is regulated by the Federal Energy

[1] Idaho Power is filing the Petition in accordance with the rules adopted by the Commission in the Docket AR 626 Rulemaking Proceeding on September 26, 2022, pursuant to Order No. 22-351. *See In re Rulemaking Regarding Certificate of Public Convenience and Necessity*, Docket AR 626, Order No. 22-351 (Sept. 26, 2022).

Regulatory Commission (FERC), the Commission, and the Idaho Public Utilities Commission. Idaho Power serves more than 600,000 customers in a 24,000-square mile service area across southern Idaho and eastern Oregon. With 17 low-cost hydroelectric projects as the core of the Company's energy mix, Idaho Power's residential, business and agricultural customers pay some of the nation's lowest prices for electricity. Idaho Power has set a goal of providing 100 percent clean energy by 2045 while continuing to keep prices low and reliability high.

Since 1996, firm peak-hour load has increased from 2,437 megawatts (MW) to 3,751 MW in 2021 – a new system peak hour record reached on June 30, 2021. The Company anticipates adding approximately 13,300 customers each year throughout the next 20 years, including significant commercial and industrial growth. The anticipated load forecast for the entire system predicts summer peak-load requirements will grow nearly 55 MW per year, and the average energy requirement is forecast to grow about 30 average Megawatt (aMW) per year. To meet this growing demand, Idaho Power's 20-year resource plan[2] includes the addition of 3,790 MW of new non-carbon emitting resources consisting of wind, solar, and storage technologies, the addition of the B2H transmission line, and a variety of demand-side management resource additions.

Once operational, the B2H project will provide the Company increased year-round access to reliable, clean, and low-cost market energy purchases from the Pacific Northwest, including during those times when energy demand from Idaho Power's customers is at its highest. The B2H project has been a cost-effective resource identified

[2] *See In re Idaho Power Company, 2021 Integrated Resource Plan*, Docket LC 78, Idaho Power's 2021 Integrated Resource Plan (IRP) (Dec. 30, 2021)..

in each of Idaho Power's Integrated Resource Plans (IRP) since 2009 and continues to be a cornerstone of the Company's 2021 IRP Preferred Portfolio. As can be seen in the 2021 IRP, the lowest-cost resource portfolio includes B2H, and the best non-B2H portfolio has a significant cost premium. As a resource alone, B2H is the lowest-cost alternative to serve Idaho Power's customers in Oregon and Idaho. As a transmission line, B2H also offers incremental ancillary benefits and additional operational flexibility.

The development and construction of high-voltage transmission lines is also critical to a clean energy future. According to recent research provided by Princeton University, the United States will need to expand electricity transmission systems by 60 percent by 2030, and may need to triple it by 2050, to meet clean energy goals. Putting an even finer point on it, researchers stated:

> The current power grid took 150 years to build. Now, to get to net-zero emissions by 2050, we have to build that amount of transmission again in the next 15 years and then build much more again in the 15 years after that.[3]

B2H is considered a piece of that clean energy puzzle. In 2012, the White House identified B2H as one of seven lines that were critical to our enhancing our nation's energy portfolio and fostering the growth of renewable energy resources.[4] Later, in 2021, Americans for a Clean Energy Grid identified B2H as one of the 22 shovel ready infrastructure projects needed to unlock and interconnect 60,000 MW of new renewable capacity.[5] The B2H

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[3] Molly Seltzer, *et al.*, *Big but affordable effort needed for America to reach net-zero emissions by 2050, Princeton study shows*, PRINCETON UNIV. (Dec. 15, 2020) (available at https://www.princeton.edu/news/2020/12/15/big-affordable-effort-needed-america-reach-net-zero-emissions-2050-princeton-study) (last visited Sept. 30, 2022).

[4] DEP'T OF ENERGY, *Obama Administration Announces Job-Creating Grid Modernization Pilot Projects* (Oct. 5, 2011) (available at https://www.energy.gov/articles/obama-administration-announces-job-creating-grid-modernization-pilot-projects) (last visited Sept. 30, 2022).

[5] Michael Goggin, *et al.*, GRID STRATEGIES, LLC, *Transmission Projects Ready to Go: Plugging into America's Untapped Renewable Resources* at 5 (Apr. 2021) (available at https://cleanenergygrid.org/wp-content/uploads/2021/09/Transmission-Projects-Ready-to-Go.pdf) (last visited Sept. 30, 2022).

project is necessary to integrate and balance variable energy resources, like wind and solar, by facilitating the transfer of geographically diverse renewable resources across the western grid. This will be particularly important as states such as Oregon and Washington progress with their clean energy goals.

II. COMMUNICATIONS

Idaho Power respectfully requests that all communications with reference to this Application be sent to the following:

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III. LEGAL STANDARD

ORS 758.015 requires electric utilities to petition the Commission for a CPCN if condemnation of land or an interest therein is necessary for construction of a transmission line. This Petition is being filed in accordance with the Commission's updated CPCN rules adopted in Docket AR 626 on September 26, 2022. Upon receipt of a petition for a CPCN, the Commission must conduct an investigation to "determine the necessity, safety, practicability and justification in the public interest for the proposed transmission line...."[6] The Commission considers the "public interest" when addressing each of these requirements, not as a separate standard.[7]

[6] ORS 758.015(2).

[7] See *Pacific Power Petition for Public Convenience and Necessity*, UM 1495, Order No. 11-366 (Sept. 22, 2011).

The Commission's review criteria are set forth in OAR 860-025-0035(1) and (2):

A. OAR 860-025-0035(1):

The Commission may approve a petition filed under OAR 860-025-0030 by determining the necessity, safety, practicability and justification in the public interest of the proposed transmission line upon consideration of the following:

(a) Whether the transmission line will meet a demonstrated need for transmission of additional capacity or improved system reliability that enables the petitioner to provide or continue to provide adequate and reliable electricity service;

(b) Whether the petitioner has demonstrated that it will ensure the transmission line is constructed, operated, and maintained in a manner that protects the public from danger and conforms with applicable Commission rules, and other applicable safety standards and best industry practices;

(c) Whether the transmission line using petitioner's proposed route is practicable and feasible, whether it will be effectively and efficiently constructed in a commercially reasonable manner;

(d) Whether petitioner has justified construction of the proposed transmission line as in the public interest, as compared with feasible alternatives for meeting the identified need, considering the public benefits and costs of the project, as they relate to the interests in land proposed to be condemned, petitioner's existing facilities and equipment, petitioner's Oregon customers, and other considerations that may be relevant to the public interest. Other such considerations include, but are not limited to, the benefits and costs to other Oregon utilities, their customers, and all Oregonians, the value of connections to

regional and interregional electricity grids and to a petitioner's non-Oregon service territories, and all Oregonians;

(e) The Commission may also consider other factors it deems relevant to the statutory criteria.

B. OAR 860-025-0035(2):

In evaluating a petition under this rule, the Commission will give due consideration to related regulatory reviews and permitting approvals as pertinent to the proposed transmission line, if the transmission line has already been acknowledged or approved by regulatory or permitting authorities.

The Commission also considers whether the transmission line is compatible with state and local land use regulations.[8] For an EFSC-jurisdictional project, the Commission relies on the land use findings adopted as part of the site certificate to satisfy its obligations to consider compliance with state and local land use regulations.[9]

IV. PROPOSED SCHEDULE

On September 1, 2022, the Company filed with the Commission a Notice of Intent to file a Petition for a CPCN, opening the docket for this proceeding. The Company also included a proposed schedule with that filing, requesting a Commission decision in this proceeding no later than May 5, 2023, to allow for construction to begin in 2023 and to allow for energization in time to meet the 2026 resource deficit projected in the Company's IRP. To aid parties in review of the request in this proceeding, the Company also filed its

[8] OAR 860-025-0040(1).
[9] OAR 860-025-0040(1).

responses to the Standard Data Requests[10] via the Commission's Huddle site pursuant to OAR 860-025-0030(2)(q) at the time of the Notice of Intent filing.

ORS 758.015(2) requires the Commission to give notice of this Petition and to hold a public hearing. As part of the Notice of Intent, Idaho Power prepared a proposed schedule, including a proposed public hearing date, that would allow for a final order by May 5, 2023. A prehearing conference is scheduled for October 11, 2022. The following is the schedule proposed by the Company and included in the Notice of Intent but with a revised prehearing conference date as set by the Commission and resulting revision to the Public Comment Hearing and Petition to Intervene dates as well as the removal of the date identified for the Commission's consideration of the Request for Waiver, which is no longer applicable following the September 27, 2022, EFSC decision.

EVENT	**DATE**
Idaho Power files Notice of Intent to file Petition and Standard Data Requests	9/1/2022
Idaho Power files Petition for CPCN and Testimony	9/30/2022
Prehearing Conference	10/11/2022
Public Comment Hearing	10/11/2022
Petitions to Intervene	10/18/2022
Staff and Intervenor Opening Testimony	11/23/2022
Company Reply Testimony	1/26/2023
Witness List, Cross-Examination Statements and Exhibits	2/2/2023
Evidentiary Hearing	2/14/2023, 2/15/2023
All Party Opening Briefs	3/7/2023
All Party Reply Briefs	3/21/2023
Final Order	5/5/2023

[10] The Standard Data Requests (SDRs) are referenced under proposed OAR 860-025-0030(2)(q). Idaho Power's September 1, 2022 SDR response filing was based on the June 2022 draft Standard Data Requests; Idaho Power expects to supplement its filing based on any additional Standard Data Requests that are issued following approval of the rules in AR 626.

The schedule proposed by Idaho Power, and in particular the May 5, 2023, date for a final Commission decision, is critical to allowing the Company to meet its expected in-service deadline of mid-2026. To begin construction in 2023, the Company will need access to the affected parcels. Idaho Power is currently negotiating with landowners in good faith to obtain options for easements, however, Idaho Power anticipates it may need to initiate condemnation proceedings to gain access to certain parcels along the B2H project route. If the Commission's order in this proceeding is delayed beyond May 2023, Idaho Power likely will not be able to gain access to the affected parcels in time to begin construction in 2023 and accordingly to meet the B2H project's 2026 in-service date.

V. BACKGROUND

In 2018, Idaho Power submitted its complete application for an Energy Facility Siting Council (EFSC or Council) site certificate to construct the portions of the B2H project located in Oregon. As part of that application, the Company has requested that the site certificate include and govern the local land use approvals related to siting. In July 2020, the Oregon Department of Energy (ODOE) issued its Proposed Order, proposing approval of the B2H project subject to certain conditions. The EFSC then initiated a contested case hearing process that included exchange of discovery, live depositions, submission of written testimony, live cross-examination hearings, and extensive briefing. On May 31, 2022, following the conclusion of the nearly-two-year-long contested case, the hearing officer issued the Proposed Contested Case Order, proposing approval of the B2H project subject to certain conditions.[11] The Council held a three-day hearing to

[11] See In re the Application for Site Certificate for the Boardman to Hemingway Line, OAH Case No. 2019- ABC-02833, Proposed Contested Case Order at 296 of 337 (May 31, 2022), available at

consider the parties' exceptions to the Proposed Contested Case Order, ODOE issued the draft Final Order on September 16, 2022, and on September 27, 2022, EFSC made its final decision approving the B2H project subject to certain conditions.[12] The Final Order and Site Certificate include the land use approvals (and related conditions) for the B2H project, and in accordance with ORS 469.401(3), following issuance of the site certificate, the state and local agencies will issue the permits and land use approvals governed by the site certificate without further hearings or other proceedings.

Currently, the B2H project is moving into the preliminary construction phase. On January 18, 2022, and after significant discussions, study efforts, and negotiations, the three B2H permit funding participants, Idaho Power, PacifiCorp, and Bonneville Power Administration (BPA), executed a Non-Binding Term Sheet that addresses B2H ownership, transmission service considerations, and asset exchanges (Term Sheet). In April 2022, the Company awarded a contract for constructability consulting services, which indicated that construction must start in the summer of 2023 to ensure energization in time to meet the 2026 resource deficit identified in Idaho Power's 2021 IRP. Idaho Power anticipates issuing a Requests for Proposals for materials and subcontractors necessary for construction to commence in the first quarter of 2023. As explained in more detail below, the Company is submitting this Petition prior to obtaining the outstanding permits and approvals due to scheduling constraints. It should be noted however that

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https://www.oregon.gov/energy/facilities-safety/facilities/Facilities%20library/2022-05-31-B2HAPP-Hearing-Officer-Proposed-Contested-Case-Order-w-Bookmarks.pdf ("I propose the Oregon Department of Energy, Energy Facility Siting Council, issue a Final Order granting the requested site certificate consistent with the Department's Proposed Order dated July 2, 2020, including the recommended site certificate conditions, and incorporating the following amendments to recommended conditions: . . . .").

[12] Idaho Power understands that EFSC will issue the Final Order and Site Certificate on or shortly after September 30, 2022.

Idaho Power's request in this case does not eliminate or circumvent any approval processes associated with the B2H project, but rather allows the processes to run concurrently to ensure the B2H project can be energized by the 2026 in-service date.

VI. COMPLIANCE WITH OAR 860-025-0030 FILING REQUIREMENTS

A. OAR 860-025-0030(2)(b):

Thorough description of the proposed transmission line. A thorough description of the information listed in subsection (c) of this rule, including but not limited to the proposed route, voltage and capacity of the line. The description must include a comprehensive narrative that provides sufficient detail to enable a full understanding of the public convenience, necessity and justification in the public interest for the proposed transmission line and the benefits to be derived therefrom, and to enable a determination of its safety and practicability under normal and emergency conditions, as well as the foreseeable or potential consequences of not building the proposed transmission line.

Once operational, the B2H project will help meet the Pacific Northwest and Mountain West's need for reliable, clean, low-cost market energy purchases year-round and is expected to provide a total of 2,050 megawatts (MW) of bidirectional capacity.[13] The new transmission line will provide Idaho Power and its customers with many benefits, including (1) greater access to the Pacific Northwest electric market, (2) improved system reliability and resiliency, (3) reduced capacity limitations on the regional transmission systems as demands on the system continue to grow, and (4) flexibility to integrate renewable resources and more efficiently implement advanced market tools, such as the

[13] B2H is expected to provide 1,050 MW of capacity in the west-to-east direction, and 1,000 MW of capacity in the east-to-west direction.

Energy Imbalance Market. The direct testimony of Mr. Ellsworth discusses the benefits and values of the B2H project in detail.[14] The benefits of the B2H project in aggregate reflect its importance to the achievement of Idaho Power's goal to provide 100 percent clean energy by 2045 without compromising the Company's commitment to reliability and affordability.[15]

The Resource Need. The B2H project was first included in the Preferred Portfolio of Idaho Power's 2006 IRP, and subsequently identified as part of the preferred portfolio in the Company's 2009, 2011, 2013, 2015, 2017, 2019, and most recently, in the 2021 IRP. The Commission has acknowledged the B2H project in the Action Plans of Idaho Power's 2017 IRP and 2019 IRP. Acknowledgement of the 2021 IRP is pending with the Commission. In addition to the IRPs, the B2H project has been identified as a regionally significant project, producing a more efficient or cost-effective plan in the Northern Tier Transmission Group's (NTTG) 2007, 2009, 2011, 2013, 2015, 2017, and 2019 biennial regional transmission plans, and in the NorthernGrid, NTTG's successor regional planning organization, 2021 biennial regional transmission plan.[16] The B2H project is demonstrated to be the most cost-effective method of serving projected customer demand and meeting clean energy goals.

In the 2021 IRP, as has been the case in prior IRPs, the B2H project is not simply evaluated as a transmission resource, but rather as a supply-side resource that will be used to serve Idaho Power load. That is, the B2H project, and the market purchases it

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[14] *See* Idaho Power/100, Ellsworth.

[15] Idaho Power/100, Ellsworth/49.

[16] *See* Exhibit Idaho Power/203, Barretto/479-899 (The NTTG and NorthernGrid biennial regional transmission plans were provided as attachments to the Company's Response to Standard Data Request No. 5.).

will facilitate, are evaluated in the same manner as a new gas plant, or a new utility-scale solar plus storage project. In addition, as a transmission line, B2H offers incremental ancillary benefits, additional operational flexibility. Company witness Mr. Ellsworth presents the results of the 2021 IRP modeling showing that the Preferred Portfolio that includes the B2H project is, on a net present value, $266 million lower cost than the lowest cost portfolio that does not include the B2H project, and best minimizes both cost and risk.[17]

The B2H project's current planned in-service date of summer of 2026 is necessary to meet forecasted peak demand growth needs, as well as to fill in for the Valmy Unit 2 exit occurring at the end of 2025, and to facilitate the exit of Bridger Unit 3, also currently identified in the 2021 IRP for early exit at the end of 2025. Should the B2H in-service date slip to 2027, the planned exit of Bridger Unit 3 will most likely be delayed, and additional new resources will need to be acquired by 2026 that are not dependent on B2H transmission capacity, which at this time is estimated to be an additional 375 MW of capacity, or 550 MW of capacity if the Company moves forward with the Bridger Unit 3 exit.

The B2H Project. The B2H project will occur on federal, state, and private lands in five counties in Oregon and one county in Idaho. It consists of approximately 298 miles of electric transmission line, with 274 miles located in Oregon and 24 miles in Idaho.[18] The project will require 298 miles of single-circuit 500-kV transmission line, removal of 12 miles of existing 69-kV transmission line, rebuilding of 0.9 mile of a 230-kV transmission

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[17] Idaho Power/100, Ellsworth/32-33.
[18] Idaho Power/200, Barretto/2.

line, and rebuilding of 1.1 miles of an existing 138-kV transmission line into a new right-of-way (ROW).[19] The B2H project will connect to the planned Longhorn Substation four miles east of Boardman, Oregon and to the Company's existing Hemingway Substation in Owyhee County, Idaho. A series capacitor station will be constructed near the mid-point of the transmission line as part of the B2H project. For ease of reference, the Longhorn substation, mid-line station, and the existing Hemingway substation are referred to simply as "stations."

The proposed stations will serve to connect the B2H project to other 500-kV transmission lines and the Pacific Northwest power market, increasing the capacity to Idaho Power's service area, adding 1,050 MW of capacity to the Idaho to Northwest path in the west-to-east direction, and 1,000 MW of capacity from east-to-west.[20] The Company's ownership share of that capacity is an average of 750 MW west-to-east of which Idaho Power plans to utilize 500 MW the summer months (April–September) and 200 MW in the winter months (January–March and October–December) to serve its native customers.[21] In addition, there remains 400 MW of unallocated capacity east-to-west of which 182 MW of the capacity is expected to be allocated to Idaho Power.[22]

The B2H project will also include approximately 10 communication station sites, consisting of communication shelters and related facilities, two alternative communication station sites, and a series capacitor station. Other related and supporting facilities include access roads for the proposed route, including approximately 206 miles of new roads and 223 miles of existing roads requiring substantial modification. Finally, there will be

[19] *Id*.
[20] Idaho Power/100, Ellsworth/23.
[21] Idaho Power/100, Ellsworth/7.
[22] Idaho Power/100, Ellsworth/7-8.

approximately 30 temporary multi-use areas and 299 temporary pulling and tensioning sites, of which four will have light-duty fly yards within the pulling and tensioning sites.

Safety, reliability, and electrical performance are all incorporated into the design of transmission lines. With respect to safety, the National Electrical Safety Code (NESC) provides for minimum guidelines and industry standards for safeguarding persons from hazards arising from the construction, maintenance, and operation of electric supply and communication lines and equipment.[23] The B2H project is designed to withstand a wide range of physical conditions and extreme events, explained in greater detail in the direct testimony of Ms. Barretto.[24] Because transmission lines are so vital to our electrical grid, design standards are stringent. B2H will adhere to, and in most cases, exceed, the required codes or standards observed for high voltage transmission line design.[25] This approach to the design and construction of the B2H project will establish the utmost safe and reliable operation of the transmission line over its life.

Additional narrative discussion of the spatial information listed in (c) is provided in Section V.B, below.

B. OAR 860-025-0030(2)(c): Spatial information. A map or maps that are drawn to appropriate scale and show appropriate distinguishing colors and symbols to depict the following information:

OAR 860-025-0030(2)(c)(A). *A general location and boundaries of petitioner's service area to be connected or served by the proposed transmission line.*

[23] Idaho Power/200, Barretto/3-4.
[24] *See* Idaho Power/200, Barretto/3-10.
[25] Idaho Power/200, Barretto/4.

See Attachment 1 for a map of Idaho Power's service area. The B2H project will connect resources in the Pacific Northwest to the Company's transmission system.

OAR 860-025-0030(2)(c)(B). *Proposed route, voltage and capacity of the proposed transmission line.*

See Attachment 2 for a map of the proposed route of the B2H project, which consists of 278 miles of electric transmission line, with 274 miles located in Oregon and 24 miles in Idaho, including 298 miles of single-circuit 500-kV transmission line, 0.9 mile of a 230-kV transmission line, and 1.1 miles of a 138-kV transmission line.

In the EFSC application, Idaho Power included a "Proposed Route" and alternative route segments in certain areas. Idaho Power included two alternative route segments in the La Grande area in its EFSC application, which are called the Morgan Lake Alternative and the Mill Creek Alternative/Proposed Route. Additionally, the EFSC application included alternative route segments at the northern end of the B2H project, near the Boardman Bombing Range, and toward the southern end of the Project in Malheur County near the Double Mountain Wilderness Characteristic Unit. With approval of the Company's application for the B2H project on September 27, 2022, the Council approved the proposed route and all of the proposed alternative segments, providing Idaho Power the option to develop a final route among the alternatives. The route depicted in Attachment 2 represents the Company's final route choice among the alternatives approved by EFSC, which include the proposed route as modified by the Morgan Lake Alternative and the West of Bombing Range Alternative 1 routes. In this Petition, Idaho Power is seeking condemnation authority only for properties along the final route choice, and not for alternative segments included in the EFSC application but not chosen as part of the final route.

Morgan Lake Alternative. In the EFSC application, Idaho Power's proposed route in Union County ran parallel to an existing 230-kV transmission line along the hillside west of the City of La Grande. That route was referred to as the Mill Creek Route. In that same area, Idaho Power proposed the Morgan Lake Alternative as an alternative to the Mill Creek Route, providing a route that was farther from and not visible from the City of La Grande. Based on feedback Idaho Power received from the local community and given EFSC approved both routes, Idaho Power has decided to develop the Morgan Lake Alternative and not the Mill Creek Route.

West of Bombing Range Road Alternative 1. At the time of development of the Application for Site Certificate (ASC), Idaho Power was pursuing an easement from the Department of the Navy for access across the Naval Weapons Systems Training Facility Boardman along Bombing Range Road (the Boardman Bombing Range). In the ASC, Idaho Power included two alternative routes in that area, given the uncertainty of whether, and to what extent, the Navy would grant an easement. In 2020, the Navy granted an easement across a portion of the Boardman Bombing Range. The West of Bombing Range Alternative 1 represents the access granted by the Navy in that area.

OAR 860-025-0030(2)(c)(C). *Available alternate transmission line routes analyzed by petitioner, if any.*

As stated previously, the need for the B2H project was first identified in the 2006 IRP. At that time, the transmission line was contemplated as a line between Boise and McNary. The project evolved into a 500-kV line between the Boardman area and the

Hemingway station. In 2008, Idaho Power initiated a year-long comprehensive public process to gather more input. Through the Community Advisory Process (CAP), the Company hosted 27 Project Advisory Team meetings, 15 public meetings, and 7 special topic meetings. In all, nearly 1,000 people were involved in the CAP, either through Project Advisory Team activities or public meetings. A considerable number of routes through western, central, and eastern Oregon, and southern Washington were considered to connect Hemingway and the Boardman area. Attachment 3 is a map of the routes considered during this timeframe.

Ultimately, the route recommendation from the CAP was the route Idaho Power brought into the National Environmental Policy Act (NEPA) process as the proponent-recommended route. Attachment 4 is a map of the proposed route resulting from the CAP process and submitted as the Company's proposed route in the Bureau of Land Management (BLM)-led NEPA process. Throughout the NEPA process, Idaho Power continued to work with landowners, stakeholders, and jurisdictional leaders on route refinements and to balance impacts to various natural resources with impacts to farmers and ranchers. The BLM considered the Company's proposed route, along with a few other alternative routes, in the NEPA process. Attachment 5 shows the route alternatives and variations considered in the BLM's November 2016 Final Environmental Impact Statement. Ultimately, the route selected through the BLM-led NEPA process, based on the BLM's analysis and public input, led do a singular route, presented in Attachment 6.

The route Idaho Power submitted in its EFSC application, a separate and distinct process from the NEPA process, is very similar in most areas to the BLM's selected route. As discussed earlier, in the EFSC application, Idaho Power included a "Proposed Route" and alternative route segments in certain areas. See Attachment 7 for the maps submitted with the EFSC application.

OAR 860-025-0030(2)(c)(D). *Other transmission lines and substations of petitioner connecting, serving or capable of being adopted to connect or serve the areas covered by the proposed transmission line, if any.*

As explained in the direct testimony of Mr. Ellsworth, the Pacific Northwest is a winter peaking region and Idaho Power operates a system with an early summer peak (i.e. late June, early July) which aligns with the Mid-C hydro runoff conditions when the Pacific Northwest is flush with surplus power capacity. Attachment 8 presents a map of the Company's existing transmission system. Idaho Power owns 1,280 MW of transmission capacity between the Pacific Northwest transmission system and the Company's service territory. Of this, 1,200 MW are on the Idaho to Northwest path and 80 MW are on the Montana-Idaho path. Avista, BPA, and PacifiCorp share an allocation of capacity on the western side of the Idaho to Northwest path and Idaho Power owns 100 percent of the capacity on the eastern side. The Company fully utilizes the capacity of these lines. Constructing the B2H project will alleviate this constraint and add 1,050 MW of total transfer capability between the Pacific Northwest and the Intermountain West region, providing a cost-effective method of serving projected customer demand while also offering incremental ancillary benefits and additional operational flexibility.

OAR 860-025-0030(2)(c)(E). *The terminals, substations, sources of energy, and load centers, existing or proposed, related to the proposed transmission line and its intended operation, including the proposed transmission line itself.*

See Attachment 2 for a map of the proposed B2H project route, including the proposed terminals and substations. Under the Term Sheet, Idaho Power will secure 500 MW of point-to-point transmission service from BPA from the Mid-Columbia (Mid-C) hub to the proposed Longhorn station, which will provide the Company a direct connection to the Mid-C market with flexible long-term BPA wheeling rights. The B2H project will enable additional purchased power from the Mid-C hub at both peak times and when energy prices are favorable relative to the costs of Idaho Power's existing resource fleet, leveraging diversity that exists in the region.

In addition, the Company will acquire from PacifiCorp transmission assets and their related capacity sufficient to enable Idaho Power to utilize 200 MW of bidirectional transmission capacity between the Company's system, at Populus, and Four Corners the desert Southwest market hub.[26] Eight entities with transmission have connectivity to the Four Corners market hub. Idaho Power will also have a connection to entities at Mona in central Utah.[27] This additional capacity should provide the Company with long-term strategic value diverse from B2H: the desert Southwest is rich with solar potential which is expected to continue its significant growth in the future, New Mexico has significant wind potential, and the number of desert Southwest entities with a presence at this market hub presents significant market diversity opportunities.[28] Idaho Power believes additional access to this market hub during the winter months will prove to be extremely valuable in a low carbon future.[29] Attachment 9 illustrates capacity gained to both Mid-C and the Four Corners markets, reflecting the B2H project's market diversity.

[26] Idaho Power/100, Ellsworth/40-41.
[27] *Id*. at 41.
[28] *Id.*
[29] *Id*.

Among the benefits the B2H project will provide is the ability to improve renewable integration.[30] The lack of transmission capacity, at times, prevents the energy from existing renewable generation to move to load and can be curtailed. The B2H project is necessary to integrate and balance variable energy resources like wind and solar as it will facilitate the transfer of geographically diverse renewable resources across the western grid and help ensure the clean energy grid of the future, both Idaho Power's and surrounding states', is robust and reliable.

OAR 860-025-0030(2)(c)(F). *Each parcel of land that the petitioner has either acquired or has determined it should acquire an interest in to construct and operate the transmission line. The parcels of land that the petitioner has determined it should acquire an interest in must be clearly marked and must clearly show the general contour, uses, and improvements along that portion of the proposed route, inclusive of structures and agricultural uses.*

As noted earlier, the Company is currently negotiating with landowners in good faith to obtain options for easements and will continue to negotiate in good faith with landowners to avoid condemnation wherever possible; however, Idaho Power must initiate the CPCN proceeding in order to obtain the CPCN in time for construction of the B2H project to commence in 2023. If the Company waits until the outstanding permits and approvals are issued to initiate this proceeding, Idaho Power likely will not be able to meet the B2H project's 2026 in-service date. See Attachment 10 for maps, by county, of parcels on which the Company has acquired, or has determined it may need to acquire, an easement. Pages 1 through 7, include the names and addresses of all persons who

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[30] Idaho Power/100, Ellsworth/34-35.

have known interests in the land that may be physically impacted or traversed. It also includes a column identifying whether or not the Company has obtained rights-of-way associated with the property as well as an identification number that corresponds with the maps of the properties.

C. OAR 860-025-0030(2)(d): Cost information.

An estimate of both already incurred and forecasted costs of developing the transmission line project, including:

OAR 860-025-0030(2)(d)(A). *Parcels of land that petitioner determines it should obtain an interest in and for which condemnation is assumed to be necessary at the time of the petition.*

Idaho Power is currently negotiating, and will continue to negotiate, with landowners in good faith to obtain options for easements and avoid condemnation wherever possible. However, Idaho Power anticipates it may need to initiate condemnation proceedings to gain access to certain parcels along the B2H project and must initiate the CPCN proceeding in order to obtain the CPCN in time for construction to commence in 2023.

Using the list of parcels in Attachment 10, and removing the value of easements on parcels for which the Company already has an easement right, or a signed option agreement, Idaho Power has estimated the Company's share of the cost of the easements for which condemnation may be required. The estimate is based on the current market value of the remaining easement areas to be acquired, or approximately $[redacted], which would be the estimated cost of the land easements if all of those remaining easements were to be condemned.

OAR 860-025-0030(2)(d)(B). *Other parcels of land and interests therein acquired or to be acquired.*

The total cost to Idaho Power for the B2H project easements and other interests it has already obtained is approximately $[redacted] for total estimated right-of-way costs for the B2H project on a system basis of approximately $[redacted].

OAR 860-025-0030(2)(d)(C). *Transmission facilities, including but not limited to, poles, lines, substations, accessory and miscellaneous labor, plant and equipment inclusive of any communication apparatus and environmental mitigations.*

Based on the Company's most recent forecast, the estimated cost of Idaho Power's share of all other B2H project direct costs, excluding right-of-way, indirect and overhead costs, on a system basis is approximately $[redacted].[31]

OAR 860-025-0030(2)(d)(D). *Indirect and overhead costs including engineering, legal expense, taxes, interest during construction, and itemized administrative and general expenses.*

The Company estimates Idaho Power's share of overheads, Allowance for Funds Used During Construction, and property taxes associated with the B2H project will be a total of $[redacted] on a system basis.

OAR 860-025-0030(2)(d)(E). *Any other costs, direct or indirect, relating to the transmission line project including but not limited to operating and maintenance costs of the project.*

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[31] Excludes capital costs associated with the B2H project transmission upgrades discussed in the Direct Testimony of Mr. Ellsworth, including the Midline Series Capacitor station, local 230-kV upgrades necessary to integrate the project into the Treasure Valley load center, and the buyout of BPA's permitting interest. *See* Idaho Power/100, Ellsworth/30-31.

Idaho Power anticipates the Company's share of operation and maintenance costs associated with the B2H project to be minimal, approximately $300,000 per year on a system basis. At this time, Idaho Power does not anticipate other estimated B2H project costs that have not been reflected in the amounts above.

OAR 860-025-0030(2)(d)(F). *Explanation of the foregoing cost estimates as needed to enable a full understanding of their basis and derivation.*

Based on cost estimates revised in 2022, Idaho Power estimates the Company's share of the overall B2H project costs to be approximately $[redacted] on a system basis, which is made up of costs associated with the transmission facilities including a contingency, overheads, Allowance for Funds Used During Construction (AFUDC) and property taxes. The following table summarizes the cost breakdown:

Direct Costs		[redacted]	
Overheads		[redacted]	
Contingency		[redacted]	
AFUDC		[redacted]	
Property Taxes		[redacted]	
Total		[redacted]	

D. OAR 860-025-0030(2)(e): Financial Feasibility.

An explanation of the financial feasibility of the proposed transmission line, including any expected costs, revenues, and financing tools.

As detailed in the direct testimony of Mr. Ellsworth, the 2021 IRP Preferred Portfolio includes B2H project costs assuming Idaho Power's ownership share under the Term Sheet, or 45.45 percent. The capital costs modeled, including Allowance for Funds Used During Construction, and excluding any contingency amounts to be consistent with other resources modeled, are $435.5 million.[32] The Preferred Portfolio also includes a reduction in project costs associated with incremental transmission revenues, ultimately benefiting Idaho Power's retail customers. Due to the significant increase in capacity that the B2H project provides to the Idaho to Northwest path, the Company believes firm, short-term firm, and non-firm usage of the Idaho Power transmission system by third parties will likely increase.[33] Additionally, Idaho Power's acquisition of 200 MW of bidirectional capacity to Four Corners, New Mexico will only further enhance the value of the Company transmission system to third parties.[34] These potential revenues would further reduce the cost of the project; however, to be conservative, when modeling in the 2021 IRP, Idaho Power assumed a constant transmission usage by third parties (no increase or decrease) from an average of usage over recent years.[35]

In addition, as evidenced by an opinion from the Company's legal counsel provided as required in the EFSC application and included as Attachment 11, Idaho Power has the legal authority to construct and operate the B2H project without violating its bond indenture provisions, as supplemented, articles of incorporation, bylaws (which together with the articles of incorporation contain all applicable covenants pertaining to common stock), credit agreement, or similar agreements. Due to the high demand for transmission services, the high cost of building new transmission lines, and the intrinsic value of transmission rights-of-way, the Company designs, constructs, and operates its transmission lines and stations with the objective that the facility will be in service indefinitely. Idaho Power has never retired any high-voltage transmission line facilities.

[32] Idaho Power/100, Ellsworth/29.
[33] Idaho Power/100, Ellsworth/31.
[34] *Id.*
[35] *Id.* at 31-32.

Industry-wide, transmission line retirements are extremely rare, occurring only when a line is re-routed. In the extremely unlikely event the B2H project would need to be retired, the Company has the financial capability to cover the costs of the same, as evidenced by the letter from Wells Fargo Bank also provided in support of the EFSC application and included as Attachment 12.

E. OAR 860-025-0030(2)(f): Description of Parcels Necessary for Construction.

A description of the parcels of land that petitioner determines it should obtain an interest in and for which condemnation is assumed to be necessary at the time of the petition, a full explanation of the intended use and the specific necessity and convenience of each. The description must be accompanied by the names and addresses of all persons who have interests, known or of record, in the land to be physically impacted or traversed by the proposed route from whom petitioner has not yet acquired the interest, rights of way or option therefor. Petitioner must include with the petition certification verifying that notice of the petition has been mailed to said persons.

See Attachment 10 for maps of the parcels of land for which Idaho Power has determined it has acquired, or will need to acquire, for the B2H project. Pages 1 through 7, include the names and addresses of all persons who have known interests in the land that may be physically impacted or traversed and from whom Idaho Power has not yet acquired an easement or option. The maps identify those parcels for which the Company has not obtained rights-of-way and therefore may need to be condemned. The maps consist of satellite images along the route and to show the necessity and convenience for each parcel, include the proposed route, proposed tower locations, stations, parcel identifications, and whether or not the property is zoned farm or forest and non-farm or forest. Included as part of this request, is a Certificate of Service listing all the potential affected landowners, identified in Attachment 10, as recipients of the notice of the Petition.

F. OAR 860-025-0030(2)(g): Information related to alternate routes. A statement and explanation with supporting data comparable to that described in subsections (d) and (e) of this section for possible alternative routes analyzed by petitioner.

Over the past decade, Idaho Power has evaluated a myriad of routes. It is important to note that, as a practical matter, providing a comparable level of cost data for all possible alternative routes that were studied for the B2H project is not possible because some alternative routes or route segments were rejected and not studied at the same level of detail (including detailed design and cost estimating) in comparison with the proposed transmission line route. Additionally, cost is not the only criterion used for evaluating a route, and instead other factors may drive siting, such as: (1) regulatory criteria from the BLM, Forest Service, ODOE, Oregon Department of Fish and Wildlife, and Idaho Department of Fish and Game, (2) results of the technical analysis of proposed route alternatives, (3) community criteria, (4) difficulty of construction, and (5) placement opportunities and avoidance and exclusion categories. In general, the route choice was dictated by siting constraints and opportunities and therefore routes rejected early in the process were rejected for non-cost related reasons. However, cost was considered where there was a choice between two permittable routes; in such a case, all other things being equal, the preferred route would have been the shorter, more easily constructed – and therefore less costly – route.

As evidenced in its ASC, Idaho Power presented EFSC with four alternative route segments that could each replace a portion of the proposed B2H project route. Those were: (1) West of Bombing Range Road Alternative 1 (3.7 miles) ("Alternative 1"), (2) West of Bombing Range Road Alternative 2 (3.7 miles) ("Alternative 2"), (3) Morgan Lake Alternative (18.5 miles) ("Alternative 3"), and (4) Double Mountain Alternative (7.4 miles) ("Alternative 4"). The alternative routes are shown in Attachment 7.

As indicated in the ASC, the primary difference between Alternative 1 and the related proposed route segment is that the alternative route shifts a portion of the B2H project from Navy land on the west side of the road to private land on the east side of the road. This alternative will result in impacts to agricultural operations on the east side of the Boardman Bombing Range that otherwise would be avoided with the proposed route. Alternative 2 was developed to avoid the agricultural impacts associated with Alternative 1 on the east side of the Boardman Bombing Range, while also avoiding the Boardman Research Natural Area.

In comparison with the related proposed route segment, Alternative 3 crosses fewer parcels with residences, does not cross the Ladd Marsh WMA, does not cross highway I-84, and is 0.5 mile shorter. Alternative 3 was developed by the Company based on input from land owners.

Finally, Alternative 4, which is located entirely on BLM-managed land, is rangeland and sagebrush. Almost the entire length of this alternative route is located within the BLM-designated Double Mountain Wilderness Characteristic Unit. As can be seen by alternative routes presented in the ASC, cost is not the only criterion used for evaluating a route, and other factors such as permitting difficulty in connection with land use, fish and wildlife, historic and archaeological resources, or other resource constraints ultimately drive route selection.

G. OAR 860-025-0030(2)(h): Additional information. Such additional information as may be needed for a full understanding of the petition.

In addition to the information provided in this Petition, the direct testimony of Mr. Ellsworth, Transmission, Distribution & Resource Planning Director, presents the need and justification for the B2H project, identifying Idaho Power's 2026 capacity deficit through development of the IRP which has been repeatedly met with the addition of a planned 500-kV transmission project, and how the B2H project has demonstrated to be the most cost-effective method for serving projected customer demand.[36] The direct testimony of Ms. Barretto, 500-kV and Joint Projects Senior Manager will present the practicability, design, and permitting of the B2H project.[37] In addition to being the lowest-cost resource in the 2021 IRP, the project is the most cost-effective and reliable way to make progress in meeting the Company's 2045 clean energy goal. The B2H project is needed to continue to provide safe, reliable electric service to Idaho Power's customers and should be deemed by the Commission to be necessary and convenient.

H. OAR 860-025-0030(2)(i): Safety standards information. *A summary of petitioner's plan to ensure compliance with applicable Commission rules, including but not limited to OAR Chapter 860, Division 24, and other safety standards for the safe construction, operation and maintenance of the transmission line. Petitioner must include a certificate executed by an authorized representative of petitioner affirming that it will*

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[36] *See* Idaho Power/100, Ellsworth.
[37] *See* Idaho Power/200, Barretto.

adhere to the applicable Commission rules and other applicable safety standards for construction operation and maintenance of the transmission line. The representative's certificate must be a sworn statement under ORS 162.055 attesting to the truth of the certification;

As described in the testimony of Company witness Ms. Barretto, and evidenced by the declaration included as Idaho Power/202, the B2H project will satisfy the Commission's safety criterion, because it will be constructed, operated, and maintained to meet or exceed all applicable National Electrical Safety Code standards, as well as all applicable federal state and local laws, regulations, and ordinances.[38] Further, Idaho Power has substantial experience in constructing, operating, and maintaining transmission lines in a safe, efficient manner.

Further, with respect to rights-of-way, the widths are based on the National Electrical Safety Code that requires: (1) sufficient clearance is maintained to the edge of the right-of-way during a wind event when the conductors are blown towards the right-of-way edge, (2) sufficient room to allow for transmission line maintenance, and (3) sufficient clearances where structures or trees may be located and deemed a hazard or danger to the transmission line. As a result, there may be circumstances in which specific localized conditions may result in slightly different right-of-way widths. These will be finalized during the detailed design.

Finally, as part of the B2H site certificate, Idaho Power has various plans and commitments to reduce and mitigate the risk of a transmission-related fire during both

[38] *See* Idaho Power/200, Barretto/3-5.

construction and operation of the B2H project.[39] Specifically, the B2H site certificate requires Idaho Power to implement its Fire Prevention and Suppression Plan,[40] which details specific fire-prevention actions during construction, including: posting a firewatch, stationing a water truck at the job site, enforcing red flag warnings, providing fire behavior training to all construction personnel, keeping vehicles on or within designated roads or work areas, and providing fire suppression equipment and emergency notification numbers at each construction site.[41] Additionally, in the event that a fire occurs, firewatch personnel will first report the fire, summon any necessary firefighting assistance, describe intended fire suppression activities and agree on a checking system.[42] Then, after determining a safety zone and an escape route that will not be cut off if the fire increases or changes direction, firewatch personnel will immediately proceed to control and extinguish the fire, consistent with firefighting training and safety.[43]

During operation, Idaho Power's fire-prevention actions will be governed by Vegetation Management Plan and the Wildfire Mitigation Plan.[44] Idaho Power will

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[39] Idaho Power/200, Barretto/7-8.

[40] *In re Application for Site Certificate for the Boardman to Hemingway Transmission Line*, Energy Facility Siting Council, Draft Final Order, Attachment 1: Draft Site Certificate Conditions at 36-37 (Sept. 16, 2022) (discussing Public Services Condition 6, which requires Idaho Power to follow its Fire Prevention and Suppression Plan during construction and operation of the transmission line) (available at https://www.oregon.gov/energy/facilities-safety/facilities/Facilities%20library/2022-09-16-Attachment-1-Draft-Site-Certificate-Conditions.pdf) (last visited Sept. 29, 2022) [hereinafter "Draft Site Certificate Conditions"]. The EFSC has approved Idaho Power's site certificate, but has not yet issued its final order memorializing that approval. For that reason, the document cited here is the draft site certificate. Idaho Power will provide a copy of the final site certificate after EFSC issues its final order..

[41] *In re Application for Site Certificate for the Boardman to Hemingway Transmission Line*, Energy Facility Siting Council, Draft Final Order, Attachment U-3, Fire Prevention and Suppression Plan, § 2.1 [hereinafter "Fire Prevention and Suppression Plan"] (available at https://www.oregon.gov/energy/facilities-safety/facilities/Facilities%20library/2022-09-16-Attachment-U-3-Draft-Fire-Prevention-Suppression-Plan.pdf) (last visited Sept. 29, 2022).

[42] *Id.* at § 2.1.5.

[43] *Id.*

[44] *In re Idaho Power Wildfire Protection Plan*, Docket UM 2209, Idaho Power's 2022 Supplemental Wildfire Mitigation Plan (June 28, 2022) (available at https://edocs.puc.state.or.us/efdocs/HAD/um2209had14368.pdf) (last visited Sept. 29, 2022) [hereinafter "2022 Supplemental Wildfire Mitigation Plan"].

minimize the likelihood of vegetative contact with the transmission line by clearing the right-of-way of any vegetation and regularly conducting vegetation management along the Project route. Idaho Power will initially remove trees and tall shrubs that could potentially come into contact with conductors as part of the right-of-way clearing.[45] After the initial clearance, Idaho Power will maintain the right-of-way consistent with the Project-specific Vegetation Management Plan, which requires Idaho Power to perform vegetation management work in accordance with annual work plans that detail segments of the Project to be managed during a calendar year.[46] In accordance with those annual work plans, Idaho Power will trim trees and tall shrubs sufficiently to ensure that the vegetation will not become a clearance violation before the next maintenance cycle.[47]

Idaho Power's Wildfire Mitigation Plan contains provisions that will further reduce the risk of fire from the transmission line, which identified no areas of higher wildfire risk associated with the proposed route. Relevant sections of the Wildfire Mitigation Plan include but are not limited to: Mitigation of fire risk in the Company's operations and transmission programs,[48] enhanced vegetation management;[49] and the temporary operating procedures put in place during fire season.[50]

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[45] *In re Application for Site Certificate for the Boardman to Hemingway Transmission Line*, Energy Facility Siting Council, Draft Final Order, Attachment K-2: Right-of-Way Clearing Assessment at 13 (July 2020) (available at https://www.oregon.gov/energy/facilities-safety/facilities/Facilities%20library/2022-09-16-Attachment-K-2-Right-of-Way-Clearing-Assessment.pdf) (last visited Sept. 29, 2022). *See also also* Draft Site Certificate Conditions at 18 (discussing Land Use Condition 16, which requires Idaho Power to comply with the Right-of-Way Clearing Assessment).

[46] *In re Application for Site Certificate for the Boardman to Hemingway Transmission Line*, Energy Facility Siting Council, Draft Final Order, Attachment P1-4: Vegetation Management Plan, Appendix A at 91 (available at https://www.oregon.gov/energy/facilities-safety/facilities/Facilities%20library/2022-09-16-Attachment-P1-4-Draft-Vegetation-Management-Plan.pdf) (last visited Sept. 27, 2022). *See also* Draft Site Certificate Conditions at 24 (discussing Fish and Wildlife Condition 2, which requires Idaho Power to comply with its Vegetation Management Plan).

[47] *Id.* at 3-5.

[48] 2022 Supplemental Wildfire Mitigation Plan at 26.

[49] *Id.* at 29.

[50] *Id.* at 39.

Finally, as part of the Wildfire Mitigation Plan, Idaho Power also promulgated its Public Safety Power Shutoff ("PSPS") Plan.[51] The PSPS Plan details Idaho Power's process for assessing when it may be necessary to de-energize the Company's transmission and distribution facilities, including the Project.[52] Importantly, the Commission has approved Idaho Power's Wildfire Mitigation Plan, including the PSPS Plan.[53]

I. OAR 860-025-0030(2)(j): Estimated revenue requirement impacts. At a minimum, petitioner must include an estimate of the levelized, annual revenue requirement of the transmission line as a percentage of its estimated annual revenue requirement. A revenue requirement estimate provided under this rule may be used solely for purposes of evaluating the petition.

Assuming the Company's share of the overall B2H project costs of $[redacted], which is made up of costs associated with the transmission facilities including a contingency, overheads, Allowance for Funds Used During Construction (AFUDC) and property taxes, the estimated levelized annual revenue requirement would be approximately [redacted] [redacted]

[51] *In re Idaho Power Wildfire Protection Plan*, Docket UM 2209, Idaho Power's 2022 Supplemental Wildfire Mitigation Plan, Appendix B: Idaho Power Company's Wildfire Public Safety Power Shutoff Plan (Dec. 2021) [hereinafter "PSPS Plan"].

[52] *Id.* at 5-9.

[53] *In re Idaho Power Wildfire Protection Plan*, Docket UM 2209, Order No. 22-312 (Aug. 26, 2022).

[54] Includes the revenue requirement associated with the capital costs related to the B2H project transmission upgrades, as described in the direct testimony of Mr. Ellsworth.

J. OAR 860-025-0030(2)(k): Public benefits and cost information. Public benefits and costs of the transmission line, if any, are reasonably known to petitioner, including but not limited to: (A) costs and benefits to petitioner's Oregon customers and customers of other Oregon utilities and to Oregonians in general, (B) costs and benefits that the proposed transmission line will provide related to connection to regional and inter-regional grids.

As explained in Company witness Mr. Ellsworth's testimony, the 2021 IRP Preferred Portfolio that includes the B2H project, is, on a net present value basis, $266 million more cost effective than the lowest cost non-B2H project portfolio, definitively showing that the B2H project is a necessary component of the Company's Preferred Portfolio and minimizes both cost and risk to Idaho Power's customers.[55] These results are based on B2H project costs assuming Idaho Power's ownership share under the Term Sheet, or 45.45 percent, totaling $435.5 million.[56] The B2H project is modeled in AURORA as additional transmission capacity available for Idaho Power energy purchases from the Pacific Northwest. In general, for new supply-side resources modeled in the IRP process, surplus sales of generation are included as a cost offset in the AURORA portfolio modeling. Transmission wheeling revenues, however, are not included in AURORA calculations.

To account for this, in the 2021 IRP, Idaho Power modeled incremental transmission wheeling revenue from non-native load customers as an annual revenue

[55] Idaho Power/100, Ellsworth/27.
[56] Idaho Power/100, Ellsworth/29.

credit, offsetting retail revenue requirements of the Company's customers.[57] Therefore, the Preferred Portfolio, which includes the B2H project, includes a reduction in project costs associated with all anticipated incremental transmission revenues resulting from the B2H project, ultimately benefiting the Company's retail customers. The transmission revenue credit incorporates any changes in point-to-point reservations with BPA and PacifiCorp as agreed to under the Term Sheet as well. The B2H project will increase Idaho Power's transmission capacity to the Pacific Northwest and enable additional purchased power from the Mid-C hub at both peak times and when energy prices are favorable relative to the costs of the Company's existing resource fleet, leveraging diversity that exists in the region.

In addition, as explained earlier, due to the significant increase in capacity that the B2H project provides to the Idaho to Northwest path, the Company believes firm, short-term firm, and non-firm usage of the Idaho Power transmission system by third parties could increase, as supported by the over 1,000 MWs of transmission requests that the Company has seen across the Idaho to Northwest path over the past 24 months.[58] Finally, Idaho Power's acquisition of 200 MW of bidirectional capacity to Four Corners, New Mexico will only further enhance the value of the Company transmission system to third parties. These potential revenues would further reduce the cost of the project, however, to be conservative, Idaho Power assumed a constant transmission usage by third parties (no increase or decrease) from an average of usage over recent years.

[57] Idaho Power/100, Ellsworth/31.
[58] Idaho Power/100, Ellsworth/31.

It is worth noting that Idaho Power is in frequent contact with load serving entities and others who have an interest in using the B2H project during various times of the year. Idaho Power believes this interest may increase even more as utilities consider day-ahead markets across the West. B2H could potentially provide connectivity to the CAISO and the Southwest Power Pool markets.. The Company will work to ensure customers obtain the value derived from the use of B2H in these markets.

With respect to the costs and benefits to regional and inter-regional grids, the B2H project will increase the robustness and reliability of the regional transmission system by adding additional high-capacity bulk electric facilities designed with the most up-to-date engineering standards.[59] Major 500-kV transmission lines, such as B2H, substantially increase the grid's ability to recover from unexpected disturbances. With a forced outage rate of less than 1 percent, a transmission line is much more reliable than a power plant, providing the Company's operators additional flexibility when managing the Idaho Power resource portfolio. In addition, the B2H project benefits BPA and PacifiCorp, providing BPA a transmission connection to their southern Idaho load with just a single wheel, while strengthening and modernizing PacifiCorp's transmission network and connecting diverse, clean resources across the West. The B2H project was a component of PacifiCorp's 2021 IRP Action Plan as well, approved by the Commission in docket LC 77 with Order No. 22-178.

[59] Idaho Power/100, Ellsworth/36.

K. OAR 860-025-0030(2)(l): Regulatory approval information. A review of and reference to regulatory approvals and reviews that concern, analyze or otherwise discuss the proposed transmission line, such as an integrated resource plan acknowledgement, other short- or long-term planning documents, construction work plans filed with a regulatory body, and any relevant site certificate issued by the EFSC.

The B2H project has been identified as part of the preferred resource portfolio in Idaho Power's 2009, 2011, 2013, 2015, 2017[60], 2019[61] and most recently in the 2021 IRP. In addition, the B2H project has been identified as a regionally significant project, producing a more efficient or cost-effective plan in the Northern Tier Transmission Group's (NTTG) 2007, 2009, 2011, 2013, 2015, 2017, and 2019 biennial regional transmission plans, and in the NorthernGrid, NTTG's successor regional planning organization, 2021 biennial regional transmission plan.[62] With respect to local transmission plans, the B2H project has been a component of Idaho Power's Local Transmission Plan since the 2008-2009 study cycle. Finally, as discussed in the direct testimony of Ms. Barretto and in the Land Use Information section of this Petition, the EFSC made its final decision to issue the site certificate for the B2H project on September 27, 2022.

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[60] The B2H project first appeared in the near-term Action Plan of the 2017 IRP which was acknowledged in docket LC 68, Order No. 18-176.

[61] The 2019 IRP was acknowledged in docket LC 74, Order No. 21-184, which included construction of the B2H project to occur in the near-term Action Plan.

[62] Exhibit 203/Idaho Power, Barretto/479-899 (the NTTG and NorthernGrid biennial regional transmission plans were provided as attachments to the Company's Response to SDR No. 5).

L. OAR 860-025-0030(2)(m): Load forecast. The most recent load forecasts available to petitioner supporting need for the line. The load forecasts shall, when feasible, include a load forecast of at least 10 years, and an accompanying narrative explaining the kind, nature, extent, and estimated growth of the energy requirements or reasonably anticipated need, load or demand, as relevant to the proposed transmission line.

As part of the 2021 IRP, Idaho Power prepared Appendix A – Sales and Load Forecast, included as Attachment 13, detailing the energy sales and load forecast of future demand for electricity within the Company's service area, covering a 20-year period from 2021 through 2040, which was the basis for the Preferred Portfolio and resulting need for the B2H project as a resource. The forecast is based on economic data, primarily sourced from Moody's Analytics and Woods & Poole Economics while demographic projects are developed from national and local census data. Since filing the 2021 IRP, the Company's capacity deficit increased more, primarily due to continued high load growth across its service territory, including major new large loads, further supporting the need for the B2H project.

Idaho Power's system load is forecast to increase to 2,482 average megawatts (aMW) by 2040 from 1,895 aMW in 2021, representing an average yearly growth rate of 1.4 percent over the 20-year planning period (2021–2040). From an annual peak-hour demand perspective, the anticipated case of the peak demand forecast will grow to 4,700 MW in 2040 from the all-time system peak of 3,751 MW that occurred on Wednesday, June 30, 2021, at 5 p.m. Over this same term, the number of Idaho Power active retail customers is expected to increase from the December 2020 level of 586,071 customers to nearly 851,849 customers by year-end 2040. And some of these customers are bringing significant industrial loads to bear.

The economic and demographic variables driving the 2021 forecast have the impact of increasing current annual sales levels throughout the planning period. For the Company, residential sales increased approximately 5 percent in 2020 and into 2021. This growth is attributable to both work-from-home mandates as well as continued strong in-migration trends. Negative energy use was initially exhibited by the commercial and industrial classes but have since stabilized and, overall, rebounded quickly. Irrigation sales were mostly unaffected by the pandemic.

M. OAR 860-025-0030(2)(n): Transmission line alternatives information.

An evaluation of available alternatives to construction of the transmission line, including but not limited to conservation measures, non-wires alternatives, and construction of one or more lower-voltage single or multi-circuit lines. The petitioner may make reference to relevant sections of its most recent integrated resource plan (IRP) filed under OAR 860-027-0400, local transmission plans, or a planning document substantially equivalent to an IRP.

The goal of the IRP is to ensure Idaho Power's system has sufficient resources to reliably serve customer demand and flexible capacity needs over a 20-year planning period while also the selecting a resource portfolio that balances cost, risk, and environmental concerns.[63] When developing the resource portfolios, the Company uses

[63] Idaho Power/100, Ellsworth/13.

AURORA's long-term capacity expansion modeling capability to optimize resource additions and exits of generating units based on the performance of each zone defined within WECC and develops resource portfolios under various future conditions, such as sensitivities for natural gas prices, carbon costs, load growth and electrification, transmission and clean energy constraints and timelines.[64]

By default, the IRP process evaluates available alternatives to construction of the B2H project. The direct testimony of Mr. Ellsworth discusses the 2021 IRP portfolio modeling and Chapter 9 of the 2021 IRP, included as Attachment 14, further details the development of these portfolios, which built portfolios that selected from a broad range of resource types, as well as varied amounts of nameplate generation additions:

- Wind (between 0 and 2,300 MW)
  - Wyoming (between 0 and 800 MW)
  - Idaho (between 0 and 1,500 MW)
- Solar (between 785 and 5,285 MW in total)
  - Standalone (between 785 and 2,285 MW)
  - With Battery Storage (between 0 and 3,000 MW)
- Standalone Storage (between 0 and 2,700 MW in total)
  - Pumped Hydro (between 0 and 500 MW)
  - Compressed Air Energy Storage (between 0 and 600 MW)
  - Battery Energy Storage
    - 4 Hour Transmission Connected (between 0 and 1,000 MW)
    - 4 Hour Distribution Connected (between 0 and 100 MW)

[64] *Id.* at 24.

        - 8 Hour Transmission Connected (between 0 and 500 MW)

- Natural Gas (between 0 and 2,500 MW in total)
    - Reciprocating Engines (between 0 and 333 MW)
    - Combined Cycle Combustion Turbine (between 0 and 600 MW)
    - Simple Cycle Combustion Turbine (between 0 and 850 MW)
        - Aeroderivative (between 0 and 270 MW)
        - Danskin Unit 1 retrofit (0 or 90 MW)
    - Coal to Natural Gas Conversion of Jim Bridger units 1 and 2 (between 0 and 357 MW)
- Nuclear Small Modular Reactor (between 0 and 924 MW)
- Biomass (between 0 and 350 MW)
- Geothermal (between 0 and 300 MW)
- Demand Response (between 0 and additional 280 MW)
- Accelerated Coal Exits (up to 841 MW in total)
    - Jim Bridger (up to 707 MW)
    - North Valmy Unit 2 (134 MW)

Each resulting portfolio consists of a combination of resources to enable Idaho Power to supply cost-effective electricity to customers over the 20-year planning period. The Preferred Portfolio that includes the B2H project is the lowest cost portfolio and best minimizes both cost and risk.

N. OAR 860-025-0030(2)(o): Electrical engineering studies.

All electrical engineering studies and reliability or resiliency analyses, whether performed by the petitioner or other entities, supporting the necessity of the transmission line when relevant, including those addressing single and multiple contingencies.

Through the Western Electricity Coordinating Council (WECC) Path Rating Process, Idaho Power worked with other western utilities to determine the maximum rating (power flow limit) across the transmission line under various stresses, such as high winter or high summer peak load, light load, high wind generation, and high hydro generation on the bulk power system.[65] Based on industry standards to test reliability and resilience, Idaho Power simulated various outages, including the outage of B2H, while modeling these various stresses to ensure the power grid was capable of reliably operating with increased power flow. Through this process, the Company also ensured the B2H project did not negatively impact the ratings of other transmission projects in the Western Interconnection. Idaho Power completed the WECC Path Rating Process achieving a WECC Accepted Rating of 1,050 MW in the west-to-east direction and 1,000 MW in the east-to-west direction. It was determined that the B2H project would add significant reliability, resilience, and flexibility to the Northwest power grid. Attachment 15 is the Project Review Group Phase II Rating Report resulting from this study.

In addition, as mentioned earlier, the B2H project has been identified as a regionally significant project, producing a more efficient or cost-effective plan in the NTTG's 2007, 2009, 2011, 2013, 2015, 2017 and 2019 biennial regional transmission plans, and in the NorthernGrid, 2021 biennial regional transmission plan. Please see

[65] Idaho Power/100, Ellsworth/23.

Attachments 1 through 8 to the Response to Idaho Power Company's Standard Data Request No. 5 for each of the regional transmission plans.

Finally, the Company provides extensive discussion of other reliability benefits of the project in its 2021 IRP Appendix D[66] as well as in the direct testimony of Mr. Ellsworth, which is summarized below:

Resource Adequacy. The primary reliability benefit that the Company has evaluated is the resource adequacy attributes provided by the B2H project. As discussed earlier, Idaho Power operates a system with an early summer peak demand which typically occurs in the late June/early July timeframe primarily due to its irrigation load which aligns well with spring hydro runoff conditions when the Pacific Northwest is generally flush with surplus power capacity. However, the existing transmission system between the Pacific Northwest and Idaho Power is constrained. Constructing the B2H project will alleviate this constraint benefitting the regions by leveraging the diversity of their respective seasonal demand and generation profiles. The Company needs resources to serve peak load and would benefit from buying energy from the Pacific Northwest.

Reliability – Regional Diversity. Utilities interconnect their systems with low-cost transmission creating diversity of load to reduce their need to build power plants. Transmission allows them to build and share larger, more cost-effective, and more efficient power plants. The B2H project is being developed to take advantage of existing diversity, benefiting both Idaho Power's transmission and retail customers. As evidenced

[66] See Appendix D to Idaho Power's 2021 IRP, pages 41-43, included as an attachment to Idaho Power's Response to Standard Data Request No. 11.

by peak-load estimates, there is significant diversity among the utilities between the western and eastern side of the entire Northwest. If each utility were to individually plan and construct generation to meet their own peak load, 71,900 MW of generating capacity would be required. However, by planning together, that total generating capacity can be reduced more than 10 percent, to 63,500 MW. Transmission connections between the regions, such as B2H, are the key to sharing installed generation capacity.

Grid Reliability/Resiliency. The B2H project will increase the robustness and reliability of Idaho Power's regional transmission system by adding additional high-capacity bulk electric facilities designed with the most up-to-date engineering standards, benefitting the Company's transmission and retail customers as well as substantially increasing the grid's ability to recover from unexpected disturbances.

Resource Reliability. Availability and contribution to resource adequacy on the power grid vary significantly by resource type, but the forced outage rate of a transmission lines has historically been lower than traditional generation resources. With a forced outage rate of less than 1 percent, a transmission line is significantly more reliable than a power plant. Of course, a transmission line requires generating resources to provide energy to the line to serve load. However, energy sold as "Firm" must be backed up and delivered even if a source generator fails. Therefore, Firm energy purchases would have a forced outage rate consistent with the transmission line, which is more reliable than traditional supply-side generation. In the management of cost and risk, the B2H project will provide Idaho Power's operators additional flexibility when managing the Idaho Power's increasingly clean resource portfolio.

O. OAR 860-025-0030(2)(p): Land use information.

A narrative that identifies all land use approvals and permits required for construction of the transmission line. This narrative must include information on whether petitioner has submitted an application for each approval or permit, the status of all such applications, and an explanation as to why petitioner did not obtain any pending or outstanding approvals or permits before submitting a petition under this rule as applicable, including anticipated timelines for issuance of any pending or outstanding approvals and permits, and the section of OAR 860-025-0040 under which the petitioner seeks to demonstrate compliance with that rule.

Under Oregon law, certain types of energy facilities must obtain a site certificate from the Energy Facility Siting Council prior to construction.[67] The term "energy facility" includes a "high voltage transmission line of more than 10 miles in length with a capacity of 230,000 volts or more to be constructed in more than one city or county in this state."[68] Because the B2H project consists of a transmission line of more than 10 miles and with a capacity greater than 230-kV, it is therefore an "energy facility" and cannot be constructed without a site certificate issued by the Council. EFSC determines compliance with all applicable EFSC standards, Oregon and local government statutes, regulations, and permitting requirements related to siting the facility, except for federally-delegated state permits.[69] Upon issuance of the site certificate and following submission by Idaho

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[67] See ORS 469.320(1).

[68] ORS 469.300(11)(a)(C).

[69] See ORS 469.401(4) (explaining that matters not included in and governed by the Site Certificate "include but are not limited to employee health and safety, building code compliance, wage and hour or other labor regulations, local government fees and charges or other design or operational issues that do not relate to siting the facility").

Power of the appropriate applications and payment of proper fees, the affected state agencies and local governments will issue the permits addressed in the site certificate.

The federal, state, and local permits needed for construction and operation of the B2H project in Oregon are identified in the chart included as Attachment 16. Additionally, in Idaho, the Company will need a conditional use permit from Owyhee County. Idaho Power obtained the necessary right-of-way authorizations to cross federal lands administered by the United States Bureau of Land Management in 2017, the Forest Service in 2018, and the Department of Navy in 2020.

In 2018, Idaho Power submitted its complete application for an EFSC site certificate to construct the portions of the B2H project located in Oregon. As part of that application, the Company has requested that the site certificate include and govern the local land use approvals related to siting. In July 2020, the Oregon Department of Energy issued its proposed order, proposing approval of the B2H project subject to certain conditions. Certain members of the public objected to aspects of the proposed order, and EFSC initiated a contested case hearing process to consider the issues raised. On September 27, 2022, EFSC made its final decision to issue the site certificate approving the B2H project subject to certain conditions.[70] In accordance with ORS 469.401(3), following issuance of the site certificate, the state and local agencies will issue the permits and land use approvals governed by the site certificate without further hearings or other proceedings. The permits and approvals beyond those discussed above are in various stages of their respective application and approval processes, the status of which is

[70] Idaho Power understands that EFSC will issue the Final Order and Site Certificate on or around September 30, 2022.

presented in the chart below, and Idaho Power expects they will be issued prior to the start of construction in 2023.

As explained earlier, Idaho Power is submitting its Petition prior to obtaining the outstanding permits and approvals due to scheduling constraints. The B2H project is intended, in part, to serve the 2026 resource deficit identified in Idaho Power's 2021 Integrated Resource Plan. In order to complete the B2H project by 2026, construction must begin in summer 2023. And to begin construction in 2023, the Company will need access to the affected parcels. Idaho Power anticipates it will need to initiate condemnation proceedings to gain access to certain parcels along the B2H project but cannot initiate those condemnation proceedings without first obtaining a CPCN. In order to obtain the CPCN in time to gain access and start construction in 2023, Idaho Power must initiate the CPCN proceedings in September 2022. Therefore, if Idaho Power waits until the outstanding permits and approvals are issued to submit the Company's Petition for a CPCN, Idaho Power likely will not be able to meet the B2H project's 2026 in-service date.

P. OAR 860-025-0030(2)(q): Standard data requests.

When filing a petition, a petitioner must also certify that it has concurrently submitted its responses to the most recent version of the Standard Data Requests for Petitions for Certificates of Public Convenience and Necessity, developed by Staff and available on the Commission's website. As noted earlier, as part of the Notice of Intent submitted to the Commission on September 1, 2022, Idaho Power also filed its responses to the draft Standard Data Requests[71] on the Commission's Huddle site.

V. CONCLUSION

The B2H project has been a cost-effective and reliable resource identified in each of Idaho Power's IRPs since 2009 and continues to be a cornerstone of Idaho Power's 2021 IRP Preferred Portfolio. In the 2021 IRP, as has been the case in prior IRPs, the B2H project is not simply evaluated as a transmission line, but rather as a resource that will be used to serve Idaho Power load, proving to be the most cost-effective method of serving projected customer demand. Once operational, the B2H project will provide Idaho Power increased access to reliable, clean, low-cost market energy purchases from the Pacific Northwest. In addition, the B2H project will increase the efficiency, reliability, and resiliency of the electric system by creating an additional pathway for energy to move between major load centers in the West. The benefits in aggregate reflect the B2H project's importance to the achievement of Idaho Power's goal to provide 100 percent clean energy by 2045 without compromising the Company's commitment to reliability and affordability.

Idaho Power is submitting its Petition prior to obtaining the outstanding permits and approvals due to scheduling constraints. To begin construction in 2023, the Company will need access to the affected parcels. Idaho Power is currently negotiating with landowners in good faith to obtain options for easements, however, Idaho Power anticipates it may need to initiate condemnation proceedings to gain access to certain

[71] Idaho Power's filing included responses to the June 2022 Standard Data Requests; the Company will supplement its filing based on any additional Standard Data Requests that are issued following approval of the rules in AR 626.

parcels along the B2H project. While the Company will continue to negotiate in good faith with landowners to avoid condemnation wherever possible, Idaho Power must initiate the CPCN proceeding now, and respectfully requests approval no later than May 5, 2023, in order to obtain the CPCN in time for construction to commence in 2023.

Respectfully submitted this 30th day of September, 2022.

McDowell Rackner Gibson PC

Jocelyn Pease

Idaho Power Company

Donovan Walker
Lead Counsel
P.O. Box 70
Boise, Idaho 83707

Attorneys for Idaho Power Company

BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON

Docket PCN 5

In the Matter of

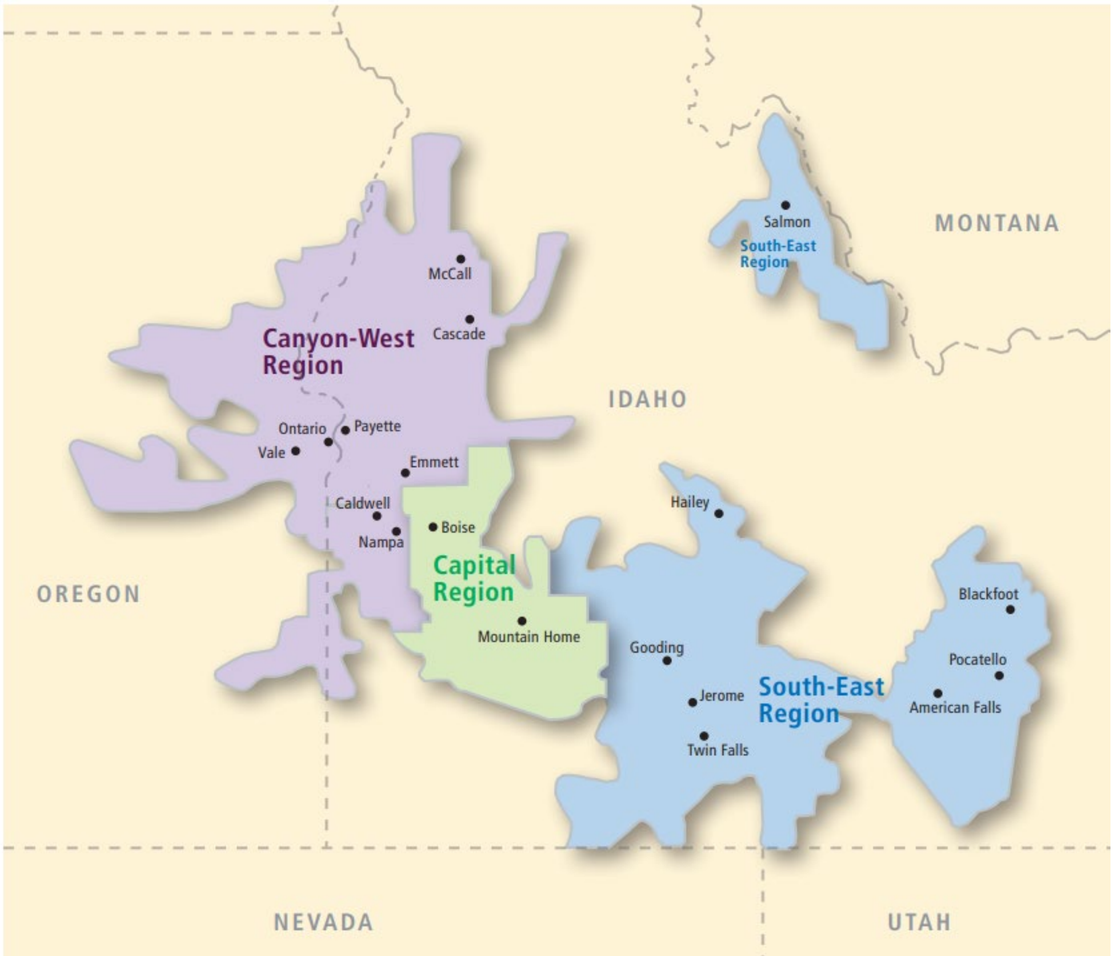
IDAHO POWER COMPANY'S
PETITION FOR CERTIFICATE OF PUBLIC CONVENIENCE
AND NECESSITY

Attachment 1

Idaho Power Service Area

September 30, 2022

Idaho Power's Service Area Map



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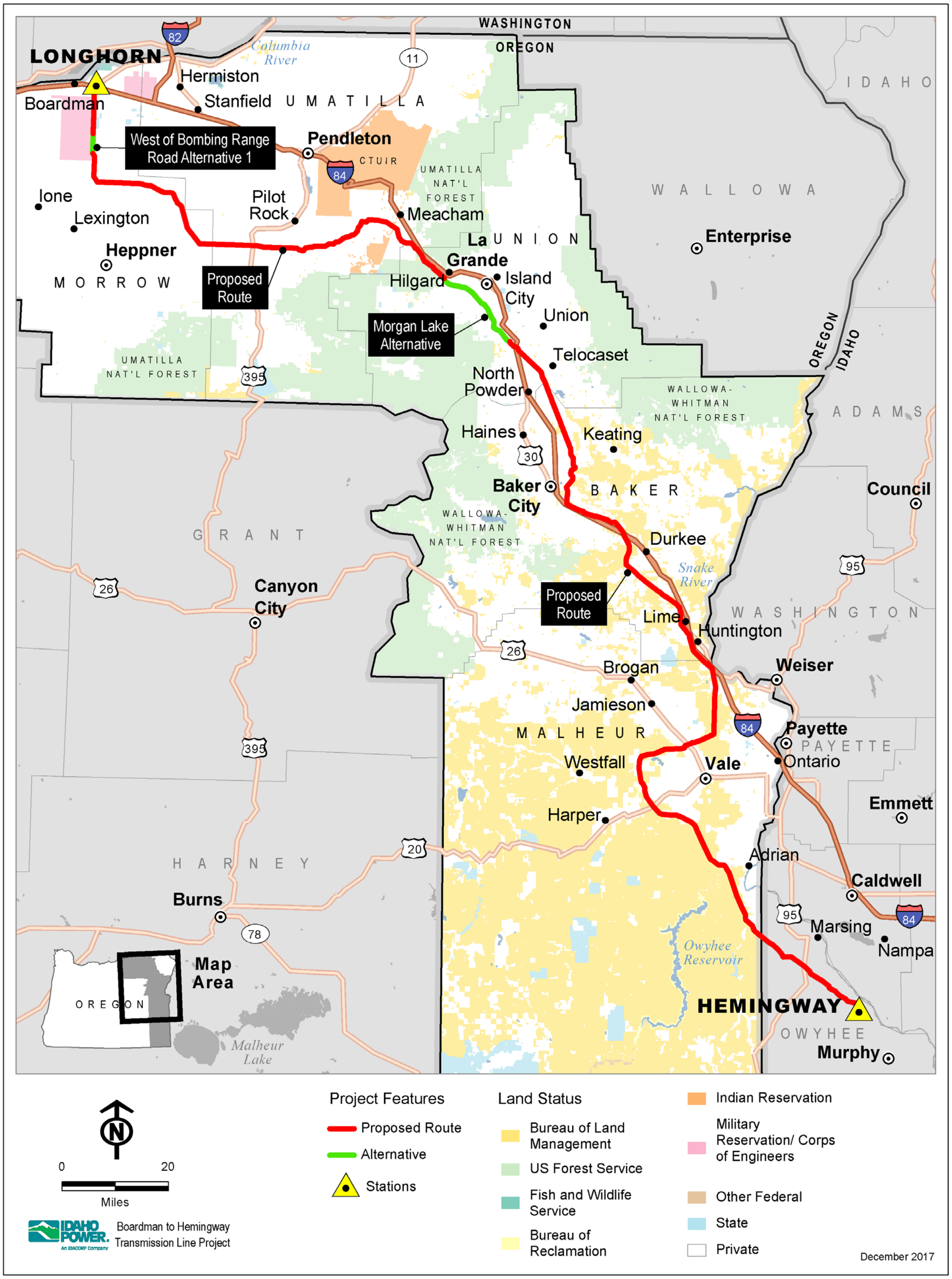
Attachment 2

B2H Project Proposed Route

September 30, 2022

B2H Project Proposed Route



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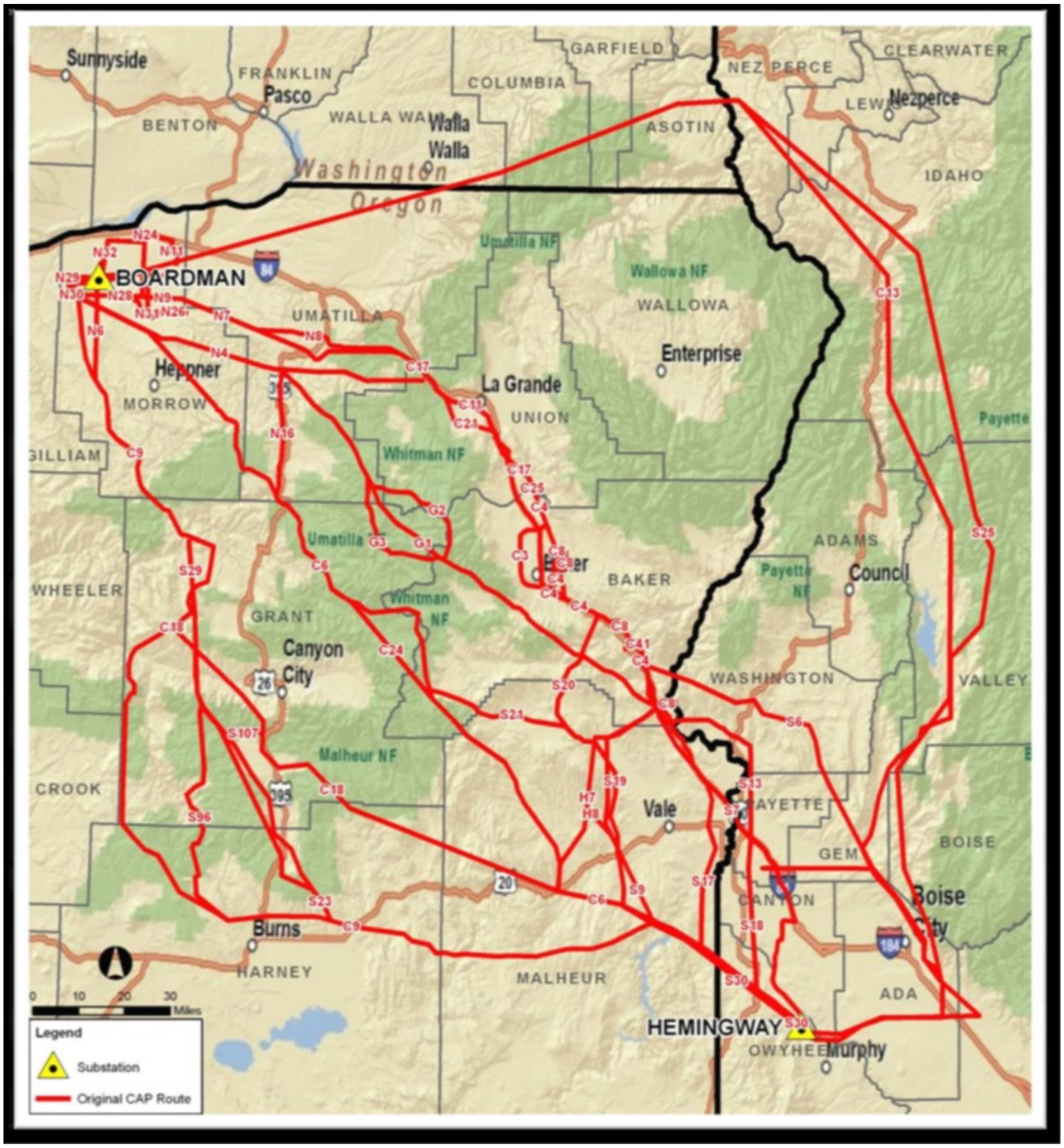
Attachment 3

Routes Developed by CAP Teams

September 30, 2022

B2H Project Routes Developed by the Community Advisory Process Teams
2009 timeframe



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Attachment 4

CAP Proposed Route to BLM

September 30, 2022

B2H Project Proposed Route Resulting from the Community Advisory Process
2010 timeframe

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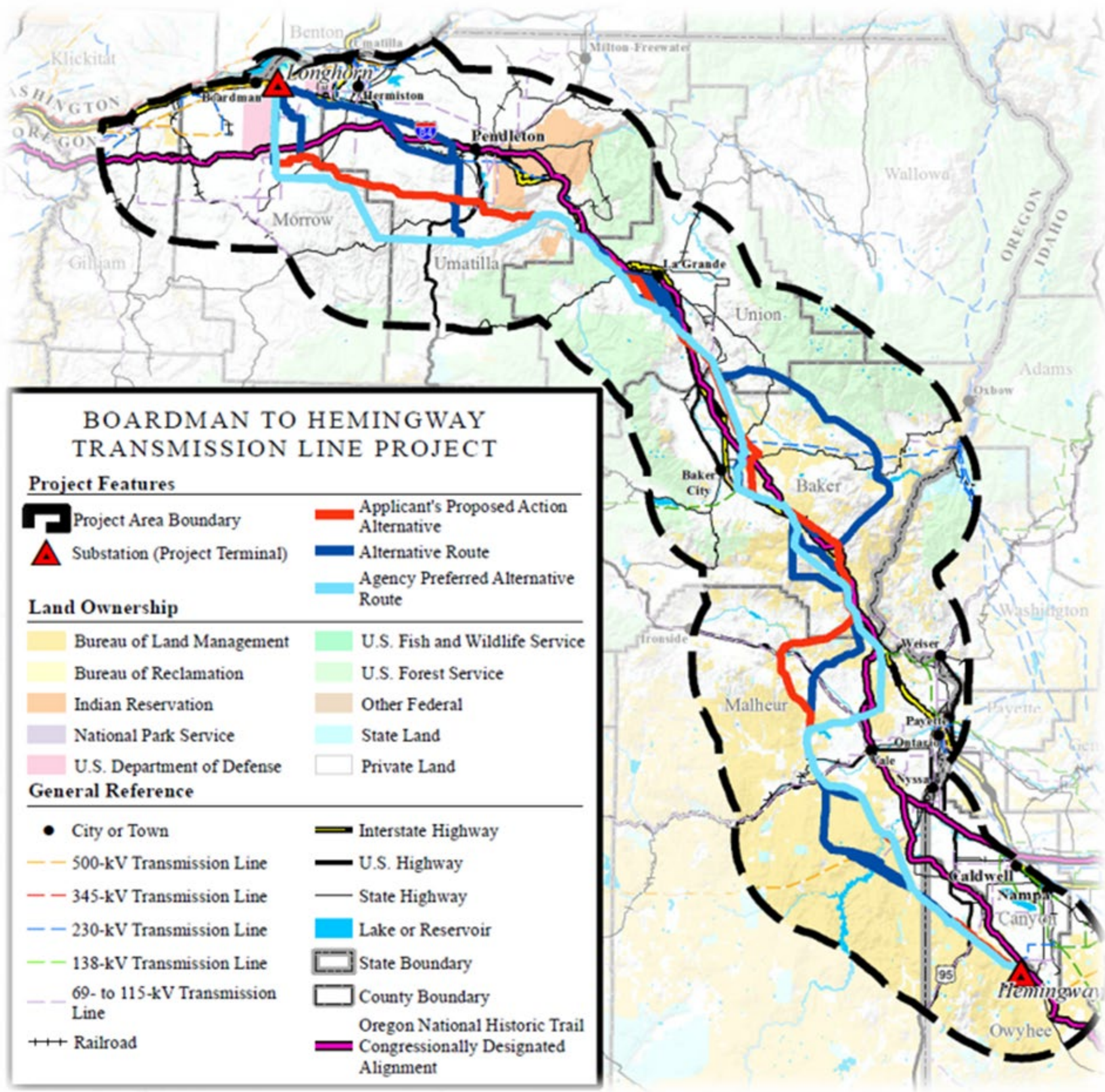
Attachment 5

BLM Route Alternatives

September 30, 2022

Bureau of Land Management Final Environmental Impact Statement Routes



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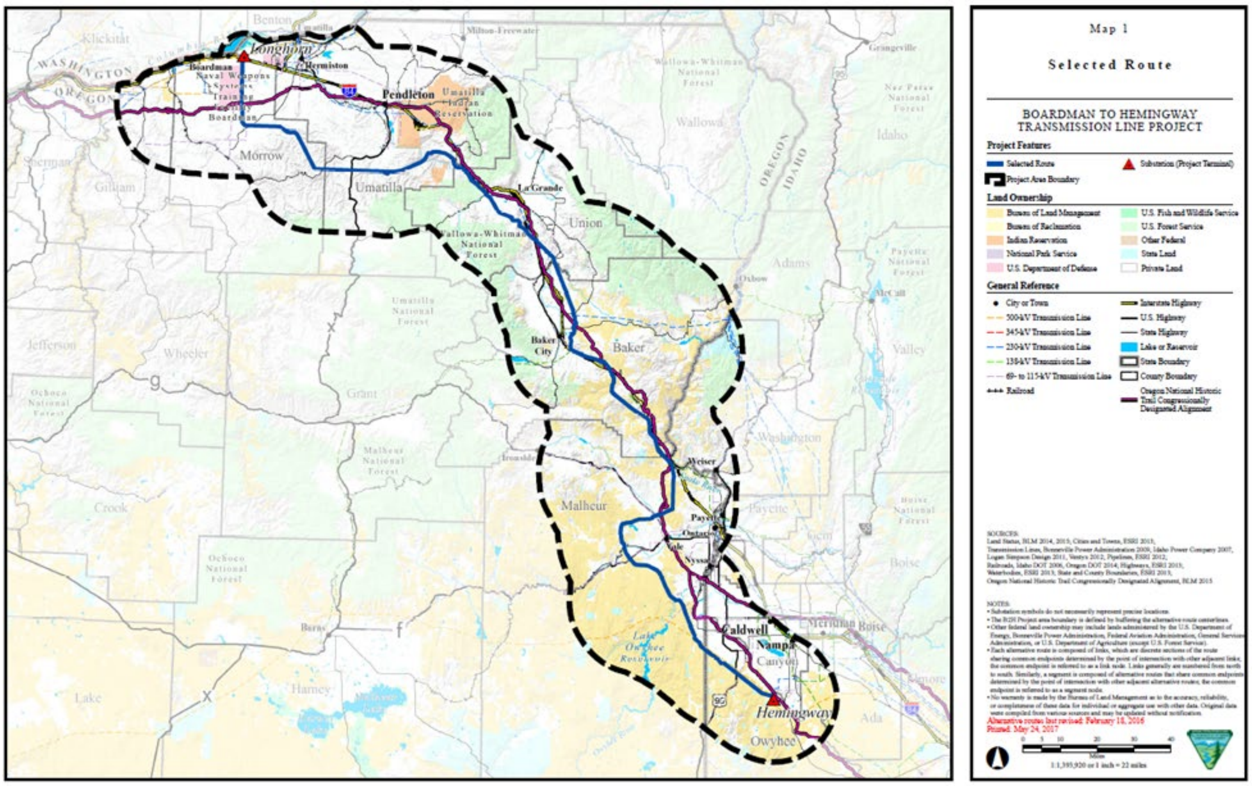
Attachment 6

BLM Agency Preferred Route

September 30, 2022

Bureau of Land Management Agency Preferred Route

2017 Record of Decision



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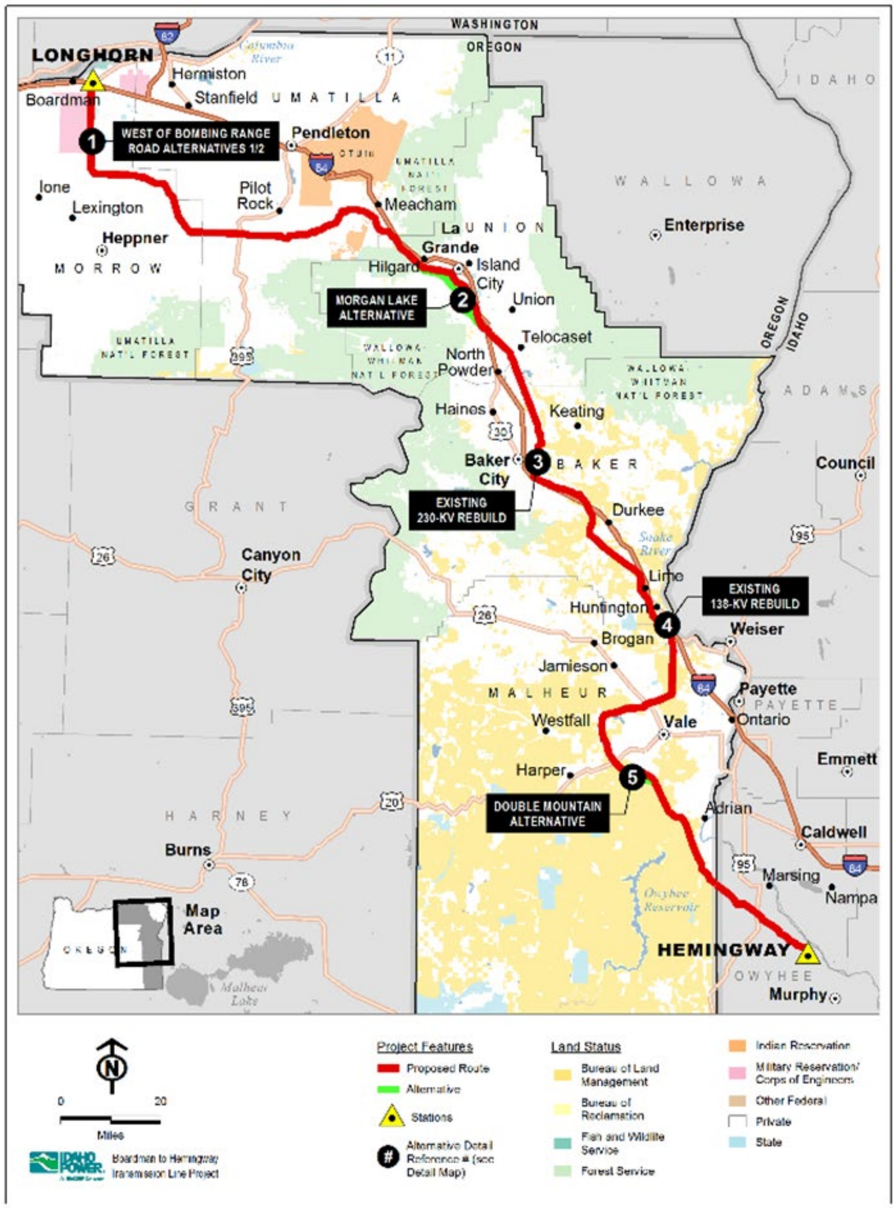
Attachment 7

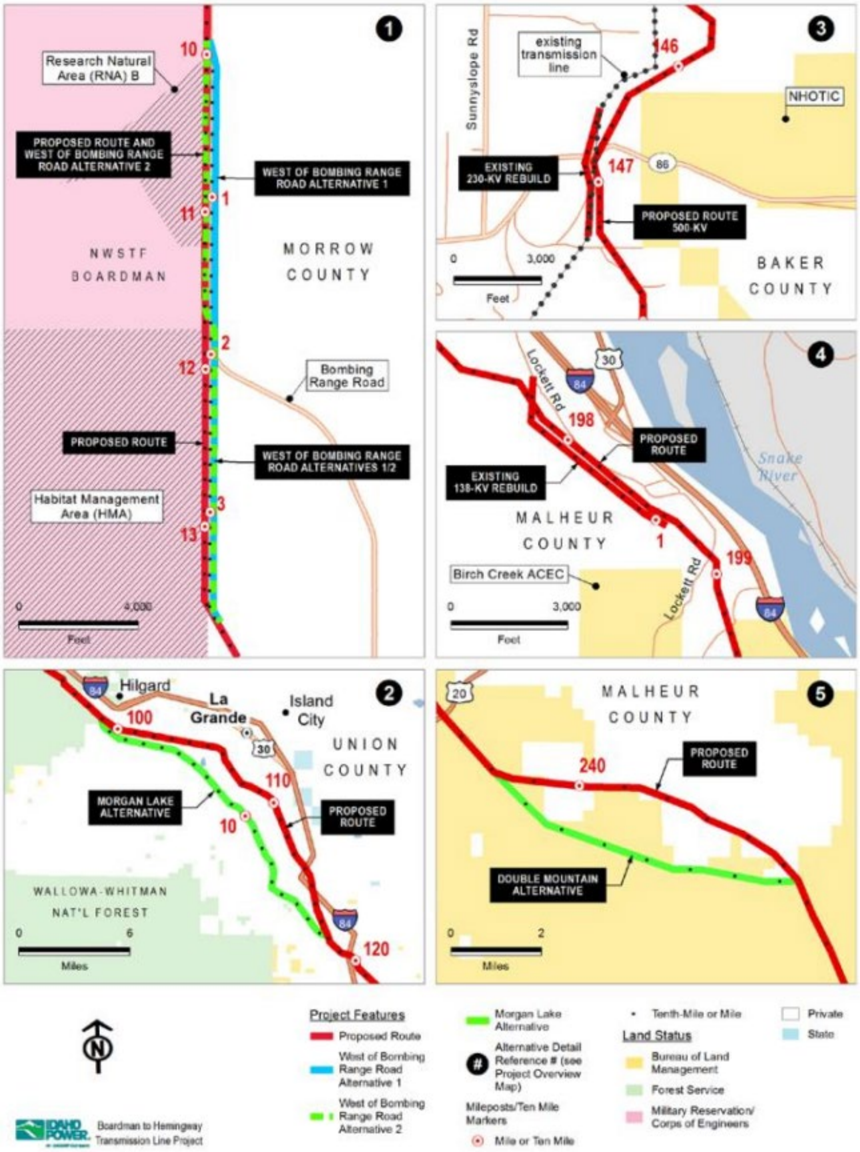
B2H Route EFSC Application

September 30, 2022

B2H Routes Submitted in the EFSC Application for a Site Certificate

2017




1
Research Natural Area (RNA) B
PROPOSED ROUTE AND WEST OF BOMBING RANGE ROAD ALTERNATIVE 2
WEST OF BOMBING RANGE ROAD ALTERNATIVE 1
NWSTF BOARDMAN
MORROW COUNTY
Bombing Range Road
PROPOSED ROUTE
WEST OF BOMBING RANGE ROAD ALTERNATIVES 1/2
Habitat Management Area (HMA)
0 4,000 Feet
3
Sunnyslope Rd
existing transmission line
NHOTIC
EXISTING 230-KV REBUILD
PROPOSED ROUTE 500-KV
BAKER COUNTY
0 3,000 Feet
4
Lockett Rd
PROPOSED ROUTE
EXISTING 138-KV REBUILD
MALHEUR COUNTY
Snake River
Birch Creek ACEC
0 3,000 Feet
2
Hilgard
La Grande
Island City
UNION COUNTY
MORGAN LAKE ALTERNATIVE
PROPOSED ROUTE
WALLOWA-WHITMAN NAT'L FOREST
0 6 Miles
5
MALHEUR COUNTY
PROPOSED ROUTE
DOUBLE MOUNTAIN ALTERNATIVE
0 2 Miles
Project Features
Proposed Route
West of Bombing Range Road Alternative 1
West of Bombing Range Road Alternative 2
Morgan Lake Alternative
Alternative Detail Reference # (see Project Overview Map)
Mileposts/Ten Mile Markers
Mile or Ten Mile
Tenth-Mile or Mile
Land Status
Bureau of Land Management
Forest Service
Military Reservation/ Corps of Engineers
Private
State
Boardman to Hemingway Transmission Line Project

BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON

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PETITION FOR CERTIFICATE OF PUBLIC CONVENIENCE
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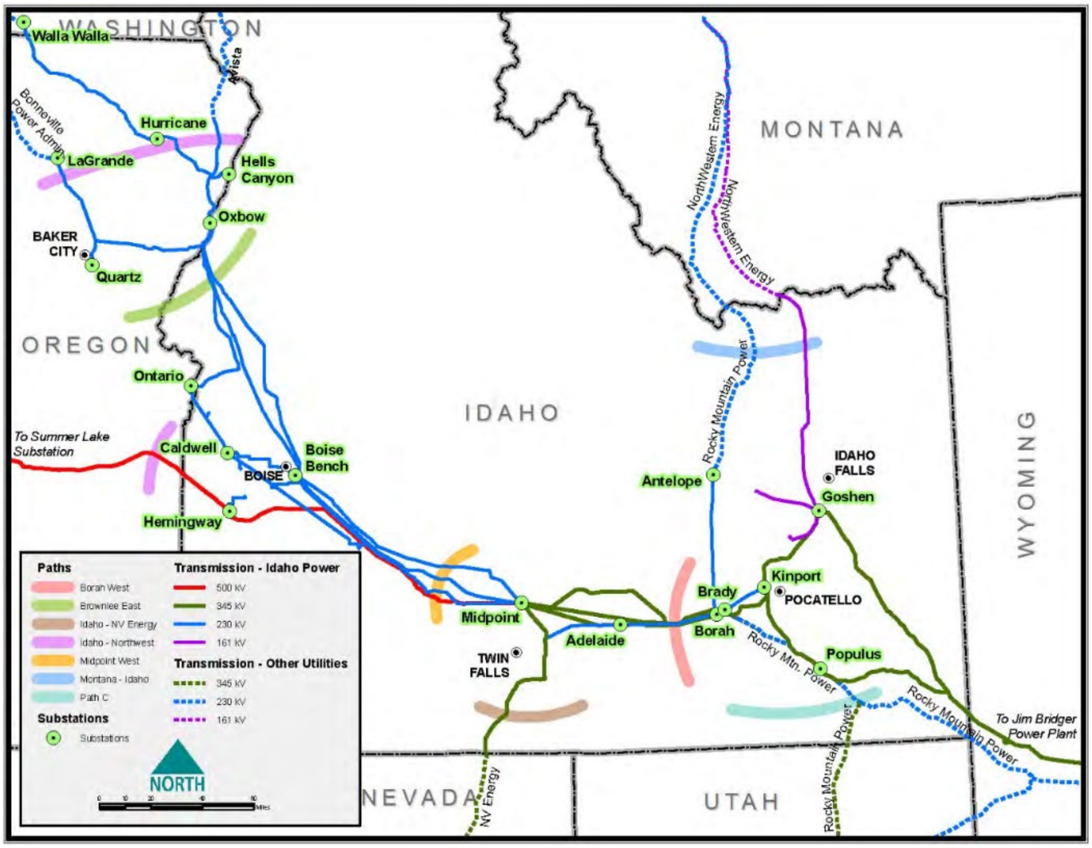
Attachment 8

Idaho Power's Transmission System

September 30, 2022

Idaho Power's Existing Voltage Transmission System



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OF OREGON

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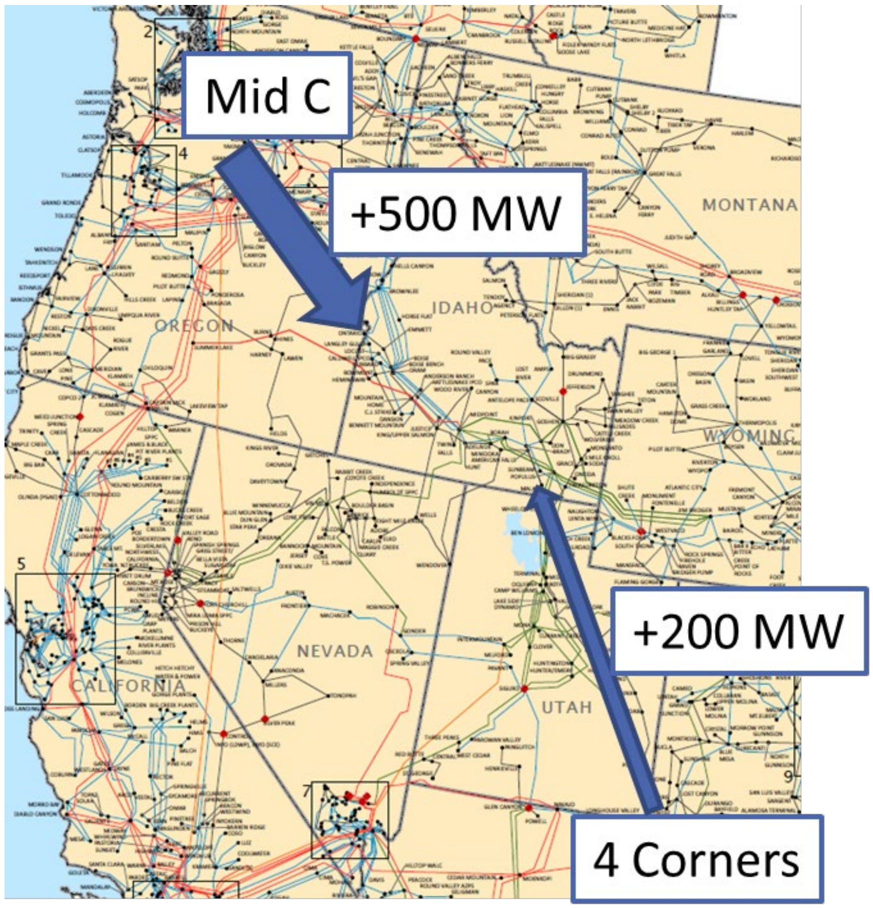
Attachment 9

B2H Market Diversity

September 30, 2022

The B2H Project's Market Diversity



BEFORE THE PUBLIC UTILITY COMMISSION
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Attachment 10

Landowner Information and Parcel Maps

September 30, 2022

LANDOWNER PARCELS									
COUNTY	**TLID/Parcel ID**	**M_OWNER**	**M_OWNER2**	**M_STREET**	**M_STREET2**	**M_CITY**	**M_STATE**	**M_ZIP**	**STATUS**
Umatilla	1S32000004900	ESTATE OF TRUMAN A. CROSS	<Null>	PO BOX 188	<Null>	PILOT ROCK	OR	97868	
Union	03S37E00500	516 RANCH PARTNERSHIP ET AL		1904 ADAMS AVE	<Null>	LA GRANDE	OR	97850	
Union	03S37E00600	516 RANCH PARTNERSHIP ET AL		1904 ADAMS AVE	<Null>	LA GRANDE	OR	97850	
Union	03S37E02600	516 RANCH PARTNERSHIP ET AL		1904 ADAMS AVE	<Null>	LA GRANDE	OR	97850	
Malheur	21S45E1300100	7JB LIVING TRUST	JAMES & KAYE FOSS, TRUSTEES	774 PHEASANT RD	<Null>	ADRIAN	OR	97901	
Malheur	21S45E1300200	7JB LIVING TRUST	JAMES & KAYE FOSS, TRUSTEES	774 PHEASANT RD	<Null>	ADRIAN	OR	97901	
Baker	14S45E02200	ABBE, TEL REECE & LACEY LEANN	<Null>	PO BOX 154	<Null>	WESTFALL	OR	97920	
Malheur	15S45E00300	AGAR, ROY M & DEBRA D LIV TRST		384 OUTLOOK DR	<Null>	ONTARIO	OR	97914	
Morrow	04N25E000001701	AMAZON DATA SERVICES, INC	(blank)	PO BOX 80416	<Null>	SEATTLE	WA	98108	
Umatilla	1S34000001200	ANDERSON LAND & LIVESTOCK, INC		68601 MOTANIC RD	<Null>	PILOT ROCK	OR	97868	
Malheur	17S44E14400	ANTHONY ANGUS LIMITED PTNRSHIP		939 CLARK ST S	<Null>	VALE	OR	97918	Under Contract
Morrow	01N28E000000500	ARCUS, LLC	(blank)	ONE 100TH AVE NE STE. 102	<Null>	BELLEVUE	WA	98004	
Morrow	01N27E10A000300	ASHBECK, MICHELE	(blank)	69425 LITTLE BUTTER CREEK RD	<Null>	ECHO	OR	97826	
Morrow	01N27E000000108	ASHBECK, MITCHELL C & TERRYL ANN	(blank)	69359 LITTLE BUTTER CREEK RD	<Null>	ECHO	OR	97826	
Morrow	01N27E10A000400	ASHBECK, MITCHELL C & TERRYL ANN	(blank)	69359 LITTLE BUTTER CREEK RD	<Null>	ECHO	OR	97826	
Morrow	01N27E000000102	ASHBECK, ROBERT R & JENNIFER	(blank)	69361 LITTLE BUTTER CREEK RD	<Null>	ECHO	OR	97826	
Morrow	01N26E000001900	ASHBECK, TONY R & GERALD T	(blank)	71384A HIGHWAY 207	<Null>	ECHO	OR	97826	
Malheur	21S45E1300300	ASTON, JANET		3902 W ANGUS DR	<Null>	SOUTH JORDAN	UT	84009	
Malheur	21S45E1300301	ASTON, JANET		3902 W ANGUS DR	<Null>	SOUTH JORDAN	UT	84009	
Malheur	23S47E00300	ATKINS, LEE M & SHARON A ET AL		1067 STATELINE RD	<Null>	ADRIAN	OR	97901	
Malheur	17S44E2200800	BAIR, JEFFREY R & MARTI JO		2048 6TH AVE W	<Null>	VALE	OR	97918	Under Contract
Baker	09S40E00100	BAKER COUNTY		1995 3RD ST	<Null>	BAKER CITY	OR	97814	
Baker	09S40E0100500	BAKER COUNTY		1995 3RD ST	<Null>	BAKER CITY	OR	97814	
Morrow	02N26E000000400	BAKER PRODUCE SOUTH, INC	(blank)	PO BOX 4063	<Null>	PASCO	WA	99302	Under Contract
Morrow	02N26E000000500	BAKER PRODUCE SOUTH, INC	(blank)	PO BOX 4063	<Null>	PASCO	WA	99302	Under Contract
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Morrow	02N26E000000603	BAKER PRODUCE SOUTH, INC	(blank)	PO BOX 4063	<Null>	PASCO	WA	99302	Under Contract
Morrow	03N26E000000511	BAKER PRODUCE SOUTH, INC	(blank)	PO BOX 4063	<Null>	PASCO	WA	99302	Under Contract
Baker	11S42E03700	BATES, BETTY L TTEE		28049 OXMAN RANCH LN	<Null>	DURKEE	OR	97905	
Baker	11S43E02800	BATES, BETTY L TTEE		28049 OXMAN RANCH LN	<Null>	DURKEE	OR	97905	
Malheur	17S44E11100	BETTIS, HARRY		PO BOX 7	<Null>	EMMETT	ID	83617	
Morrow	01N28E000000700	BIRCH CREEK LAND, LLC	CURRIN, LISANNE	60732 LITTLE BUTTERCREEK RD	<Null>	HEPPNER	OR	97836	
Morrow	01S28E000000100	BIRCH CREEK LAND, LLC	CURRIN, LISANNE	60732 LITTLE BUTTER CREEK RD	<Null>	HEPPNER	OR	97836	
Morrow	01S29E000000400	BIRCH CREEK LAND, LLC	CURRIN, LISANNE	60732 LITTLE BUTTER CREEK RD	<Null>	HEPPNER	OR	97836	
Baker	12S43E04800	BLOOMER, GARY E TTEE		2411 MAIN STREET	<Null>	BAKER CITY	OR	97814	
Baker	12S43E05600	BLOOMER, GARY E TTEE		2411 MAIN STREET	<Null>	BAKER CITY	OR	97814	
Baker	13S43E00100	BLOOMER, GARY E TTEE		2411 MAIN STREET	<Null>	BAKER CITY	OR	97814	
Baker	13S44E00800	BLOOMER, GARY E TTEE		2411 MAIN STREET	<Null>	BAKER CITY	OR	97814	
Baker	14S44E01100	BOKIDES PROPERTIES, LLC		PO BOX 28	<Null>	WEISER	ID	83672	
Baker	14S44E02900	BOKIDES PROPERTIES, LLC		PO BOX 28	<Null>	WEISER	ID	83672	
Union	04S38E05700	BOOTHMAN RANCHES, INC		PO BOX 3253	<Null>	LA GRANDE	OR	97850	
Umatilla	2S31000001600	BOYLEN, HERBERT (EST)		PO BOX 583	<Null>	PILOT ROCK	OR	97868	
Baker	10S41E02101	BROKEN SPUR RANCH, LLC		30522 OLDFIELD ST	<Null>	HERMISTON	OR	97838	
Baker	10S42E01800	BROKEN SPUR RANCH, LLC		30522 OLDFIELD ST	<Null>	HERMISTON	OR	0	
Umatilla	1S32C00000500	BROKEN SPUR RANCH, LLC		30522 OLDFIELD ST	<Null>	HERMISTON	OR	97838	
Umatilla	1S32C00000800	BROKEN SPUR RANCH, LLC		30522 OLDFIELD ST	<Null>	HERMISTON	OR	97838	
Umatilla	1S33000003900	BROKEN SPUR RANCH, LLC		30522 OLDFIELD ST	<Null>	HERMISTON	OR	97838	
Umatilla	1S33000004101	BROKEN SPUR RANCH, LLC		30522 OLDFIELD ST	<Null>	HERMISTON	OR	97838	
Umatilla	1S33000004500	BROKEN SPUR RANCH, LLC		30522 OLDFIELD ST	<Null>	HERMISTON	OR	97838	
Umatilla	1S34000003000	BROKEN SPUR RANCH, LLC		30522 OLDFIELD ST	<Null>	HERMISTON	OR	97838	
Umatilla	2S33000000800	BROKEN SPUR RANCH, LLC		30522 OLDFIELD ST	<Null>	HERMISTON	OR	97838	
Malheur	23S47E0600202	BRUNING, HAROLD & DEBBIE		1030 DESERT GLEN RD	<Null>	ADRIAN	OR	97901	
Baker	13S44E03200	BUEHLER, DEL RAE		PO BOX 328	<Null>	HUNTINGTON	OR	97907	
Baker	11S42E03000	BUNCH, LEVI A		31413 BURNT RIVER CANYON LN	<Null>	DURKEE	OR	97905	
Baker	12S43E01600	BUNCH, RODD D TTEE ET AL		PO BOX 212	<Null>	DURKEE	OR	97905	
Umatilla	1S34000002090	BURNS, ROBERT M & COLLEEN C		1422 SE 3RD ST	<Null>	PENDLETON	OR	97801	
Morrow	01N27E000000300	BUTTERCREEK RANCHES, LLC	(blank)	PO BOX 487	<Null>	PENDLETON	OR	97801	
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Baker	08S40E00200	CHARLES M COLTON & SONS, INC		45887 SLOUGH RD	<Null>	BAKER CITY	OR	97814	
Morrow	04N25E120000400	CITY OF BOARDMAN	(blank)	PO BOX 229	<Null>	BOARDMAN	OR	97818	
Umatilla	2S32000000200	CLARKE, VERA A (TRS) & TJL RANCH, LLC		1420 NW GILMAN BLVD #SUITE 2 #2655	<Null>	ISSAQUAH	WA	98027	
Umatilla	2S33000001300	CLARKE, VERA A (TRS) & TJL RANCH, LLC		1420 NW GILMAN BLVD #SUITE 2 #2655	<Null>	ISSAQUAH	WA	98027	
Union	04S38E04400	COLLINS, JOHN & CONNIE		PO BOX 402	<Null>	LA GRANDE	OR	97850	

COUNTY	TLID/Parcel ID	M_OWNER	M_OWNER2	M_STREET	M_STREET2	M_CITY	M_STATE	M_ZIP	STATUS
Baker	07S40E02001	COLTON CATTLE CO		45667 SLOUGH RD	<Null>	BAKER CITY	OR	97814	
Union	05S38E00100	COUNSELL, DALE L ET AL		58441 PIERCE RD	<Null>	LA GRANDE	OR	97850	
Union	05S39E01000	COUNSELL, DALE L ET AL		58441 PIERCE RD	<Null>	LA GRANDE	OR	97850	
Union	05S39E01200	COUNSELL, DALE L ET AL		58441 PIERCE RD	<Null>	LA GRANDE	OR	97850	
Union	03S37E01200	COURTNEY RANCHES, LLC		59844 UPPER PERRY LN	<Null>	LA GRANDE	OR	97850	
Umatilla	1S32C00001500	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Umatilla	1S33000004600	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Umatilla	1S34000002300	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Umatilla	1S35000002800	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Umatilla	1S35000005400	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Umatilla	1S35B00006500	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Umatilla	1S35B00007000	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Umatilla	2S30000000100	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Umatilla	2S30H000000300	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Umatilla	2S31000000600	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Umatilla	2S32000000800	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Umatilla	2S33000000400	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Umatilla	2S33000000590	CUNNINGHAM SHEEP & LAND CO		PO BOX 1186	<Null>	PENDLETON	OR	97801	
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Morrow	02S29E000001000	CUNNINGHAM SHEEP & LAND CO	(blank)	PO BOX 1186	<Null>	PENDLETON	OR	97801	
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Umatilla	2S33000000400	CUNNINGHAM SHEEP CO 9% ETAL 91%		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Baker	13S44E3400200	DAVIS, GARY R & LOIS A		4362 SAGE RD	<Null>	ONTARIO	OR	97914	Under Contract
Baker	14S44E00800	DAVIS, GARY R & LOIS A		4362 SAGE RD	<Null>	ONTARIO	OR	97914	Under Contract
Baker	14S44E01000	DAVIS, GARY R & LOIS A		4362 SAGE RD	<Null>	ONTARIO	OR	97914	Under Contract
Baker	14S44E01900	DAVIS, GARY R & LOIS A		4362 SAGE RD	<Null>	ONTARIO	OR	97914	Under Contract
Malheur	17S44E10100	DE LONG, MARK E		2090 7TH AVE W	<Null>	VALE	OR	97918	
Umatilla	2S32100000301	DOCKINS, RICHARD L		64566 E BIRCH CREEK RD	<Null>	PILOT ROCK	OR	97868	
Union	06S39E00100	DODSON FAMILY TRUST		51407 HWY 237	<Null>	NORTH POWDER	OR	97867	
Union	06S40E00704	DODSON FAMILY TRUST		51407 HWY 237	<Null>	NORTH POWDER	OR	97867	
Umatilla	2S30000000502	DOHERTY, LEO A & KATHERINE L		PO BOX 59	<Null>	PILOT ROCK	OR	97868	
Malheur	21S45E00200	DORN ENTERPRISES, INC		453 PALOS VERDES DR W	<Null>	PALOS VERDES EST	CA	90274	
Malheur	21S45E00300	DORN ENTERPRISES, INC		453 PALOS VERDES DR W	<Null>	PALOS VERDES EST	CA	90274	
Malheur	21S45E1300500	DORN ENTERPRISES, INC		453 PALOS VERDES DR W	<Null>	PALOS VERDES EST	CA	90274	
Malheur	21S45E1300600	DORN ENTERPRISES, INC		453 PALOS VERDES DR W	<Null>	PALOS VERDES EST	CA	90274	
Malheur	21S46E03600	DORN ENTERPRISES, INC		453 PALOS VERDES DR W	<Null>	PALOS VERDES EST	CA	90274	
Malheur	21S46E03700	DORN ENTERPRISES, INC		453 PALOS VERDES DR W	<Null>	PALOS VERDES EST	CA	90274	
Malheur	21S46E04100	DORN ENTERPRISES, INC		453 PALOS VERDES DR W	<Null>	PALOS VERDES EST	CA	90274	
Malheur	21S46E04200	DORN ENTERPRISES, INC		453 PALOS VERDES DR W	<Null>	PALOS VERDES EST	CA	90274	
Malheur	23S46E01800	DOWTY, LEON J		1190 RHODES RD	<Null>	RENO	NV	89521	
Umatilla	2S32000000500	DRAPER-JESSEN, TRUDY		PO BOX 338	<Null>	PILOT ROCK	OR	97868	
Umatilla	2S32100000400	DRAPER-JESSEN, TRUDY		PO BOX 388	<Null>	PILOT ROCK	OR	97868	
Baker	09S40E0100600	DUNN, DAN		PO BOX 310	<Null>	HELIX	OR	97835	
Malheur	18S43E01400	FAITH LAND CO, LLC	C/O RUSSELL DECKER	22391 RAMS HORN WAY	<Null>	CALDWELL	ID	83607	Under Contract
Malheur	19S43E02300	FAITH LAND CO, LLC	C/O RUSSELL DECKER	22391 RAMS HORN WAY	<Null>	CALDWELL	ID	83607	Under Contract
Morrow	04N26E000003419	FARMLAND RESERVE, INC	ATTN: TAX ADMINISTRATION	PO BOX 511196	<Null>	SALT LAKE CITY	UT	84151	
Malheur	18S43E03900	FLYING DOUBLE F RANCH, INC		489 N TAURUS WAY	<Null>	STAR	ID	83669	
Umatilla	2S33000000900	FORTH TED J		41257 RIETH RD	<Null>	PENDLETON	OR	97801	Under Contract
Union	05S39E02900	FREE, JONATHAN E & DIANE L		PO BOX 224	<Null>	NORTH POWDER	OR	97867	Under Contract
Union	03S38E08800	GEER, SUSAN ET AL		906 PENN AVE	<Null>	LA GRANDE	OR	97850	
Umatilla	1S32A00002700	GILLILAND, DONNA C		45127 STEWART CREEK RD	<Null>	PILOT ROCK	OR	97868	
Umatilla	1S32C00001600U1	GLOVER, DEAN W ET AL		906 LAMESA DR	<Null>	PORTOLA VALLEY	CA	94028	
Umatilla	2S32000000700U1	GLOVER, DEAN W ET AL		906 LAMESA DR	<Null>	PORTOLA VALLEY	CA	94028	
Umatilla	1S32C00001400U1	GLOVER, R R & D W (CO-TRS) ET AL		1815 SAINT FRANCIS WAY	<Null>	SAN CARLOS	CA	94070	
Umatilla	1S32C00001600U1	GLOVER, RICHARD &JULIA (TRS) ET AL		1815 SAINT FRANCIS WAY	<Null>	SAN CARLOS	CA	94070	
Umatilla	2S32000000700U1	GLOVER, RICHARD &JULIA (TRS) ET AL		1815 SAINT FRANCIS WAY	<Null>	SAN CARLOS	CA	94070	
Union	01S35E01100	GOLDEN POND TIMBERLANDS, INC	% HANCOCK FOREST MANAGEMENT	17700 SE MILL PLN BLVD STE 180	<Null>	VANCOUVER	WA	98683	
Union	02S36E0700200	GOLDEN POND TIMBERLANDS, INC	% HANCOCK FOREST MANAGEMENT	17700 SE MILL PLN BLVD STE 180	<Null>	VANCOUVER	WA	98683	
Union	04S38E02205	GOLDEN POND TIMBERLANDS, INC	% HANCOCK FOREST MANAGEMENT	17700 SE MILL PLN BLVD STE 180	<Null>	VANCOUVER	WA	98683	
Union	05S39E04101	GREEN BRAVO II, LLC	% HOMESTEAD CAPITAL USA LLC	1 EMBARCADERO CENTER STE 3860	<Null>	SAN FRANCISCO	CA	94111	
Union	02S35E00400	GREEN DIAMOND RESOURCE COMPANY		1301 FIFTH AVE STE 2700	<Null>	SEATTLE	WA	98101	
Morrow	02N26E000001200	GRIEB FARMS, INC	(blank)	70575 BOMBING RANGE RD	<Null>	LEXINGTON	OR	97839	
Morrow	02N26E000001500	GRIEB, KEN & CARRI	(blank)	72540 ALPINE LN	<Null>	LEXINGTON	OR	97839	
Morrow	02N26E000001600	GRIEB, KEN & CARRI	(blank)	72540 ALPINE LN	<Null>	LEXINGTON	OR	97839	
Morrow	02N26E000001700	GRIEB, KEN & CARRI	(blank)	72540 ALPINE LN	<Null>	LEXINGTON	OR	97839	
Umatilla	2S30000000500	GURDANE, LLC		PO BOX 588	<Null>	OTHELLO	WA	99344	

COUNTY	TLID/Parcel ID	M_OWNER	M_OWNER2	M_STREET	M_STREET2	M_CITY	M_STATE	M_ZIP	STATUS
Umatilla	2S30000000600	GURDANE, LLC		PO BOX 588	<Null>	OTHELLO	WA	99344	
Umatilla	2S30000000680	GURDANE, LLC		PO BOX 588	<Null>	OTHELLO	WA	99344	
Umatilla	2S30000000800	GURDANE, LLC		PO BOX 588	<Null>	OTHELLO	WA	99344	
Umatilla	2S30000000900	GURDANE, LLC		PO BOX 588	<Null>	OTHELLO	WA	99344	
Baker	10S41E01800	GYLLENBERG, JUSTIN & SAVANNAH		PO BOX 962	<Null>	BAKER CITY	OR	97814	Under Contract
Baker	12S43E03000	HAAS, MATHEW F. & AMY K., TTEE	<Null>	1970 SAN JUAN ROAD	<Null>	AROMAS	CA	95004	
Union	04S38E03300	HAGEDORN, GEORGE R JR ET AL		62097 CHANDLER LP	<Null>	LA GRANDE	OR	97850	
Union	03S37E02900	HALL, MARLENE L ET AL		1950 NW GLENCOE RD	<Null>	HILLSBORO	OR	97124	
Union	03S37E2401000	HALL, MARLENE L ET AL		1950 NW GLENCOE RD	<Null>	HILLSBORO	OR	97124	
Union	03S37E2401100	HALL, MARLENE L ET AL		1950 NW GLENCOE RD	<Null>	HILLSBORO	OR	97124	
Baker	13S44E00600	HAMMOND-PEDRO, LLC	C/O TOM HAMMOND	5365 BREWSTER RD	<Null>	ROCHESTER	MI	48306	
Baker	13S44E01500	HAMMOND-PEDRO, LLC	C/O TOM HAMMOND	5365 BREWSTER RD	<Null>	ROCHESTER	MI	48306	
Baker	13S44E01700	HAMMOND-PEDRO, LLC	C/O TOM HAMMOND	5365 BREWSTER RD	<Null>	ROCHESTER	MI	48306	
Union	03S37E01000	HAMPTON FAMILY TRUST		PO DRAWER K	<Null>	LA GRANDE	OR	97850	
Umatilla	1S35000005000	HANCOCK TIMBERLAND X, INC	% HANCOCK FOREST MANAGEMENT	17700 SE MILL PLN BLVD STE 180	<Null>	VANCOUVER	WA	98683	
Union	02S36E0701100	HANCOCK TIMBERLAND X, INC	% HANCOCK FOREST MANAGEMENT	17700 SE MILL PLN BLVD STE 180	<Null>	VANCOUVER	WA	98683	
Union	04S38E02200	HANCOCK TIMBERLAND X, INC	% HANCOCK FOREST MANAGEMENT	17700 SE MILL PLN BLVD STE 180	<Null>	VANCOUVER	WA	98683	
Baker	09S40E00200	HARRELL LAND & CATTLE, LLC ET AL		42590 SALMON CREEK RD	<Null>	BAKER CITY	OR	97814	
Malheur	21S45E1300400	HARTLEY FARMS, LLC		PO BOX 1698	<Null>	NYSSA	OR	97913	
Umatilla	1S34000002100	HARVEY, CYNTHIA ANNE		77647 N LOOP RD	<Null>	STANFIELD	OR	97875	
Baker	09S40E00800	HAT BRAND LAND & LIVESTOCK, LLC		PO BOX 1003	<Null>	BAKER CITY	OR	97814	
Baker	10S40E0100200	HAT BRAND LAND & LIVESTOCK, LLC		PO BOX 1003	<Null>	BAKER CITY	OR	97814	
Baker	10S41E01000	HAT BRAND LAND & LIVESTOCK, LLC		PO BOX 1003	<Null>	BAKER CITY	OR	97814	
Baker	10S41E01300	HAT BRAND LAND & LIVESTOCK, LLC		PO BOX 1003	<Null>	BAKER CITY	OR	97814	
Baker	10S41E01500	HAT BRAND LAND & LIVESTOCK, LLC		PO BOX 1003	<Null>	BAKER CITY	OR	97814	
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Baker	10S41E01700	HAT BRAND LAND & LIVESTOCK, LLC		PO BOX 1003	<Null>	BAKER CITY	OR	97814	
Baker	10S41E01900	HAT BRAND LAND & LIVESTOCK, LLC		PO BOX 1003	<Null>	BAKER CITY	OR	97814	
Umatilla	1S32C00001300	HATLEY, JAMES D & EVELYN E		PO BOX 458	<Null>	PILOT ROCK	OR	97868	
Umatilla	2S30H000000200	HATLEY, JAMES D & EVELYN E		PO BOX 458	<Null>	PILOT ROCK	OR	97868	
Umatilla	2S31000001100	HATLEY, JAMES D & EVELYN E		PO BOX 458	<Null>	PILOT ROCK	OR	97868	
Umatilla	2S32000000601	HATLEY, JAMES D & EVELYN E		PO BOX 458	<Null>	PILOT ROCK	OR	97868	
Umatilla	2S32000000602	HATLEY, JAMES D & EVELYN E		PO BOX 458	<Null>	PILOT ROCK	OR	97868	
Morrow	01N27E000001000	HAYS, MITCHELL & PEGGY	(blank)	77964 BIG BUTTER CREEK LN	<Null>	ECHO	OR	97826	
Union	05S39E03200	HEFFERNAN FAMILY TRUST		63600 VIEWPOINT LN	<Null>	NORTH POWDER	OR	97867-8126	
Union	05S39E04100	HEFFERNAN FAMILY TRUST		63600 VIEWPOINT LN	<Null>	NORTH POWDER	OR	97867	
Umatilla	1S32C00001400U1	HEMPHILL, RICHARD C & JEAN E (TRS) ET AL		PO BOX 189	<Null>	PILOT ROCK	OR	97868	
Umatilla	1S32C00001600U1	HEMPHILL, RICHARD C & JEAN E (TRS) ET AL		PO BOX 189	<Null>	PILOT ROCK	OR	97868	
Umatilla	2S32000000700U1	HEMPHILL, RICHARD C & JEAN E (TRS) ET AL		PO BOX 189	<Null>	PILOT ROCK	OR	97868	
Baker	08S40E06500	HERITAGE TRAIL RANCH, LLC	C/O TONIA R JOHNSON	43403 SUNNYSLOPE RD	<Null>	BAKER CITY	OR	97814	
Baker	08S41E03600	HERITAGE TRAIL RANCH, LLC	C/O TONIA R JOHNSON	43403 SUNNYSLOPE RD	<Null>	BAKER CITY	OR	97814	
Malheur	17S44E12700	HESTER, KURT ET AL		4391 S RD E	<Null>	VALE	OR	97918	
Umatilla	2S31000000601	HOKE RANCHES		PO BOX 1186	<Null>	PENDLETON	OR	97801	
Malheur	19S43E02900	HOLLOWAY, JERALD M & TAMMY R		1946 SAND HOLLOW RD	<Null>	VALE	OR	97918	
Malheur	19S43E05000	HOLLOWAY, JERALD M & TAMMY R		1946 SAND HOLLOW RD	<Null>	VALE	OR	97918	
Malheur	15S45E01700	HOLTZ MANAGEMENT, LLC	C/O DOUG SHIVELY CPA	23041 AVENIDA DELA CARLOTA#310	<Null>	LAGUNA HILLS	CA	92653	
Morrow	01S29E000001000	HOMER W PETERSON FAMILY TRUST ET AL	JENSON, CHARLES D TRUSTEE	PO BOX 550	<Null>	PENDLETON	OR	97801	
Morrow	02S29E000000400	HOMER W PETERSON FAMILY TRUST ET AL	JENSON, CHARLES D TRUSTEE	PO BOX 550	<Null>	PENDLETON	OR	97801	
Union	03S37E01302	HOORAY, LLC	<Null>	PO BOX 290	<Null>	KINGMAN	KS	67068	
Union	03S38E08900	HOORAY, LLC	<Null>	PO BOX 290	<Null>	KINGMAN	KS	67068	
Morrow	01S29E000002000	HUGHES RANCHES & RESOURCE MNGMT, LLC	(blank)	60458 LITTLE BUTTER CREEK RD	<Null>	HEPPNER	OR	97836	
Morrow	01S29E000002200	HUGHES RANCHES & RESOURCE MNGMT, LLC	(blank)	60458 LITTLE BUTTER CREEK RD	<Null>	HEPPNER	OR	97836	
Morrow	01S29E000002300	HUGHES RANCHES & RESOURCE MNGMT, LLC	(blank)	60458 LITTLE BUTTER CREEK RD	<Null>	HEPPNER	OR	97836	
Morrow	02S28E000000100	HUGHES RANCHES & RESOURCE MNGMT, LLC	(blank)	60458 LITTLE BUTTER CREEK RD	<Null>	HEPPNER	OR	97836	
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Morrow	02S29E000001501	HUGHES RANCHES & RESOURCE MNGMT, LLC	(blank)	60458 LITTLE BUTTERCREEK RD	<Null>	HEPPNER	OR	97836	
Morrow	02S29E000001600	HUGHES RANCHES & RESOURCE MNGMT, LLC	(blank)	60458 LITTLE BUTTER CREEK RD	<Null>	HEPPNER	OR	97836	
Umatilla	1S32000006100	HUMPHREYS, HELEN B (TRS)		65717 E BIRCH CREEK RD	<Null>	PILOT ROCK	OR	97868	
Umatilla	2S32000000400	HUMPHREYS, HELEN B (TRS)		65717 E BIRCH CREEK RD	<Null>	PILOT ROCK	OR	97868	
Malheur	18S43E00400	J R LAND & LIVESTOCK, INC		PO BOX 800	<Null>	HARPER	OR	97906	
Malheur	18S43E03600	J R LAND & LIVESTOCK, INC		PO BOX 800	<Null>	HARPER	OR	97906	
Malheur	18S43E05500	JACOBS, JERRY R & LAURA		942 N APPLE CREEK CIR	<Null>	ALPINE	UT	84004	
Morrow	02S29E000000100	JOE P DOHERTY SHEEP RANCH, INC	LARRY D ANDERSON	PO BOX 588	<Null>	OTHELLO	WA	99344	
Union	01S35E00600	JOHN HANCOCK LIFE INSURANCE CO	% HANCOCK FOREST MANAGEMENT	17700 SE MILL PLN BLVD STE 180	<Null>	VANCOUVER	WA	98683	

COUNTY	TLID/Parcel ID	M_OWNER	M_OWNER2	M_STREET	M_STREET2	M_CITY	M_STATE	M_ZIP	STATUS
Union	02S35E00100	JOHN HANCOCK LIFE INSURANCE CO	% HANCOCK FOREST MANAGEMENT	17700 SE MILL PLN BLVD STE 180	<Null>	VANCOUVER	WA	98683	
Union	04S38E02204	JOHN HANCOCK LIFE INSURANCE CO	% HANCOCK FOREST MANAGEMENT	17700 SE MILL PLN BLVD STE 180	<Null>	VANCOUVER	WA	98683	
Union	04S38E02206	JOHN HANCOCK LIFE INSURANCE CO	% HANCOCK FOREST MANAGEMENT	17700 SE MILL PLN BLVD STE 180	<Null>	VANCOUVER	WA	98683	
Baker	09S40E0100100	JOHNSTON, COY	<Null>	PO BOX 220	<Null>	STAR	ID	83669	
Baker	12S43E04200	JONES, GEORGE & BEVERLY		643 NW 2ND ST	<Null>	ONTARIO	OR	97914	
Baker	09S40E1400100	JUSTIN O'NEAL & ASHLEY TREES		20876 SUNSET LN.	<Null>	BAKER CITY	OR	97814	
Union	04S38E03100	KAAEN, WAYNE & BECKY		PO BOX 402	<Null>	HALFWAY	OR	97834	
Union	04S38E03200	KAAEN, WAYNE & BECKY		PO BOX 402	<Null>	HALFWAY	OR	97834	
Morrow	01N26E000002804	KARYL SMITH, INC	(blank)	8825 N ORCHARD PR RD	<Null>	SPOKANE	WA	99217	
Baker	08S41E03000	KERNS, MARK T & SAVANNAH H		14260 WILLOW CRK LN	<Null>	HAINES	OR	97833	
Baker	11S43E3000100	KESTER, CHARLES H ET AL	KESTER, CHARLES H & PENNY CP	PO BOX 255	<Null>	DURKEE	OR	97905	
Union	03S37E01900	LA GRANDE, CITY OF		PO BOX 670	<Null>	LA GRANDE	OR	97850	
Union	03S37E2400701	LA GRANDE, CITY OF		PO BOX 670	<Null>	LA GRANDE	OR	97850	
Malheur	15S45E00900	LAMSON, NANCIE		5851 LOCKETT RD	<Null>	HUNTINGTON	OR	97907	
Union	03S37E2400800	LARKIN, GREGORY D & EILEEN J		59655 MORGAN LAKE RD	<Null>	LA GRANDE	OR	97850	
Union	03S37E2400801	LARKIN, GREGORY D & EILEEN J		59655 MORGAN LAKE RD	<Null>	LA GRANDE	OR	97850	
Union	03S37E2400802	LARKIN, GREGORY D & EILEEN J		59655 MORGAN LAKE RD	<Null>	LA GRANDE	OR	97850	
Baker	10S41E1700200	LEDBETTER. ROBERT L ET AL		39001 EBELL CRK RD	<Null>	BAKER CITY	OR	97814	
Union	03S37E2400600	LESTER, ROBERT G		6897 HWY 262 SE	<Null>	OTHELLO	WA	99344	Under Contract
Malheur	17S44E10900	LOWER SNAKE RIVER PROP, LLC		707 E 600 N	<Null>	RUPERT	ID	83350	
Malheur	17S44E11000	LOWER SNAKE RIVER PROP, LLC		707 E 600 N	<Null>	RUPERT	ID	83350	
Morrow	01N28E000000400	LUCIANI, JOHN H	(blank)	27633 BUTTERCREEK RD	<Null>	ECHO	OR	97826	
Malheur	22S46E2700200	LYON FAMILY LIVING TRUST		878 COYOTE GULCH RD	<Null>	ADRIAN	OR	97901	
Malheur	22S46E2700201	LYON FAMILY LIVING TRUST		878 COYOTE GULCH RD	<Null>	ADRIAN	OR	97901	
Malheur	22S46E2700300	LYON FAMILY LIVING TRUST		878 COYOTE GULCH RD	<Null>	ADRIAN	OR	97901	
Malheur	22S46E2700400	LYON FAMILY LIVING TRUST		878 COYOTE GULCH RD	<Null>	ADRIAN	OR	97901	
Umatilla	1S32000004800	M C RANCH, INC		2250 NE 25TH AVE	<Null>	HILLSBORO	OR	97214	
Umatilla	1S32000006400	M C RANCH, INC		2250 NE 25TH AVE	<Null>	HILLSBORO	OR	97214	
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Malheur	17S44E2700200	MAAG, REX & PATTI FAMILY TRUST		2423 12TH AVE E	<Null>	VALE	OR	97918	
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Umatilla	2S31000000500	MCCALL, CONNIE		64565 BEAR CREEK RD	<Null>	PILOT ROCK	OR	97868	
Umatilla	2S32100000300	MCCALL, DARYL J & DEBORAH K		64654 E BIRCH CREEK RD	<Null>	PILOT ROCK	OR	97868	
Baker	11S42E01200	MCCALL, LELAND R TTEE ET AL		36943 HILL CREEK RD	<Null>	BAKER CITY	OR	97814	
Umatilla	2S30000000501	MILTENBERGER, ED ET AL		803 SW COURT AVE	<Null>	PENDLETON	OR	97801	
Baker	09S40E00700	MORRIS, LARRY & ROCHELLE TTEE		43010 LINDLEY RD	<Null>	BAKER CITY	OR	97814	
Baker	09S41E00700	MORRIS, LARRY & ROCHELLE TTEE		43010 LINDLEY RD	<Null>	BAKER CITY	OR	97814	
Malheur	21S45E01700	MORTON, CARL A & JULIE A		1248 KLAMATH AVE	<Null>	NYSSA	OR	97913	
Morrow	01N27E000000700	MYERS, JERRY & NANCY	(blank)	68477 LITTLE BUTTER CREEK RD	<Null>	HEPPNER	OR	97836	
Union	04S38E05600	N & C LAND, LLC		71062 PERKINS RD	<Null>	ECHO	OR	97826	
Union	04S39E09000	N & C LAND, LLC		71062 PERKINS RD	<Null>	ECHO	OR	97826	
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Union	03S37E2400700	N A & B A LARKIN REV LIV TRUST		62184 GAERTNER LN	<Null>	LA GRANDE	OR	97850	Under Contract
Baker	10S41E02300	NELSON, DEAN L, REX O & SUSAN		28509 RITTER LP	<Null>	BAKER CITY	OR	97814	
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Baker	13S44E16A00300	NOBLE, CECIL & LILAS		29073 RYE VALLEY LANE	<Null>	HUNTINGTON	OR	97907	
Morrow	01N26E000001100	NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	<Null>	LEXINGTON	OR	97839	
Morrow	01N26E000001102	NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	<Null>	LEXINGTON	OR	97839	
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COUNTY	TLID/Parcel ID	M_OWNER	M_OWNER2	M_STREET	M_STREET2	M_CITY	M_STATE	M_ZIP	STATUS
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Morrow	01N26E000002700	NORTH LEX POWER AND LAND, LLC	RAUCH, CHRISTIAN K	72967 STRAWBERRY LN	<Null>	LEXINGTON	OR	97839	
Baker	11S42E03200	NYGARD, DAVID W & EDNA L		PO BOX 285	<Null>	DURKEE	OR	97905	
Baker	11S42E03500	NYGARD, DAVID W & EDNA L		PO BOX 285	<Null>	DURKEE	OR	97905	
Malheur	17S44E10500	OCCUPANT		1923 6TH AVE E	<Null>	VALE	OR	97918	Under Contract
Union	05S39E02200	OLSEN, KIM		PO BOX 332	<Null>	NORTH POWDER	OR	97867	
Union	05S39E02300	OLSEN, KIM		PO BOX 332	<Null>	NORTH POWDER	OR	97867	
Union	04S38E01900	OREGON, DEPT OF FISH & WILDLIFE	ATTN REALTY SERVICES	3406 CHERRY AVE NE	<Null>	SALEM	OR	97303	
Baker	11S43E04400	OWEN, RICHARD B & GEORGIA TTEE		PO BOX 137	<Null>	DURKEE	OR	97905	Under Contract
Baker	12S42E00100	OWEN, RICHARD B & GEORGIA TTEE		PO BOX 137	<Null>	DURKEE	OR	97905	Under Contract
Baker	12S43E01300	OWEN, RICHARD B & GEORGIA TTEE		PO BOX 137	<Null>	DURKEE	OR	97905	Under Contract
Baker	10S41E02100	P V RANCH ET AL	C/O INTERMOUNTAIN REALTY	1425 CAMPBELL ST	<Null>	BAKER CITY	OR	97814	
Baker	10S41E03300	P V RANCH ET AL	C/O INTERMOUNTAIN REALTY	1425 CAMPBELL ST	<Null>	BAKER CITY	OR	97814	
Malheur	18S43E04000	PALMER FAMILY TRUST		42041 PINE NEEDLE ST	<Null>	TEMECULA	CA	92591	
Umatilla	2S33000000400	PENDLETON RANCHES INC 87.50% ETAL 12.5%		PO BOX 1186	<Null>	PENDLETON	OR	97801	
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Baker	11S42E02900	PIERSON, BILLE J TTEE		1604 STATE HWY 46	<Null>	GOODING	ID	83330	Under Contract
Morrow	01N28E000000200	PINE CANYON RANCH, GP	CAVALLETTO, DONALD O	PO BOX 4965	<Null>	PASO ROBLES	CA	93447	
Umatilla	1S33000002401	PLATT, STEVEN H		47452 MCKAY CREEK RD	<Null>	PILOT ROCK	OR	97868	
Morrow	04N25E120000103	PORT OF MORROW	(blank)	PO BOX 200	<Null>	BOARDMAN	OR	97818	
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Baker	08S41E03001	RICHARD, JOHN ETAL		20701 PROWELL LN	<Null>	BAKER CITY	OR	97814	
Baker	10S41E01100	RUFENACHT LAND & CATTLE CO, INC		5060 N 40TH ST STE 106	<Null>	PHOENIX	AZ	85018	
Umatilla	1S32000004601	RUGG, TOM & MAUREEN		PO BOX 209	<Null>	PILOT ROCK	OR	97868	
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Malheur	16S45E00300	RUPP, WILLIAM F & ROSA M		420 RD 49	<Null>	PASCO	WA	99301	
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Umatilla	1S32C00001400U1	SAUNDERS, RICHARD ET AL		500 POWDER HORN PASS	<Null>	BROOKINGS	SD	57006	
Umatilla	1S32C00001600U1	SAUNDERS, RICHARD ET AL		500 POWDER HORN PASS	<Null>	BROOKINGS	SD	57006	
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Baker	13S44E02100	SCHAFFELD, STEVEN & JERI TTEE		5045 S ROAD K	<Null>	VALE	OR	97918	Under Contract

COUNTY	TLID/Parcel ID	M_OWNER	M_OWNER2	M_STREET	M_STREET2	M_CITY	M_STATE	M_ZIP	STATUS
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Union	02S36E03800	SCHILLER, MARILYN		69958 SCHILLER DR	<Null>	ECHO	OR	97826	
Union	03S36E00200	SCHILLER, MARILYN		69958 SCHILLER DR	<Null>	ECHO	OR	97826	
Union	03S37E00800	SCHILLER, MARILYN		69958 SCHILLER DR	<Null>	ECHO	OR	97826	
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Morrow	01N28E000000300	SCHILLER, MARILYN	(blank)	69958 SCHILLER DR	<Null>	ECHO	OR	97826	
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Morrow	01N28E000000301	SCHILLER, MARILYN, TRUSTEE	(blank)	69958 SCHILLER DR	<Null>	ECHO	OR	97826	
Baker	08S40E2400500	SIDDOWAY, BERT & TERRI		PO BOX 115	<Null>	DURKEE	OR	97905	
Umatilla	1S34000001700	SKILLMAN, E MARGARET (LE) ET AL		38106 REITH RD	<Null>	ECHO	OR	97826	
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Baker	06S40E00100	SMOKE RANCH LP		PO BOX 251	<Null>	NORTH POWDER	OR	97867	
Baker	06S40E00200	SMOKE RANCH LP		PO BOX 251	<Null>	NORTH POWDER	OR	97867	
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Malheur	15S45E01100	STELLAR VENTURES, LLC		3682 S BRIGHAM AVE	<Null>	MERIDIAN	ID	83642	
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Union	06S40E00706	TELOCASET WIND POWER PARTNERS	% HORIZON WIND ENERGY, LLC	808 TRAVIS ST STE 700	<Null>	HOUSTON	TX	77002	
Morrow	04N25E130000100	TERRA POMA LAND, LLC	(blank)	PO BOX 862	<Null>	HERMISTON	OR	97838	
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Malheur	17S44E10300	THARP, KELLY L		133 NW 28TH ST	<Null>	CORVALLIS	OR	97330	
Baker	07S40E00600	THE DLX, LLC		45834 HERITAGE RANCH RD	<Null>	BAKER CITY	OR	97814	
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Baker	10S41E0700100	TRINDLE, MELONIE NICHOLS ETAL		38027 OLD HWY 30	<Null>	BAKER CITY	OR	97814	
Baker	10S42E04200	TROY, G WAYNE & HELEN (LE)	C/O BINGHAM,BINGHAM & WATT CPA	2055 SECOND ST	<Null>	BAKER CITY	OR	97814	
Baker	10S41E02600	TROY, HELEN M TTEE	C/O BINGHAM,BINGHAM & WATT CPA	2055 SECOND ST	<Null>	BAKER CITY	OR	97814	
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Baker	10S42E02900	TROY, HELEN M TTEE ET AL	C/O BINGHAM,BINGHAM & WATT CPA	2055 SECOND ST	<Null>	BAKER CITY	OR	97814	
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Morrow	04N26E070000300	UMATILLA ELECTRIC CO-OP	(blank)	PO BOX 1148	<Null>	HERMISTON	OR	97838	
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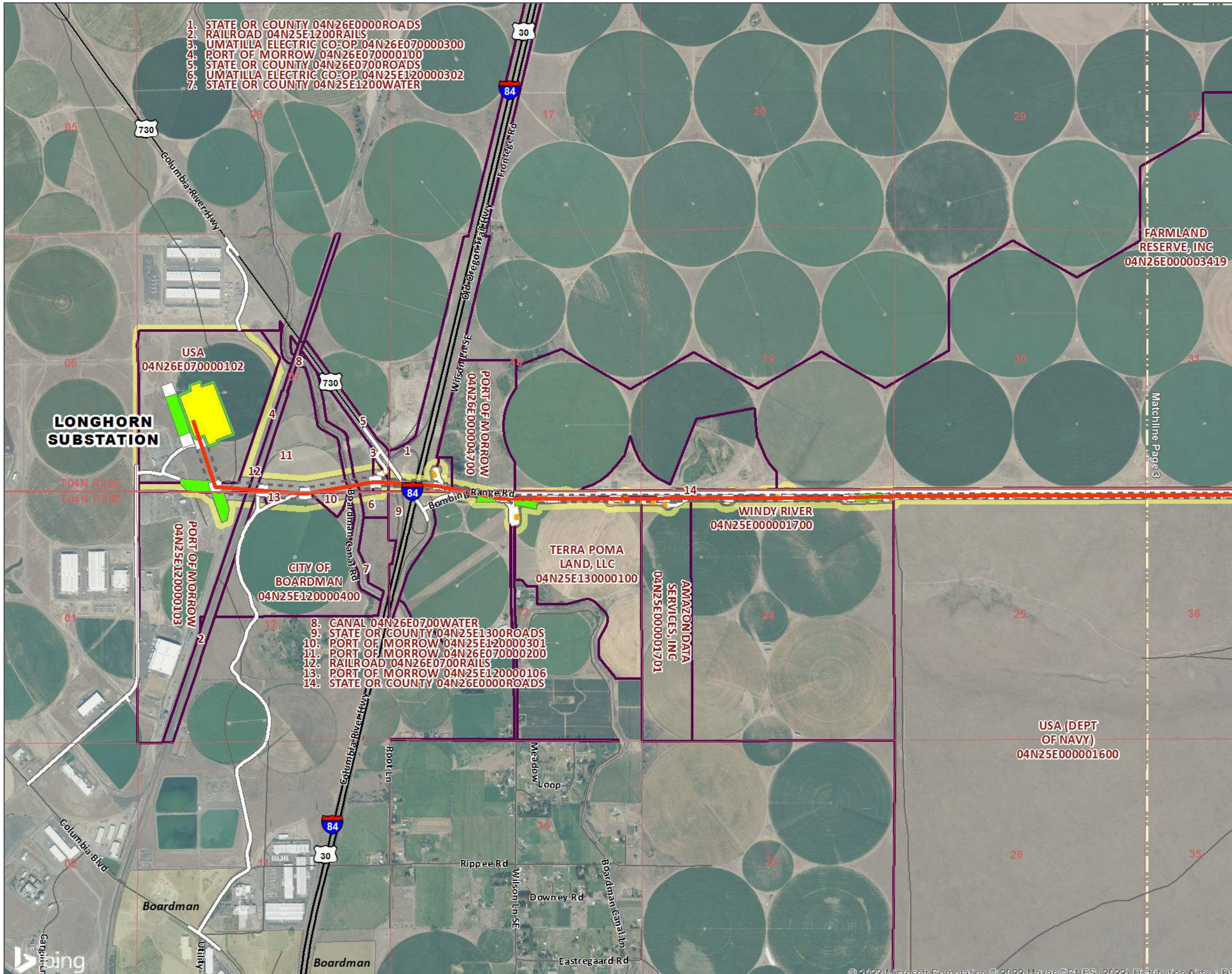
Umatilla	1S34000002900	UMBARGER, WILLIAM ET AL		45919 MINTHORN LN	<Null>	PENDLETON	OR	97801	
Umatilla	1S34000003100	UMBARGER, WILLIAM ET AL		45919 MINTHORN LN	<Null>	PENDLETON	OR	97801	
Morrow	01N27E000000101	VANBUREN FAMILY PROPERTY TRUST	(blank)	32922 KAHLOTUS-PASCO HWY	<Null>	PASCO	WA	99301	
Morrow	01N27E000000103	VANBUREN FAMILY PROPERTY TRUST	(blank)	32922 KAHLOTUS-PASCO HWY	<Null>	PASCO	WA	99301	

COUNTY	TLID/Parcel ID	M_OWNER	M_OWNER2	M_STREET	M_STREET2	M_CITY	M_STATE	M_ZIP	STATUS
Morrow	01N27E000000104	VANBUREN FAMILY PROPERTY TRUST	(blank)	32922 KAHLOTUS-PASCO HWY	<Null>	PASCO	WA	99301	
Morrow	01N28E000000401	VANBUREN FAMILY PROPERTY TRUST	(blank)	32922 KAHLOTUS-PASCO HWY	<Null>	PASCO	WA	99301	
Baker	12S43E01200	VAUGHAN FAMILY LAND & CATTLE		PO BOX 965	<Null>	BAKER CITY	OR	97814	
Baker	12S43E03900	VAUGHAN FAMILY LAND & CATTLE		PO BOX 965	<Null>	BAKER CITY	OR	97814	
Baker	12S43E04100	VAUGHAN FAMILY LAND & CATTLE		PO BOX 965	<Null>	BAKER CITY	OR	97814	
Union	05S39E02800	WARD AGRICULTURAL PROPERTIES		1500 H ST	<Null>	BAKER CITY	OR	97814	
Malheur	19S44E00100	WEGNER, DANIEL P TRUST ET AL	TERRY & PATTI WEGNER	2245 BISHOP RD	<Null>	VALE	OR	97918	
Malheur	19S44E00901	WEGNER, DANIEL P TRUST ET AL	TERRY & PATTI WEGNER	2245 BISHOP RD	<Null>	VALE	OR	97918	
Malheur	20S44E00100	WEGNER, DANIEL P TRUST ET AL	TERRY & PATTI WEGNER	2245 BISHOP RD	<Null>	VALE	OR	97918	
Malheur	20S44E00301	WEGNER, DANIEL P TRUST ET AL	TERRY & PATTI WEGNER	2245 BISHOP RD	<Null>	VALE	OR	97918	
Umatilla	2S32000000900	WEINKE, MARY K ET AL		PO BOX 547	<Null>	PILOT ROCK	OR	97868	
Umatilla	2S32100000100	WEINKE, MARY K ET AL		PO BOX 547	<Null>	PILOT ROCK	OR	97868	
Umatilla	2S31000001000	WENTZ, JOANNE		68865 ELK MOUNTAIN RD	<Null>	ENTERPRISE	OR	97828	Under Contract
Umatilla	2S31000002300	WENTZ, JOANNE		68865 ELK MOUNTAIN RD	<Null>	ENTERPRISE	OR	97828	Under Contract
Malheur	17S44E09900	WHITE, DAVID E		4457 JOHN DAY HWY	<Null>	VALE	OR	97918	
Malheur	17S44E10000	WHITE, DAVID E		4457 JOHN DAY HWY	<Null>	VALE	OR	97918	
Umatilla	2S31000001300	WHITE, NIEL OWEN		PO BOX 366	<Null>	PILOT ROCK	OR	97868	
Baker	12S44E02700	WICK RANCHES, LLC		8421 S TEN MILE RD	<Null>	MERIDIAN	ID	83642	
Baker	13S44E00900	WICK RANCHES, LLC		8421 S TEN MILE RD	<Null>	MERIDIAN	ID	83642	
Malheur	17S44E10800	WILCOX, ANDREW	<Null>	4536 JOHN DAY HWY	<Null>	VALE	OR	97918	
Malheur	17S44E11200	WILCOX, ANDREW	<Null>	4536 JOHN DAY HWY	<Null>	VALE	OR	97918	
Morrow	01N26E000000400	WILLIAM J DOHERTY RANCH, LLC	(blank)	70644 DOHERTY RD	<Null>	LEXINGTON	OR	97839	
Morrow	01N26E000001300	WILLIAM J DOHERTY RANCH, LLC	(blank)	70644 DOHERTY RD	<Null>	LEXINGTON	OR	97839	
Morrow	01N26E000002400	WILLIAM J DOHERTY RANCH, LLC	(blank)	70644 DOHERTY RD	<Null>	LEXINGTON	OR	97839	
Union	03S37E01300	WILLIAMS, JOHN COLLIER		PO BOX 1384	<Null>	LA GRANDE	OR	97850	
Morrow	04N25E000001700	WINDY RIVER	(blank)	1000 HWY 395 S #423	<Null>	HERMISTON	OR	97838	
Malheur	23S46E01900	WOOD FAMILY TRUST	C/O FLOYD WOOD, TRUSTEE	PO BOX 1107	<Null>	HOMEDALE	ID	83628	



LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
New Road, Primitive
Longhorn Station (Operation)
Longhorn Station (Construction)
Pulling and Tensioning
Structure Work Area
Structure Work Area (Removal
Selected Site Boundary

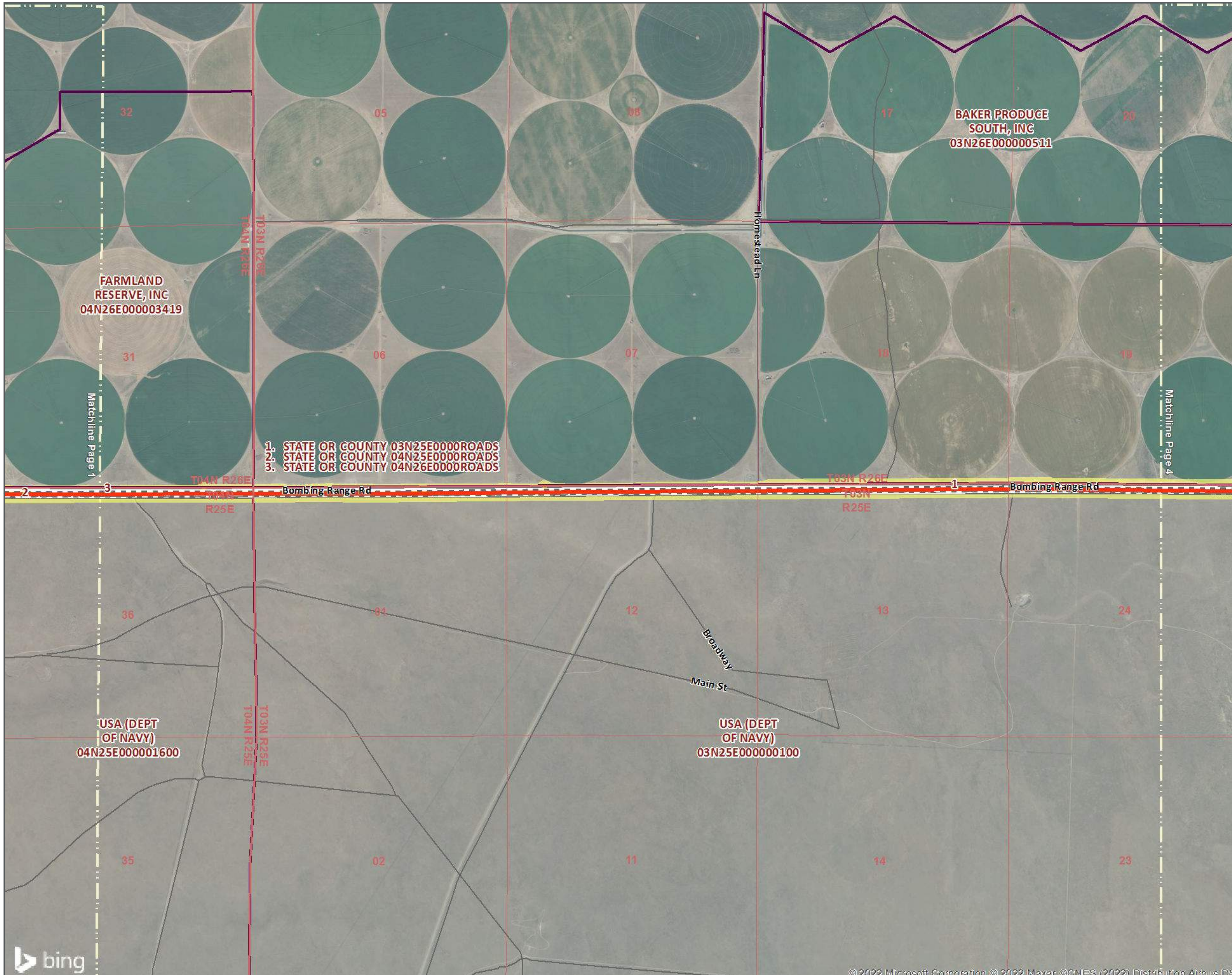
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N
0 2,000 4,000 Feet

Morrow County

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022



LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
New Road, Primitive
Pulling and Tensioning
Structure Work Area
Structure Work Area (Removal
Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

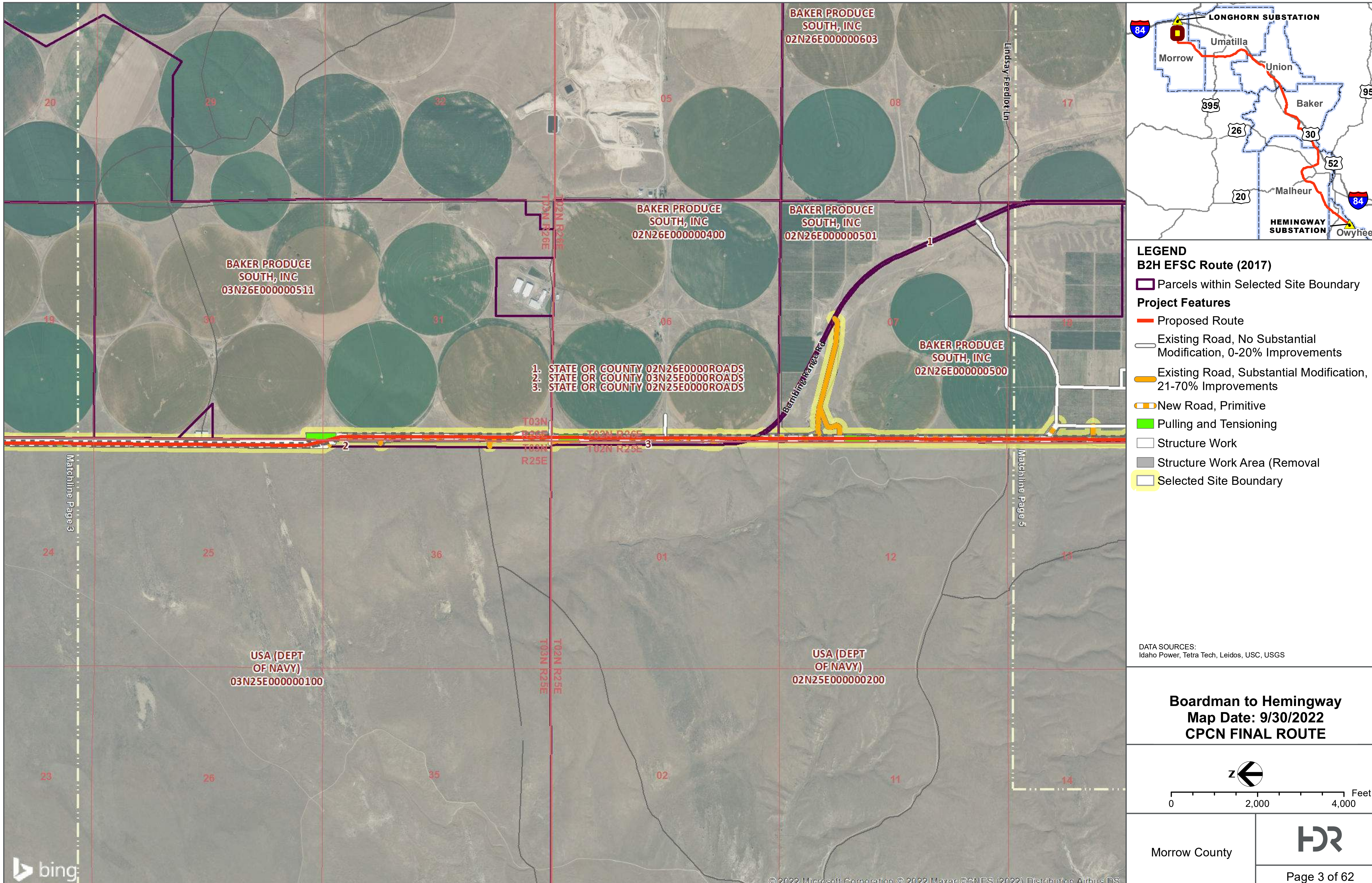
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N
Feet
0 2,000 4,000

Morrow County

HDR

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022



LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
New Road, Primitive
Pulling and Tensioning
Structure Work
Structure Work Area (Removal
Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

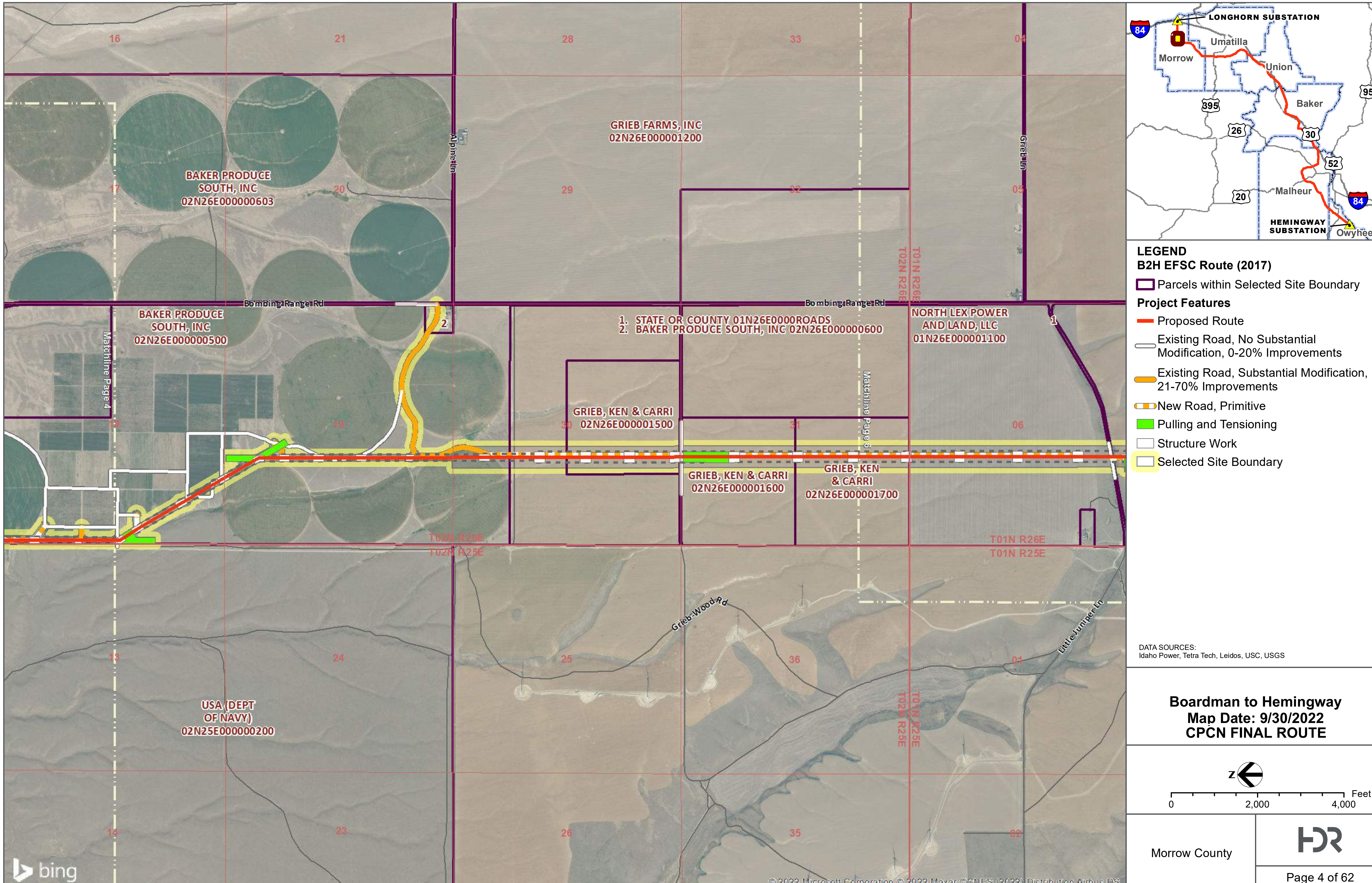
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N
0 2,000 4,000 Feet

Morrow County

HDR

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022



LEGEND

B2H EFSC Route (2017)

Parcels within Selected Site Boundary

Project Features

Proposed Route

Existing Road, No Substantial Modification, 0-20% Improvements

Existing Road, Substantial Modification, 21-70% Improvements

New Road, Primitive

Pulling and Tensioning

Structure Work

Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N

0 2,000 4,000 Feet

Morrow County

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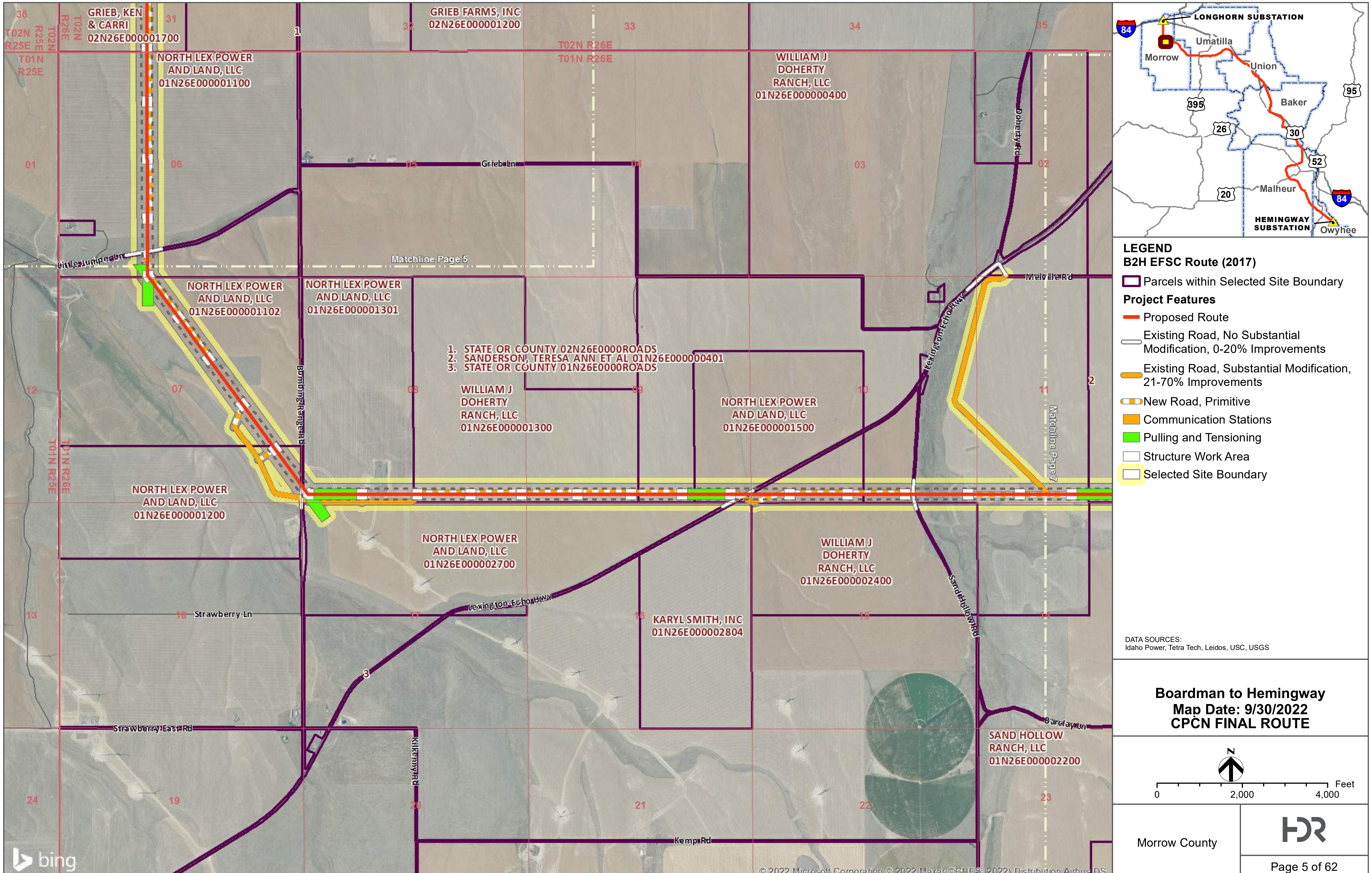
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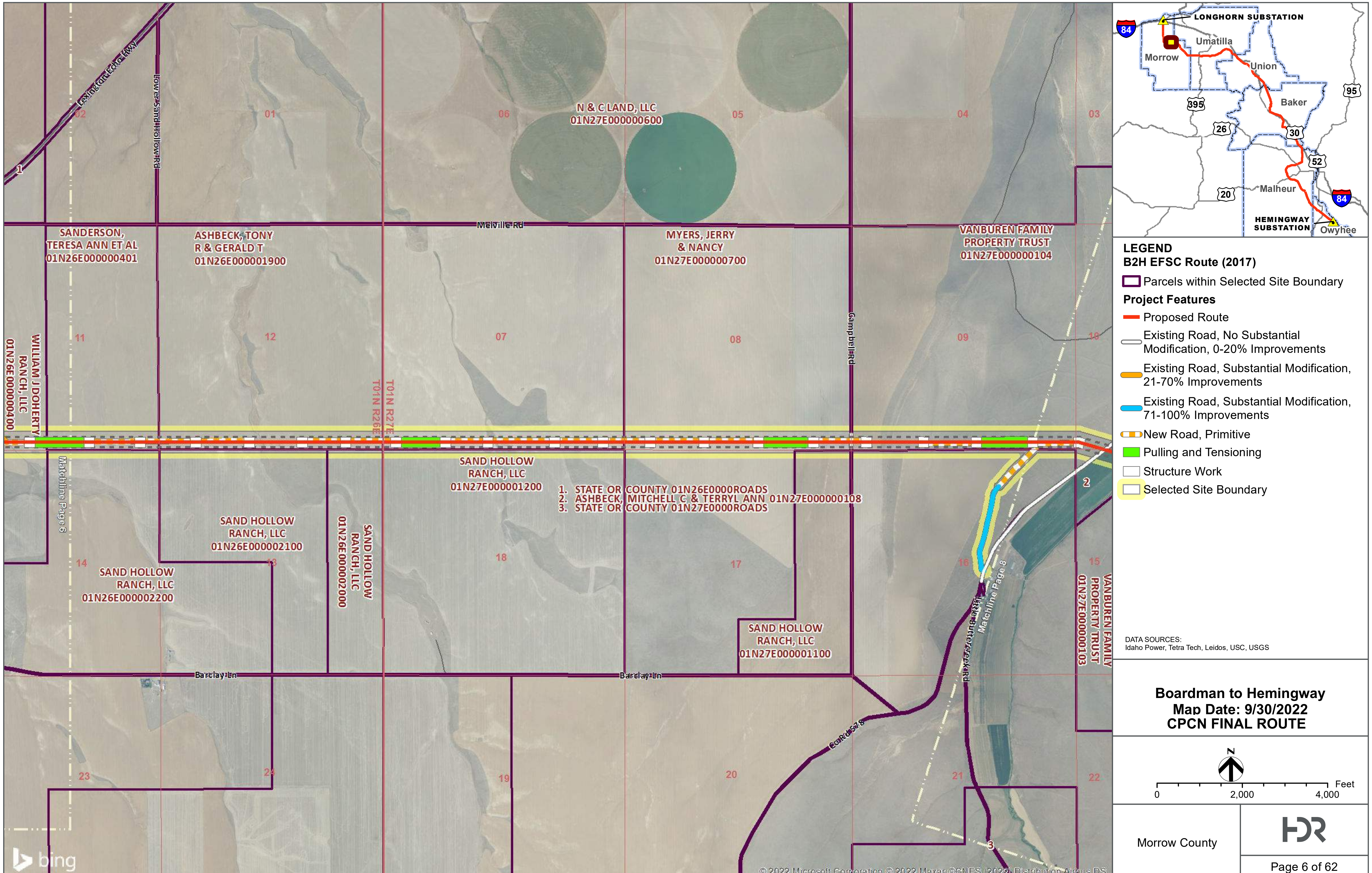
GRIEB FARMS, INC 02N26E000001200
T02N R26E
T01N R26E
NORTH LEX POWER AND LAND, LLC 01N26E000001100
WILLIAM J DOHERTY RANCH, LLC 01N26E000000400
Grieb Ln
Little Juniper Ln
Matchline Page 5
Melville Rd
Doherty Rd
NORTH LEX POWER AND LAND, LLC 01N26E000001102
NORTH LEX POWER AND LAND, LLC 01N26E000001301
1. STATE OR COUNTY 02N26E0000ROADS
2. SANDERSON, TERESA ANN ET AL 01N26E000000401
3. STATE OR COUNTY 01N26E0000ROADS
WILLIAM J DOHERTY RANCH, LLC 01N26E000001300
NORTH LEX POWER AND LAND, LLC 01N26E000001500
Lexington Echo Hwy
Bombing Range Rd
Matchline Page 7
NORTH LEX POWER AND LAND, LLC 01N26E000001200
NORTH LEX POWER AND LAND, LLC 01N26E000002700
WILLIAM J DOHERTY RANCH, LLC 01N26E000002400
KARYL SMITH, INC 01N26E000002804
Strawberry Ln
Sand Hollow Rd
Strawberry East Rd
Kilkenny Rd
Barclay Ln
SAND HOLLOW RANCH, LLC 01N26E000002200
Kemp Rd
© 2022 Microsoft Corporation © 2022 Maxar ©CNES (2022) Distribution Airbus DS
LONGHORN SUBSTATION
Umatilla
Morrow
Union
Baker
Malheur
HEMINGWAY SUBSTATION
Owyhee
LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
New Road, Primitive
Communication Stations
Pulling and Tensioning
Structure Work Area
Selected Site Boundary
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE
N
0
2,000
4,000
Feet
Morrow County
Page 5 of 62



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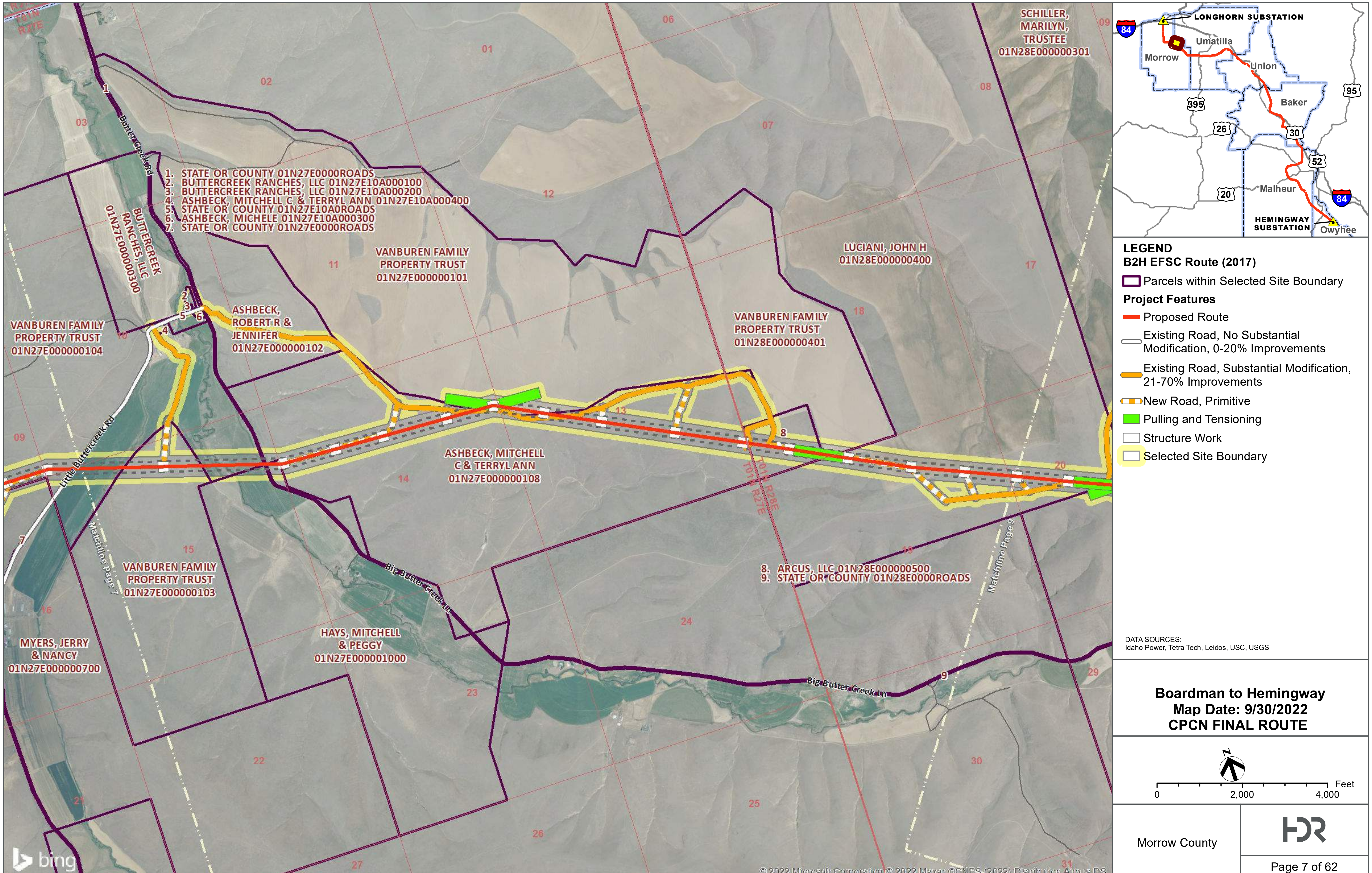

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Morrow County

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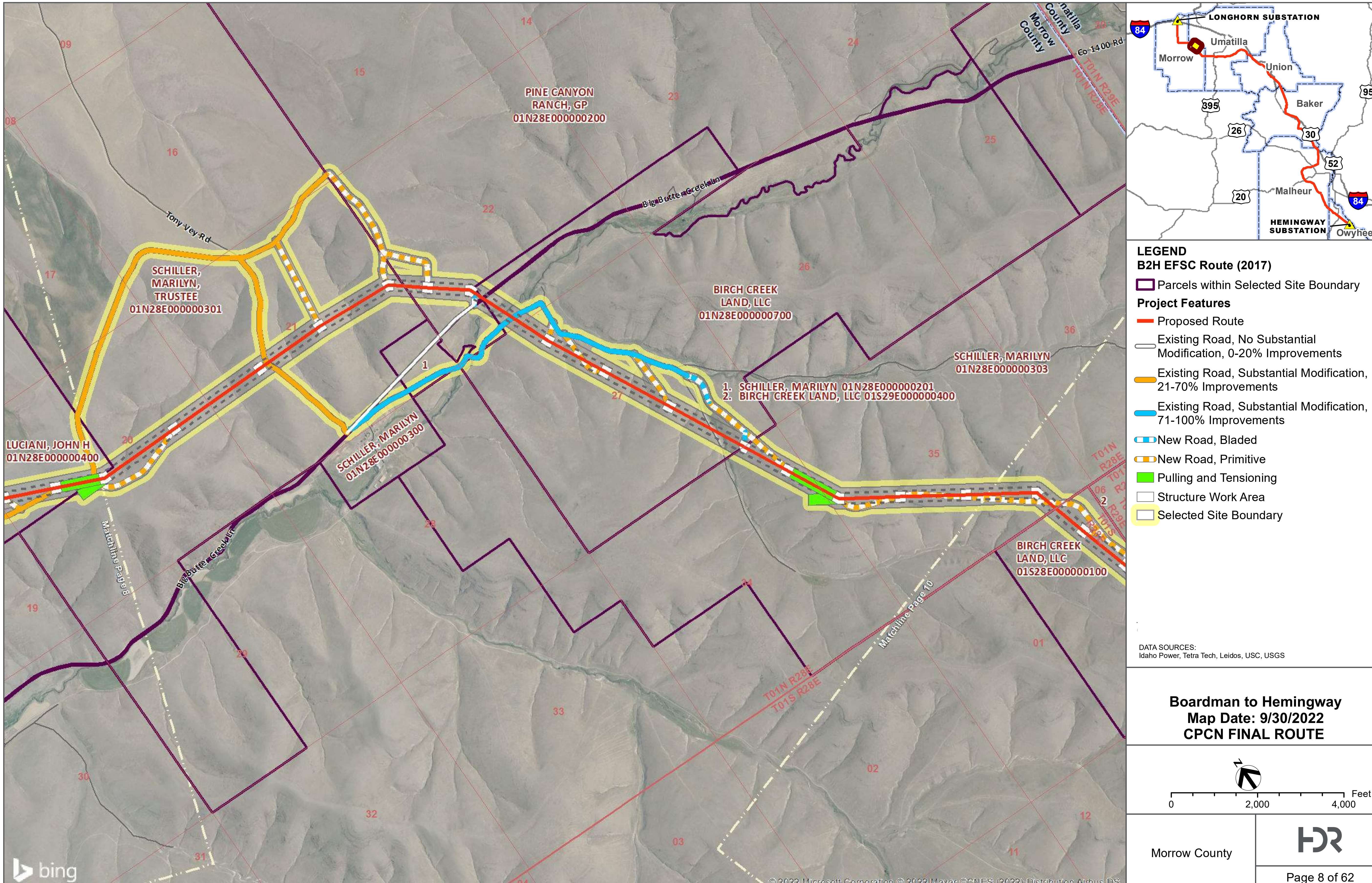


LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work Area
Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

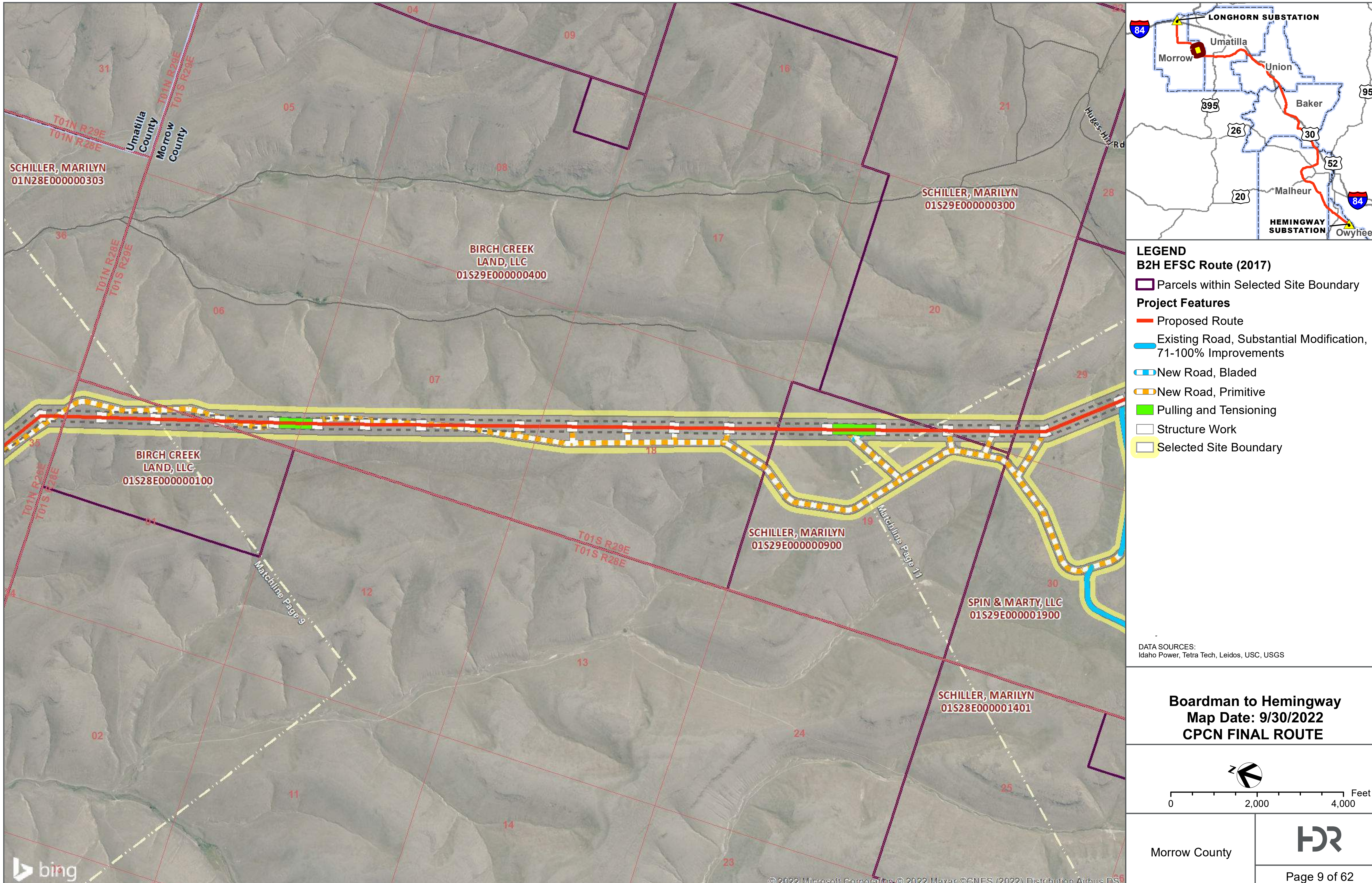
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Feet
0 2,000 4,000

Morrow County

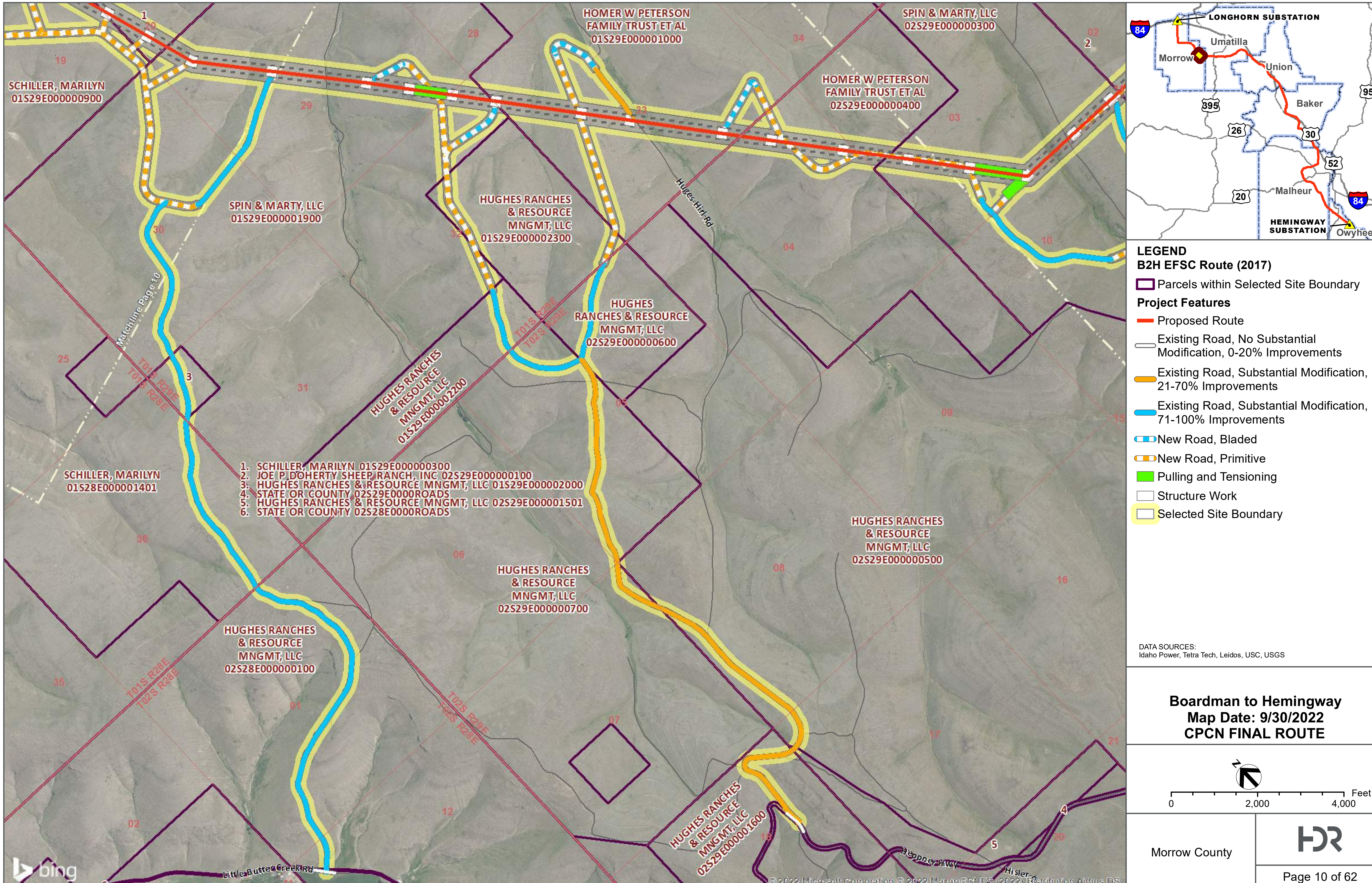
HDR

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022



Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Morrow County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FAMILY TRUST ET AL
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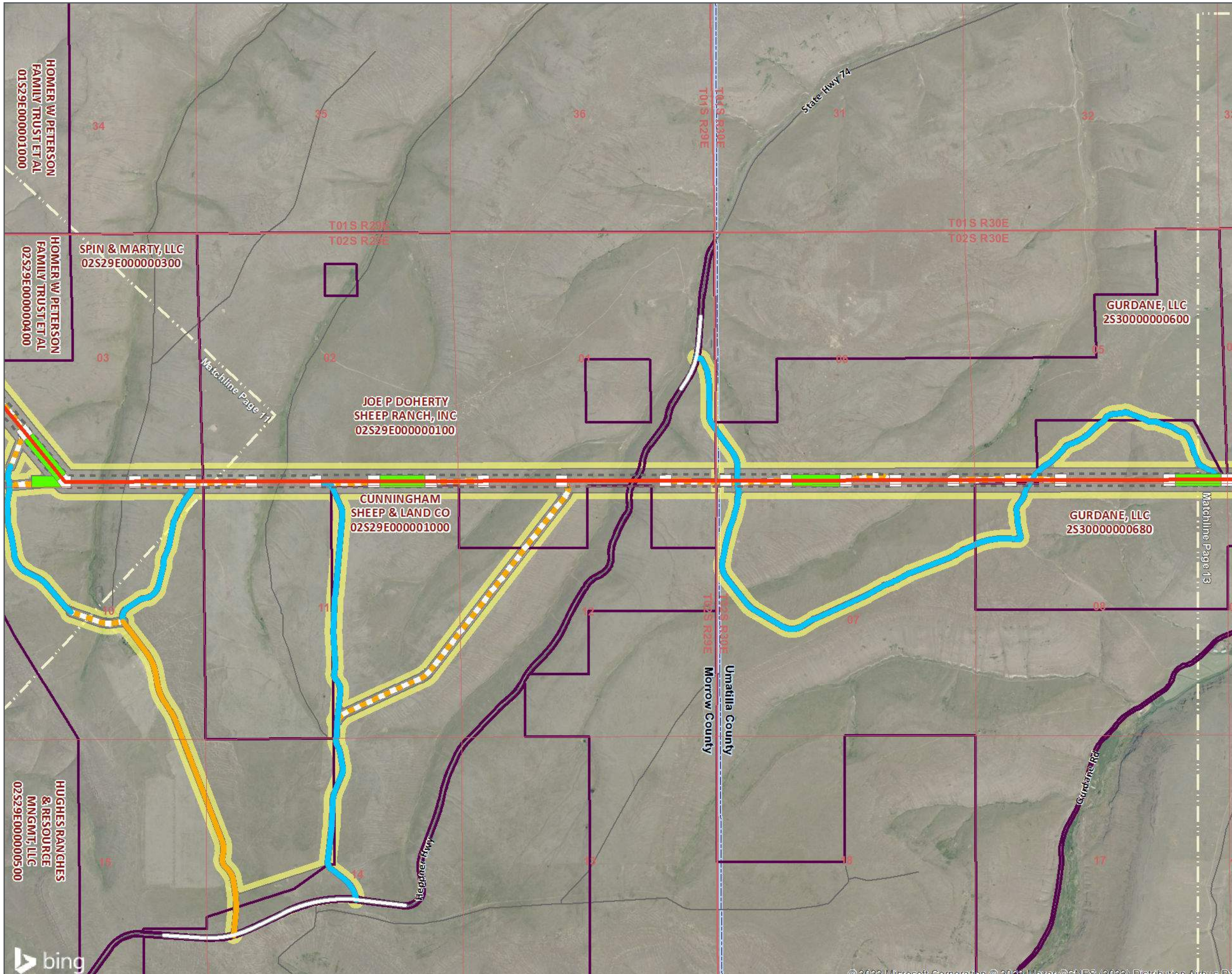
SPIN & MARTY, LLC
02S29E000000300
SCHILLER, MARILYN
01S29E000000900
HOMER W PETERSON
FAMILY TRUST ET AL
02S29E000000400
SPIN & MARTY, LLC
01S29E000001900
HUGHES RANCHES
& RESOURCE
MNGMT, LLC
01S29E000002300
Huges-Hill Rd
HUGHES
RANCHES & RESOURCE
MNGMT, LLC
02S29E000000600
Matchline Page 10
HUGHES RANCHES
& RESOURCE
MNGMT, LLC
01S29E000002200
T01S R28E
T02S R28E
T01S R29E
T02S R29E
SCHILLER, MARILYN
01S28E000001401
1. SCHILLER, MARILYN 01S29E000000300
2. JOE P DOHERTY SHEEP RANCH, INC 02S29E000000100
3. HUGHES RANCHES & RESOURCE MNGMT, LLC 01S29E000002000
4. STATE OR COUNTY 02S29E0000ROADS
5. HUGHES RANCHES & RESOURCE MNGMT, LLC 02S29E000001501
6. STATE OR COUNTY 02S28E0000ROADS
HUGHES RANCHES
& RESOURCE
MNGMT, LLC
02S29E000000500
HUGHES RANCHES
& RESOURCE
MNGMT, LLC
02S29E000000700
HUGHES RANCHES
& RESOURCE
MNGMT, LLC
02S28E000000100
T02S R29E
T02S R28E
HUGHES RANCHES
& RESOURCE
MNGMT, LLC
02S29E000001600
Little Butter Creek Rd
Heppner Hwy
Hisler
bing
© 2022 Microsoft Corporation © 2022 Maxar ©CNES (2022) Distribution Airbus DS
LONGHORN SUBSTATION
Umatilla
Morrow
Union
Baker
Malheur
HEMINGWAY SUBSTATION
Owyhee
84
395
26
30
52
95
20
LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work
Selected Site Boundary
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE
N
0
2,000
4,000
Feet
Morrow County
HDR
Page 10 of 62



LEGEND

B2H EFSC Route (2017)

- Parcels within Selected Site Boundary

Project Features

- Proposed Route
- Existing Road, No Substantial Modification, 0-20% Improvements
- Existing Road, Substantial Modification, 21-70% Improvements
- Existing Road, Substantial Modification, 71-100% Improvements
- New Road, Primitive
- Pulling and Tensioning
- Structure Work
- Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N
0 2,000 4,000 Feet

Umatilla County

HDR

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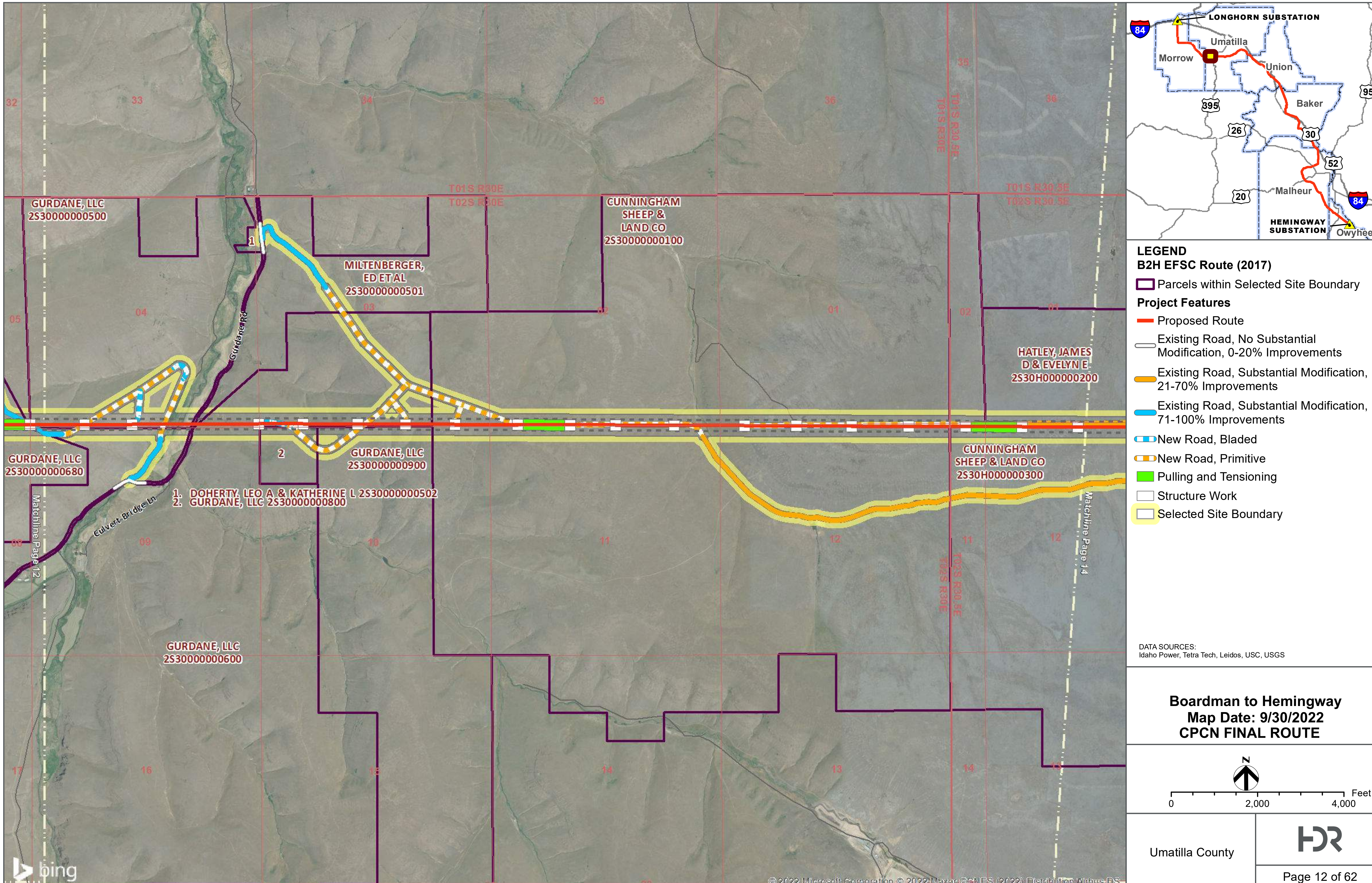
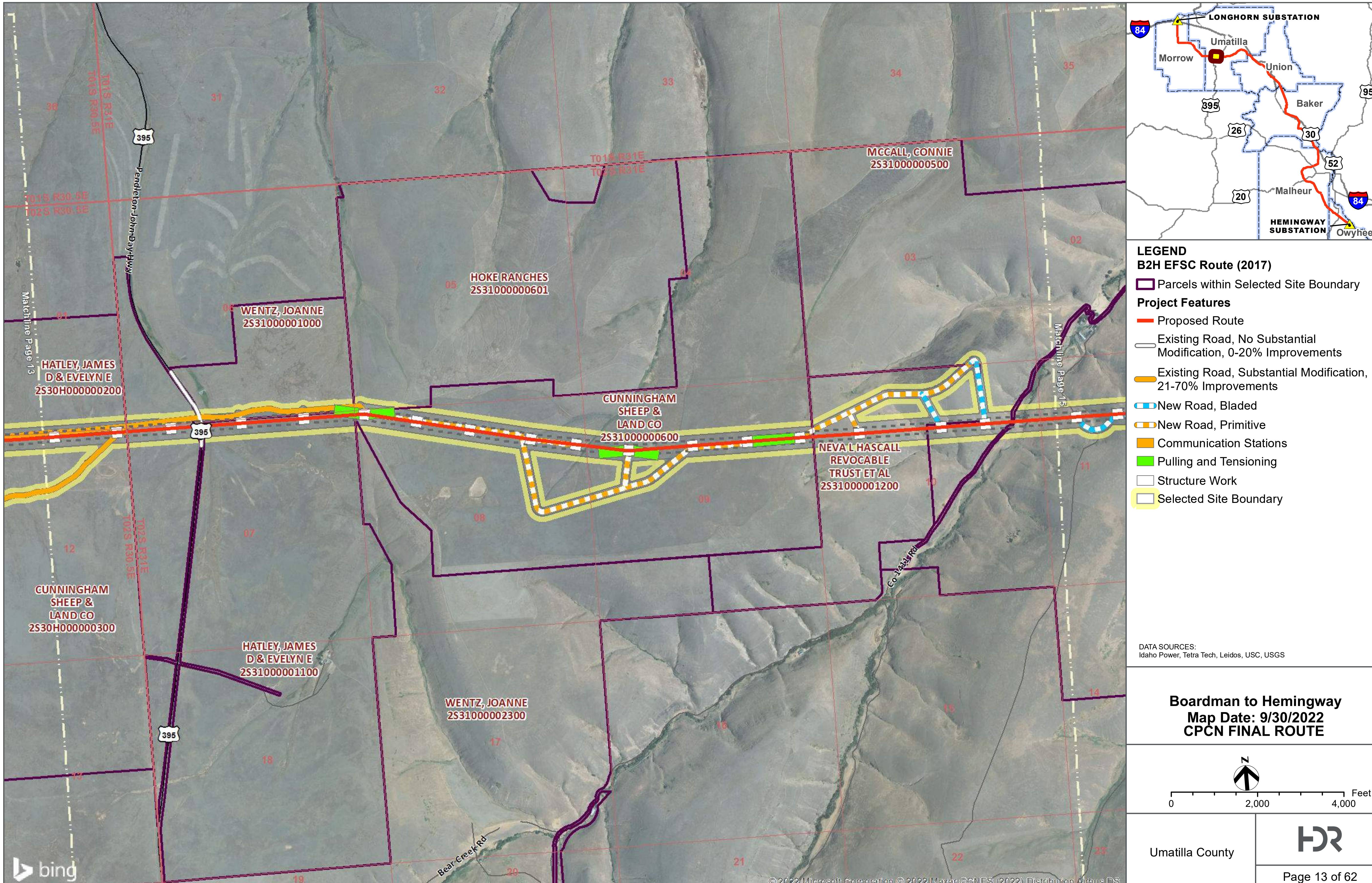


Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Umatilla County



LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
- Proposed Route
- Existing Road, No Substantial Modification, 0-20% Improvements
- Existing Road, Substantial Modification, 21-70% Improvements
- New Road, Bladed
- New Road, Primitive
- Communication Stations
- Pulling and Tensioning
- Structure Work
- Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N
0 2,000 4,000 Feet

Umatilla County

HDR

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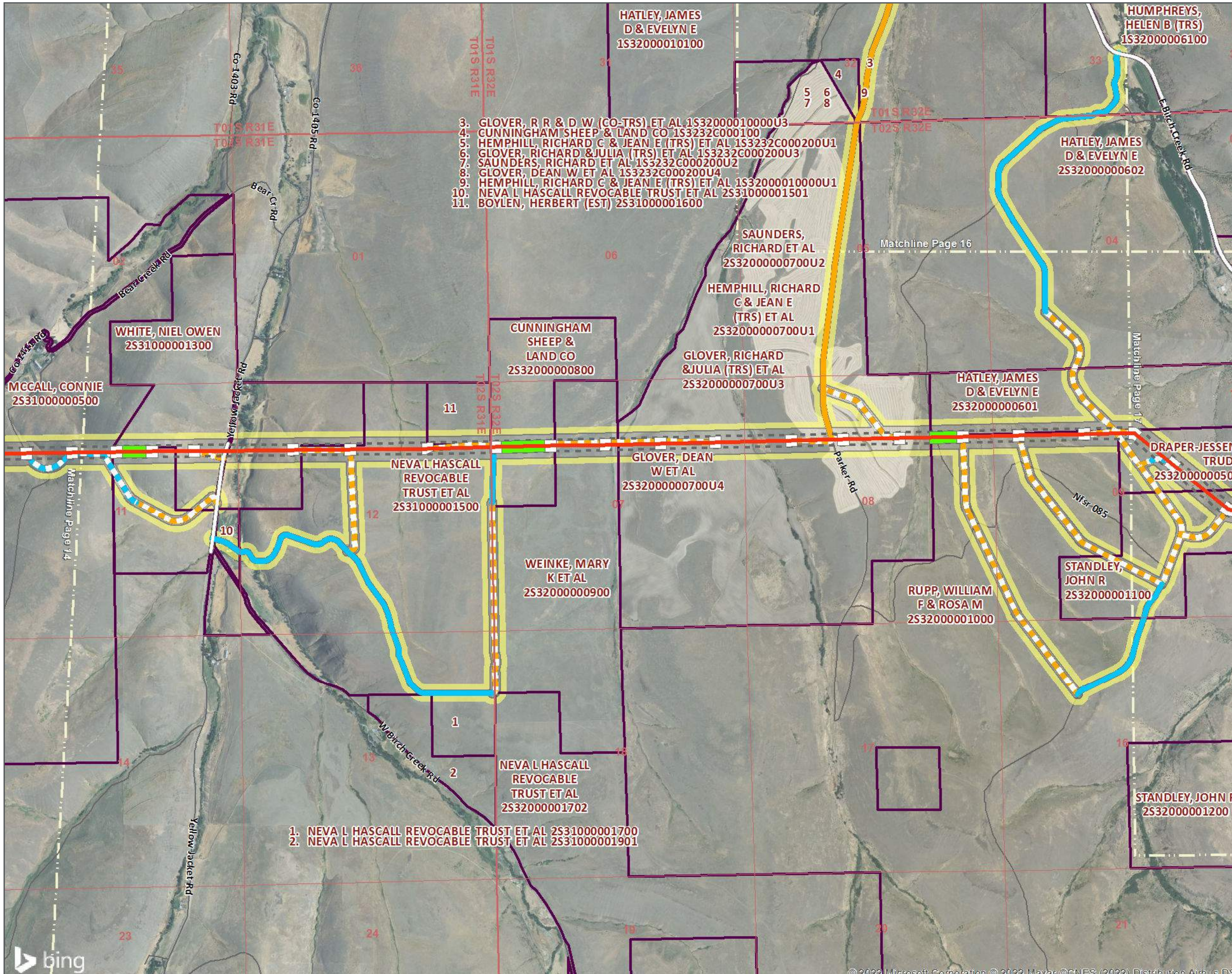

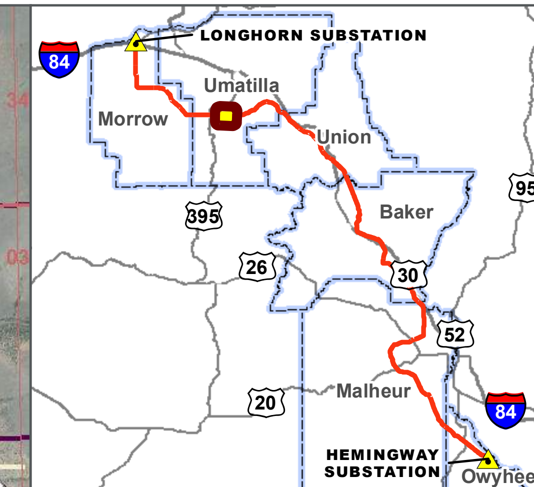

LEGEND
B2H EFSC Route (2017)
- Parcels within Selected Site Boundary

Project Features
- Proposed Route
- Existing Road, No Substantial Modification, 0-20% Improvements
- Existing Road, Substantial Modification, 21-70% Improvements
- Existing Road, Substantial Modification, 71-100% Improvements
- New Road, Bladed
- New Road, Primitive
- Pulling and Tensioning
- Structure Work
- Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N
0 2,000 4,000 Feet

Umatilla County

HDR

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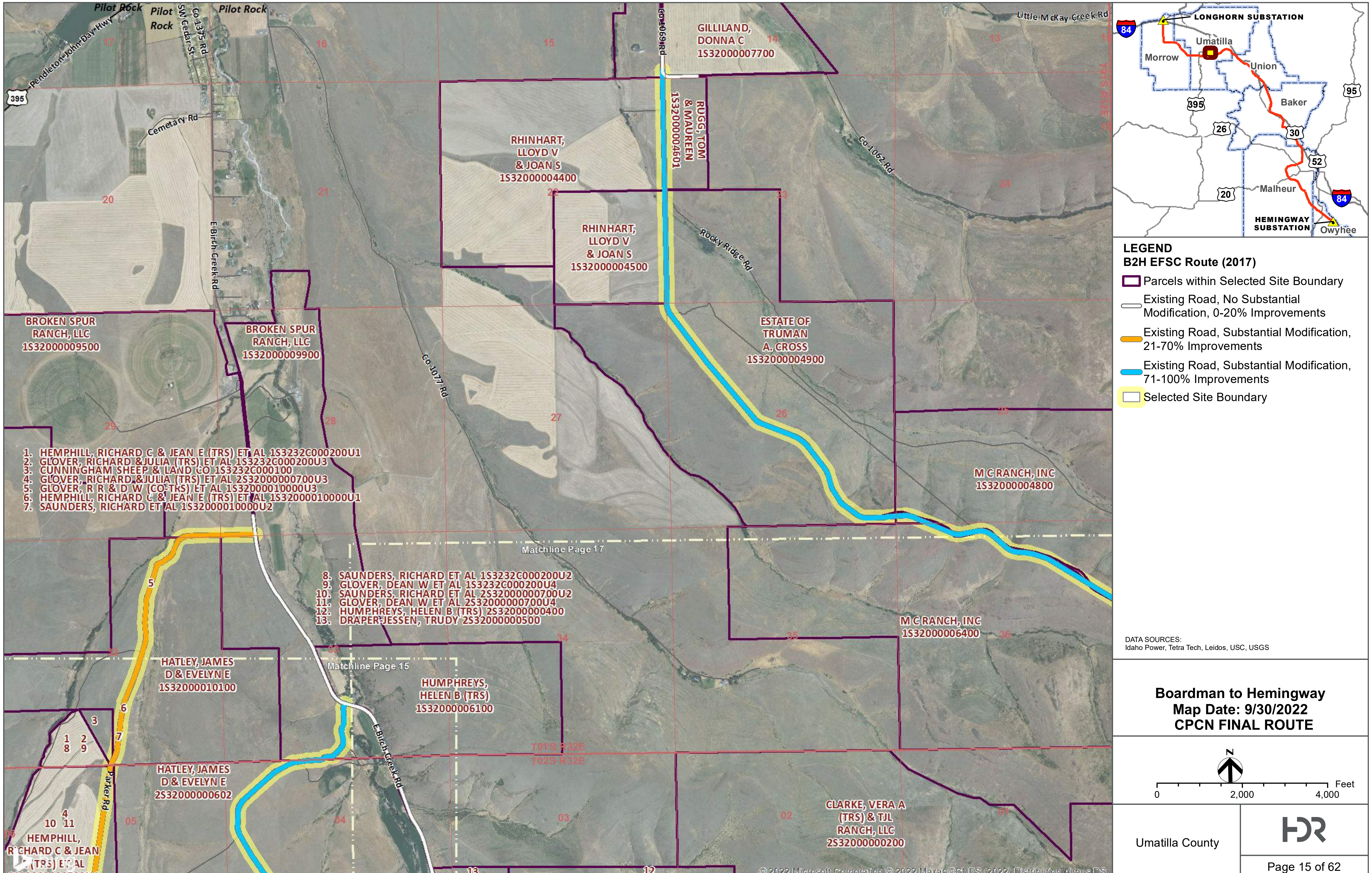

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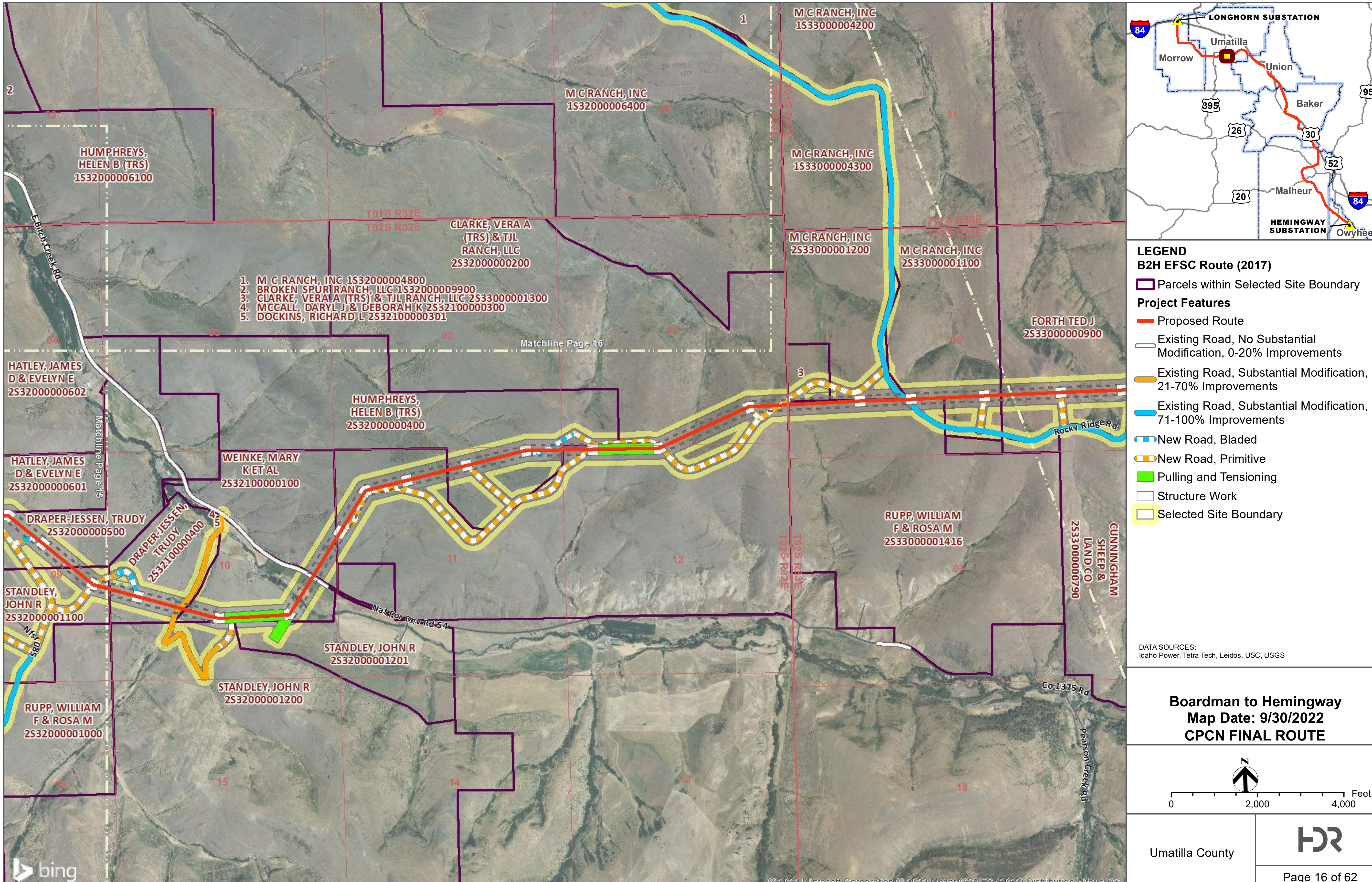

LEGEND
B2H EFSC Route (2017)
- Parcels within Selected Site Boundary

Project Features
- Proposed Route
- Existing Road, No Substantial Modification, 0-20% Improvements
- Existing Road, Substantial Modification, 21-70% Improvements
- Existing Road, Substantial Modification, 71-100% Improvements
- New Road, Bladed
- New Road, Primitive
- Pulling and Tensioning
- Structure Work
- Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N
0 2,000 4,000 Feet

Umatilla County

HDR

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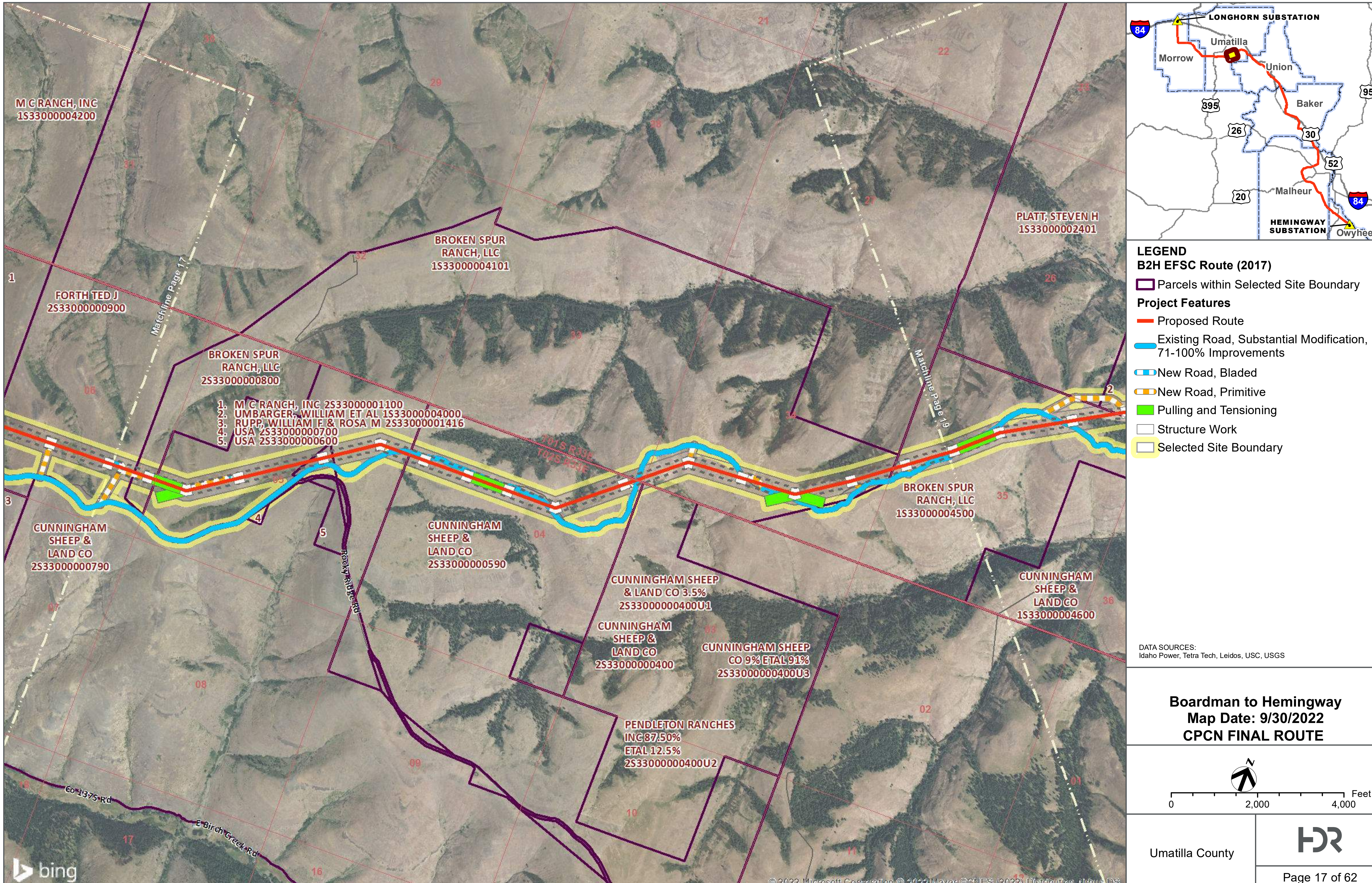
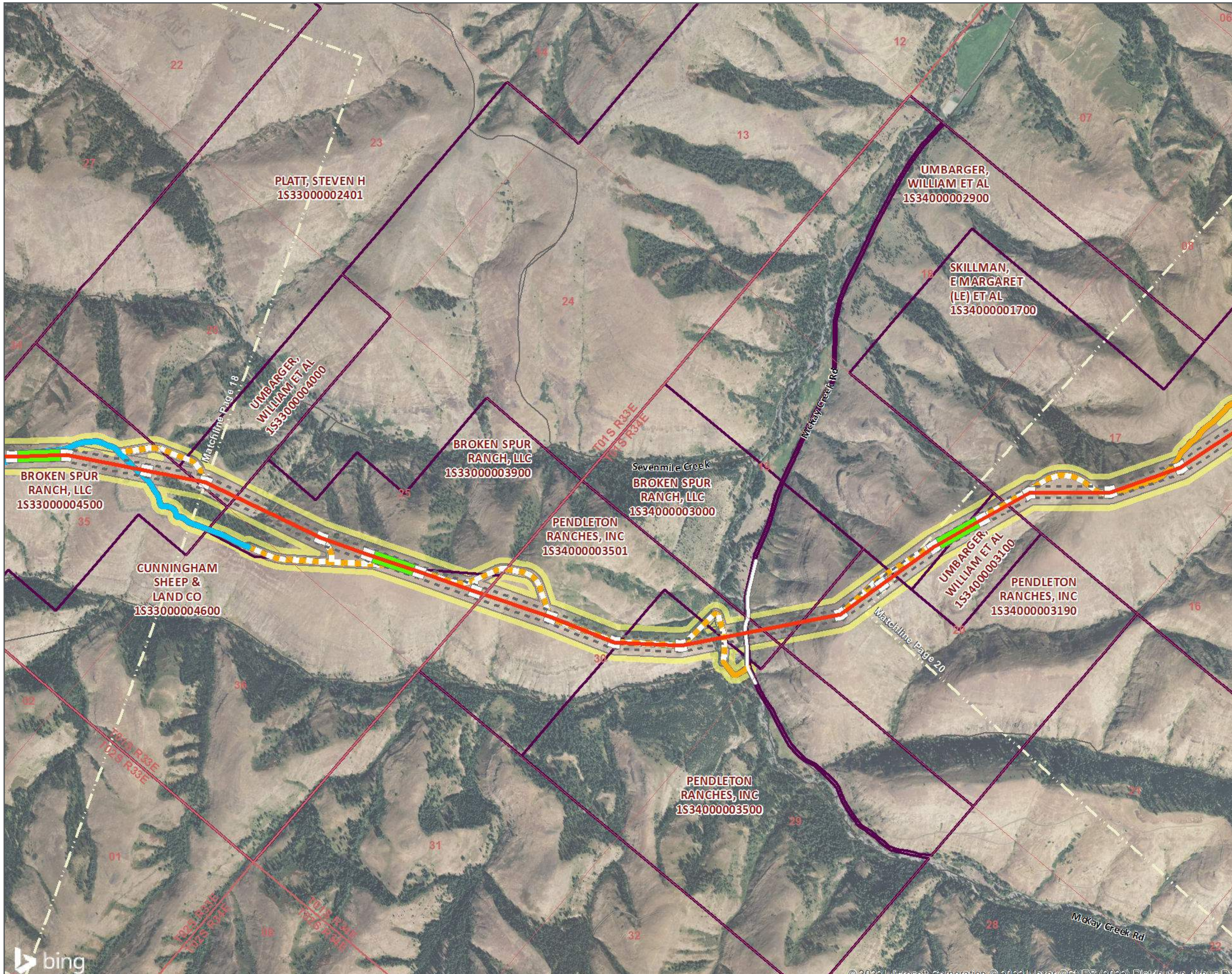
DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022



Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Umatilla County



LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Primitive
Pulling and Tensioning
Structure Work Area
Selected Site Boundary

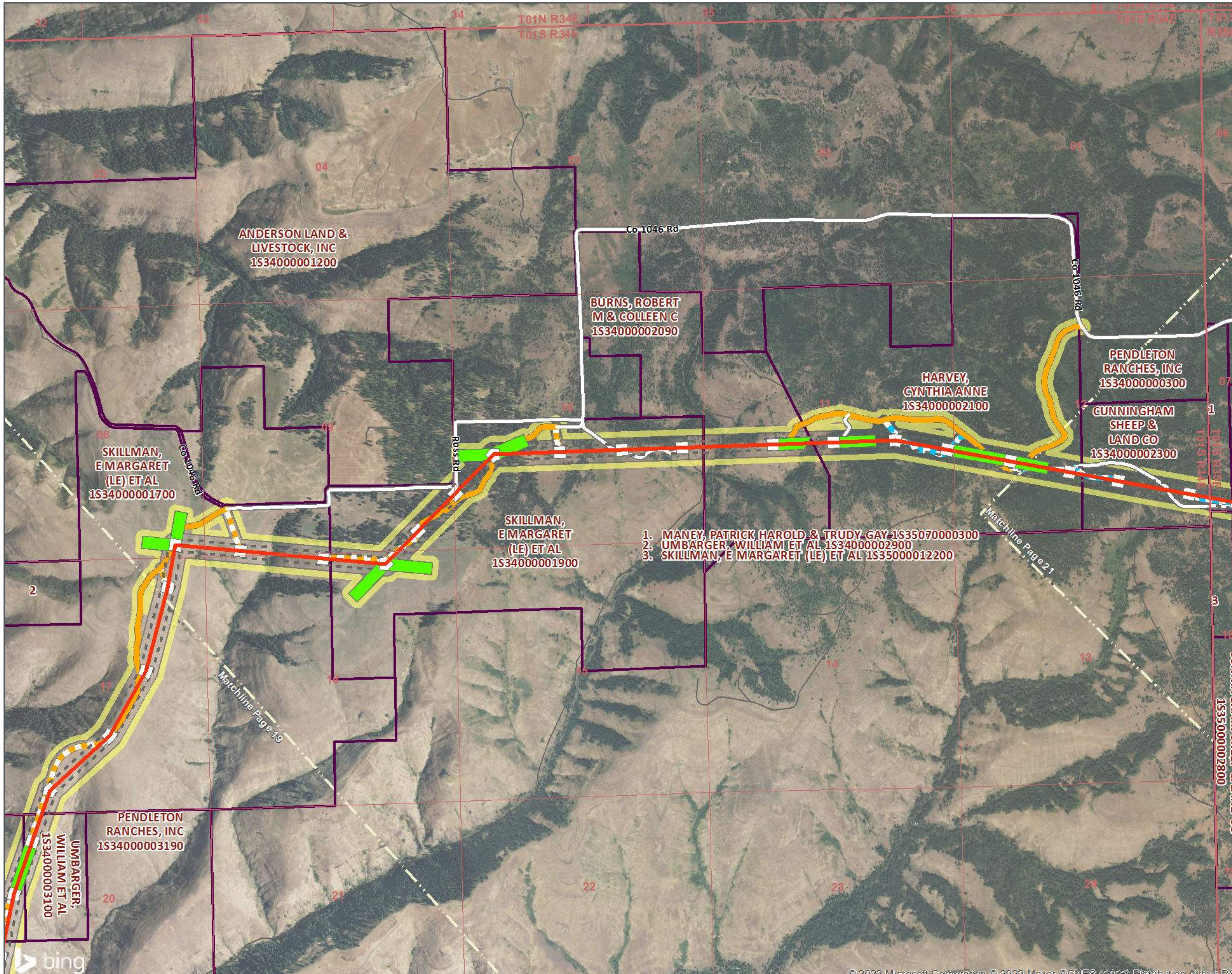
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

0 2,000 4,000 Feet

Umatilla County

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022



LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Communication Stations
Pulling and Tensioning
Structure Work
Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N
0 2,000 4,000 Feet

Umatilla County

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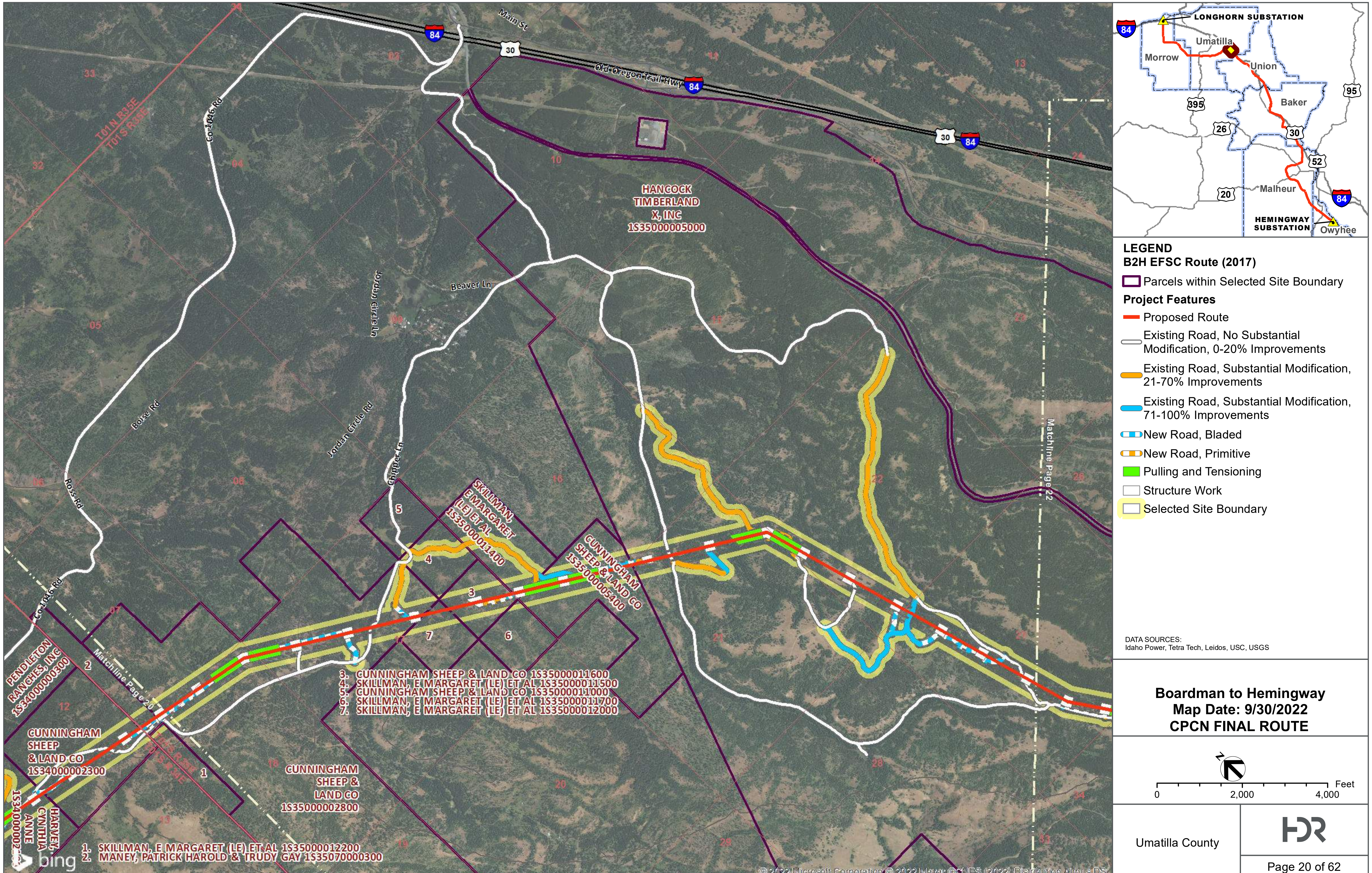
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PENDLETON RANCHES, INC 1S34000000300
CUNNINGHAM SHEEP & LAND CO 1S34000002300
CUNNINGHAM SHEEP & LAND CO 1S35000002800
HARVEY, CYNTHIA ANNE
3. CUNNINGHAM SHEEP & LAND CO 1S35000011600
4. SKILLMAN, E MARGARET (LE) ET AL 1S35000011500
5. CUNNINGHAM SHEEP & LAND CO 1S35000011000
6. SKILLMAN, E MARGARET (LE) ET AL 1S35000011700
7. SKILLMAN, E MARGARET (LE) ET AL 1S35000012000
1. SKILLMAN, E MARGARET (LE) ET AL 1S35000012200
2. MANEY, PATRICK HAROLD & TRUDY GAY 1S35070000300
T01N R35E
T01S R35E
Old Oregon Trail Hwy
Main St
Co 1046 Rd
Boise Rd
Ross Rd
Jordan Circle Rd
Jordan Circle Ln
Beaver Ln
Chipper Ln
Matchline Page 20
Matchline Page 22
LONGHORN SUBSTATION
HEMINGWAY SUBSTATION
Morrow
Umatilla
Union
Baker
Malheur
Owyhee
LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work
Selected Site Boundary
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE
Feet
0
2,000
4,000
Umatilla County
Page 20 of 62
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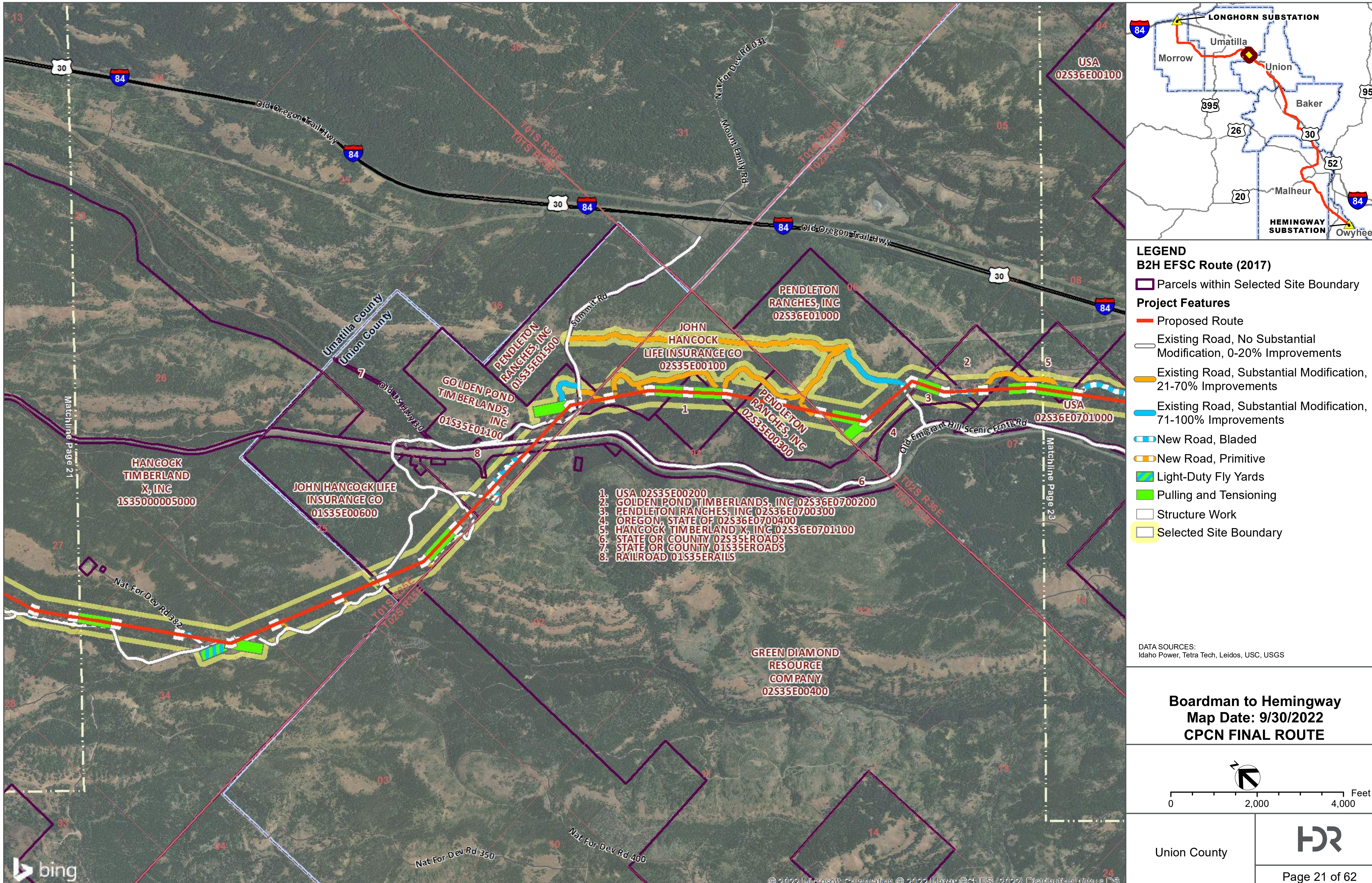

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Union County

HDR

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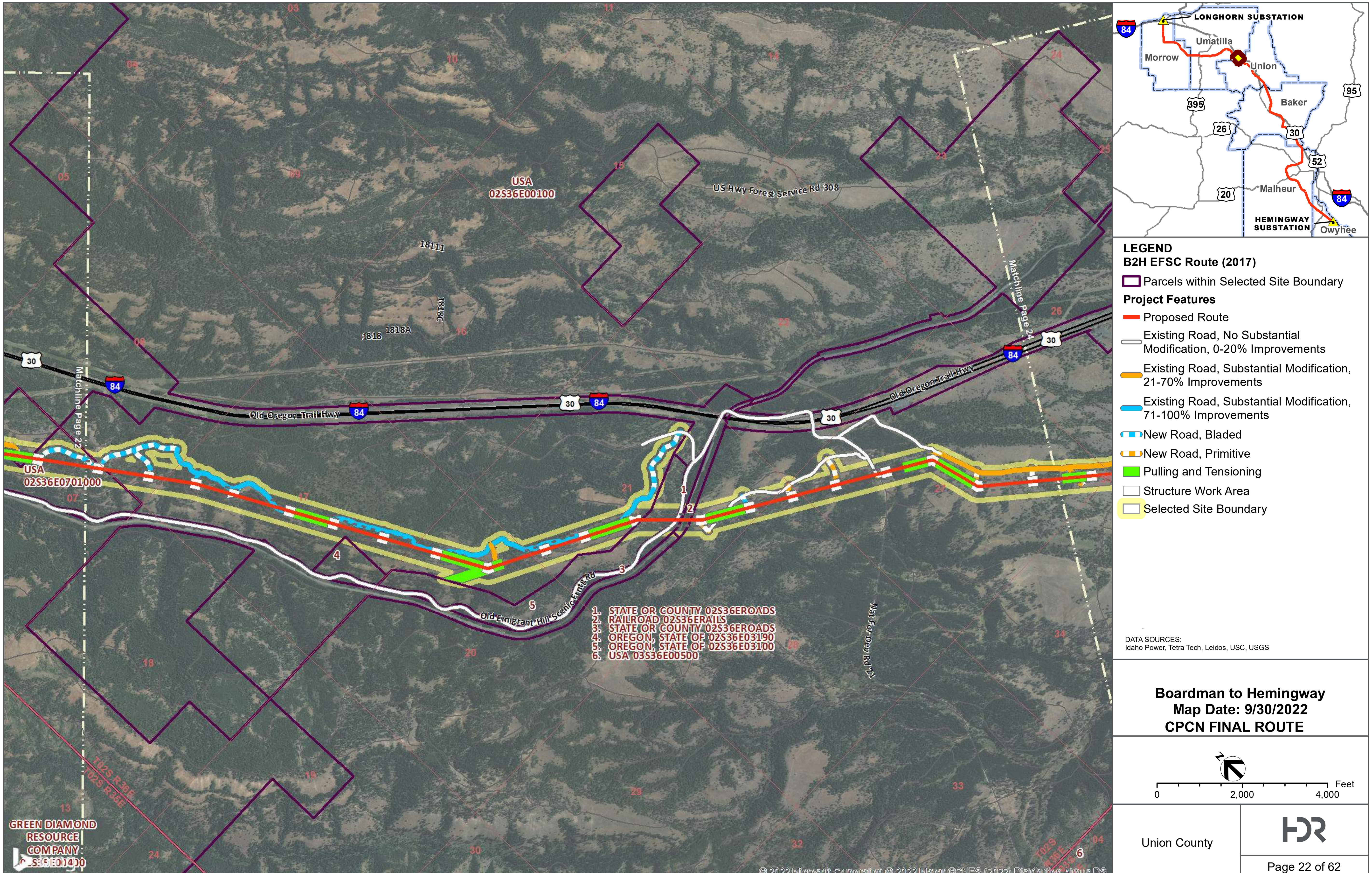
LONGHORN SUBSTATION
Umatilla
Morrow
Union
Baker
Malheur
HEMINGWAY SUBSTATION
Owyhee
84
395
95
26
30
52
20
USA
02S36E00100
US Hwy Forest Service Rd 308
18111
1818C
1818
1818A
30
84
Old Oregon Trail Hwy
Matchline Page 22
Matchline Page 24
USA
02S36E0701000
1
2
3
4
5
6
Old Emigrant Hill Scenic Rd
1. STATE OR COUNTY 02S36EROADS
2. RAILROAD 02S36ERAILS
3. STATE OR COUNTY 02S36EROADS
4. OREGON, STATE OF 02S36E03190
5. OREGON, STATE OF 02S36E03100
6. USA 03S36E00500
GREEN DIAMOND RESOURCE COMPANY
T02S R36E
T02S R35E
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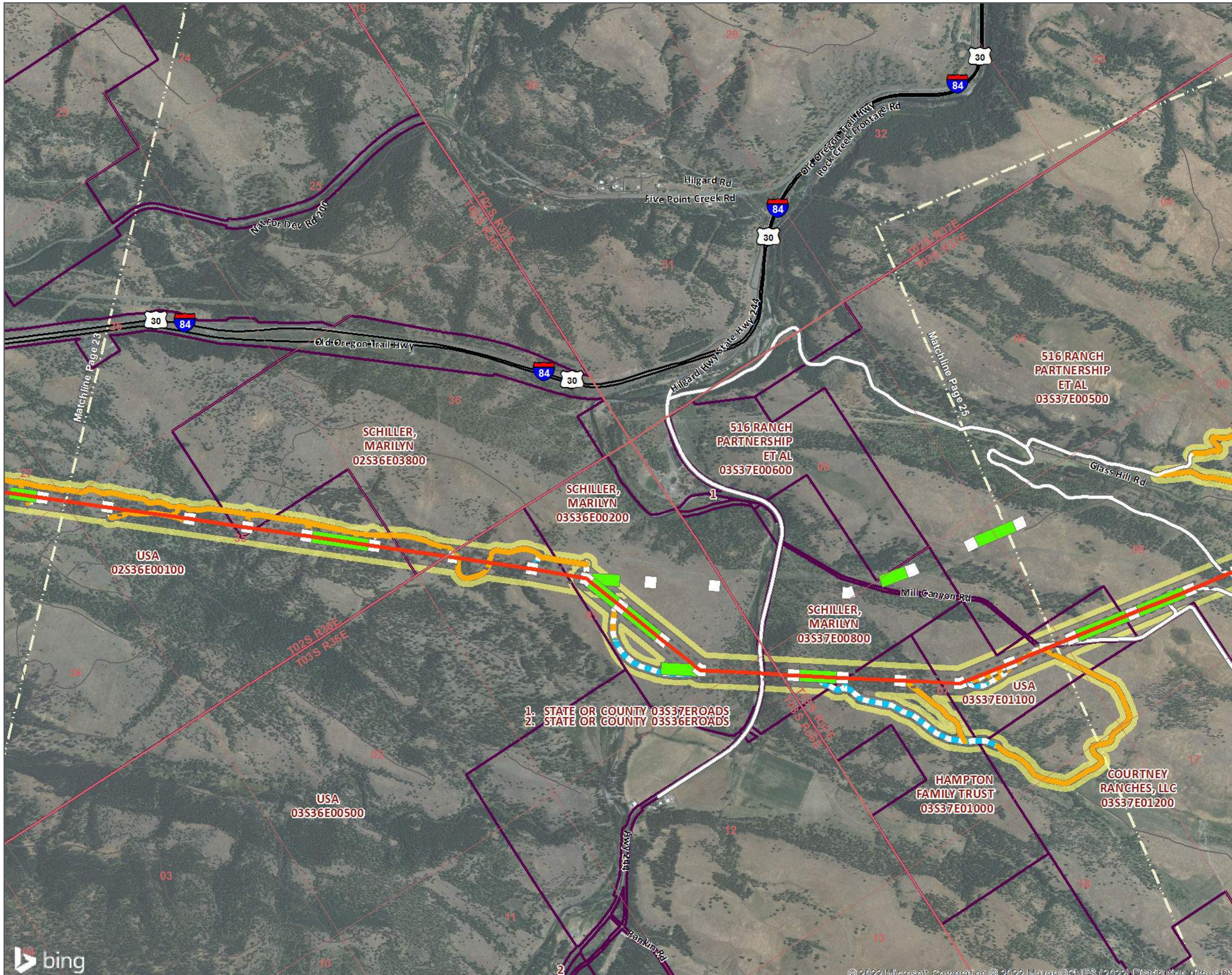
LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work Area
Selected Site Boundary
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE
N
Feet
0
2,000
4,000
Union County
HDR
Page 22 of 62



LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work
Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Feet
0 2,000 4,000

Union County

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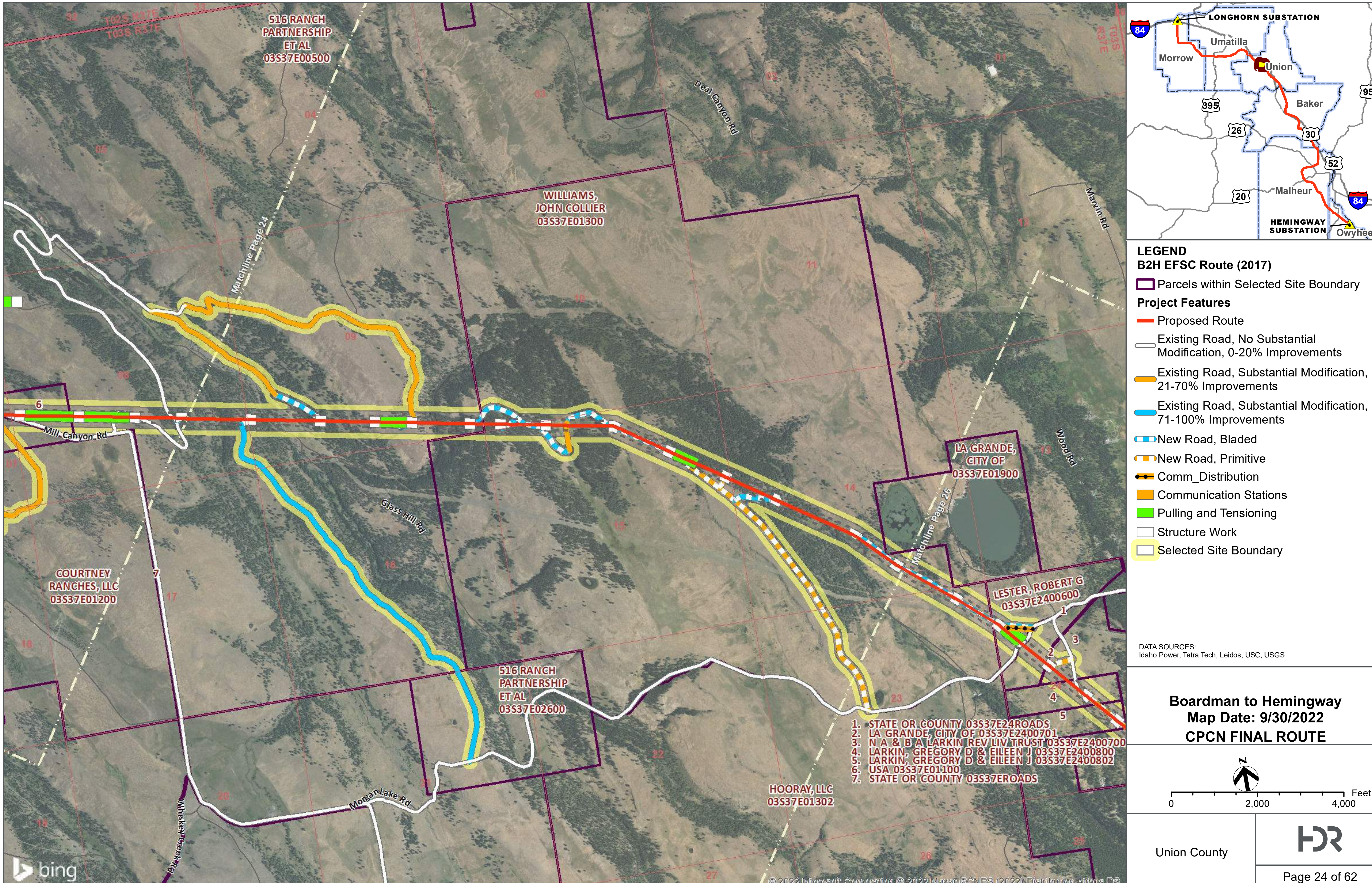
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WILLIAMS, JOHN COLLIER 03S37E01300
LA GRANDE, CITY OF 03S37E01900
LESTER, ROBERT G 03S37E2400600
COURTNEY RANCHES, LLC 03S37E01200
516 RANCH PARTNERSHIP ET AL 03S37E02600
HOORAY, LLC 03S37E01302
T02S R37E
T03S R37E
Matchline Page 24
Matchline Page 26
Deal Canyon Rd
Marvin Rd
Wood Rd
Mill Canyon Rd
Glass Hill Rd
Morgan Lake Rd
Whiskey Creek Rd
1. STATE OR COUNTY 03S37E24ROADS
2. LA GRANDE, CITY OF 03S37E2400701
3. N A & B A LARKIN REV LIV TRUST 03S37E2400700
4. LARKIN, GREGORY D & EILEEN J 03S37E2400800
5. LARKIN, GREGORY D & EILEEN J 03S37E2400802
6. USA 03S37E01100
7. STATE OR COUNTY 03S37EROADS
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bing
LONGHORN SUBSTATION
Umatilla
Morrow
Union
Baker
Malheur
HEMINGWAY SUBSTATION
Owyhee
84
395
26
30
52
20
95
LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Comm_Distribution
Communication Stations
Pulling and Tensioning
Structure Work
Selected Site Boundary
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE
N
Feet
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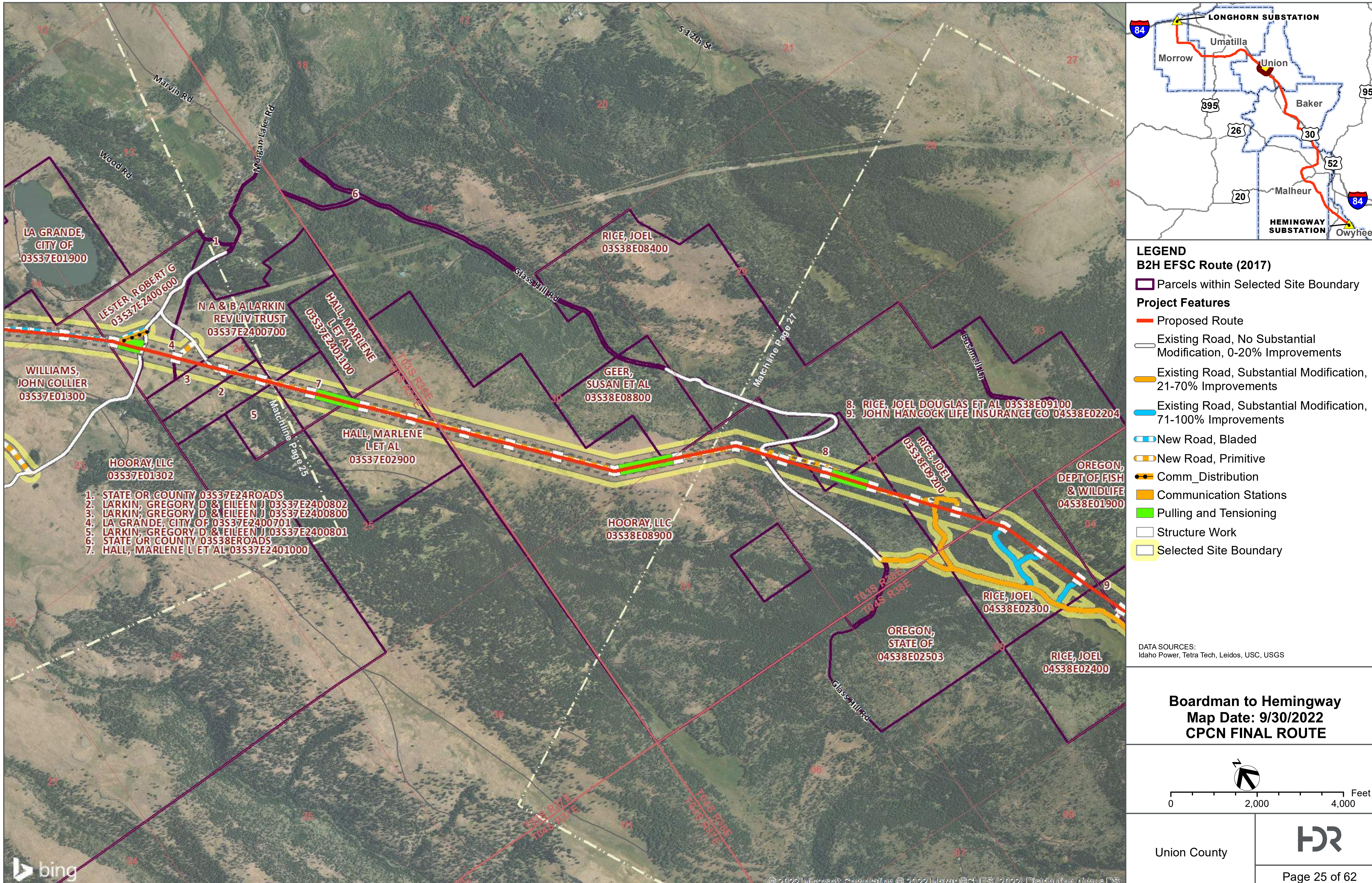
2,000
4,000
Union County
HDR
Page 24 of 62



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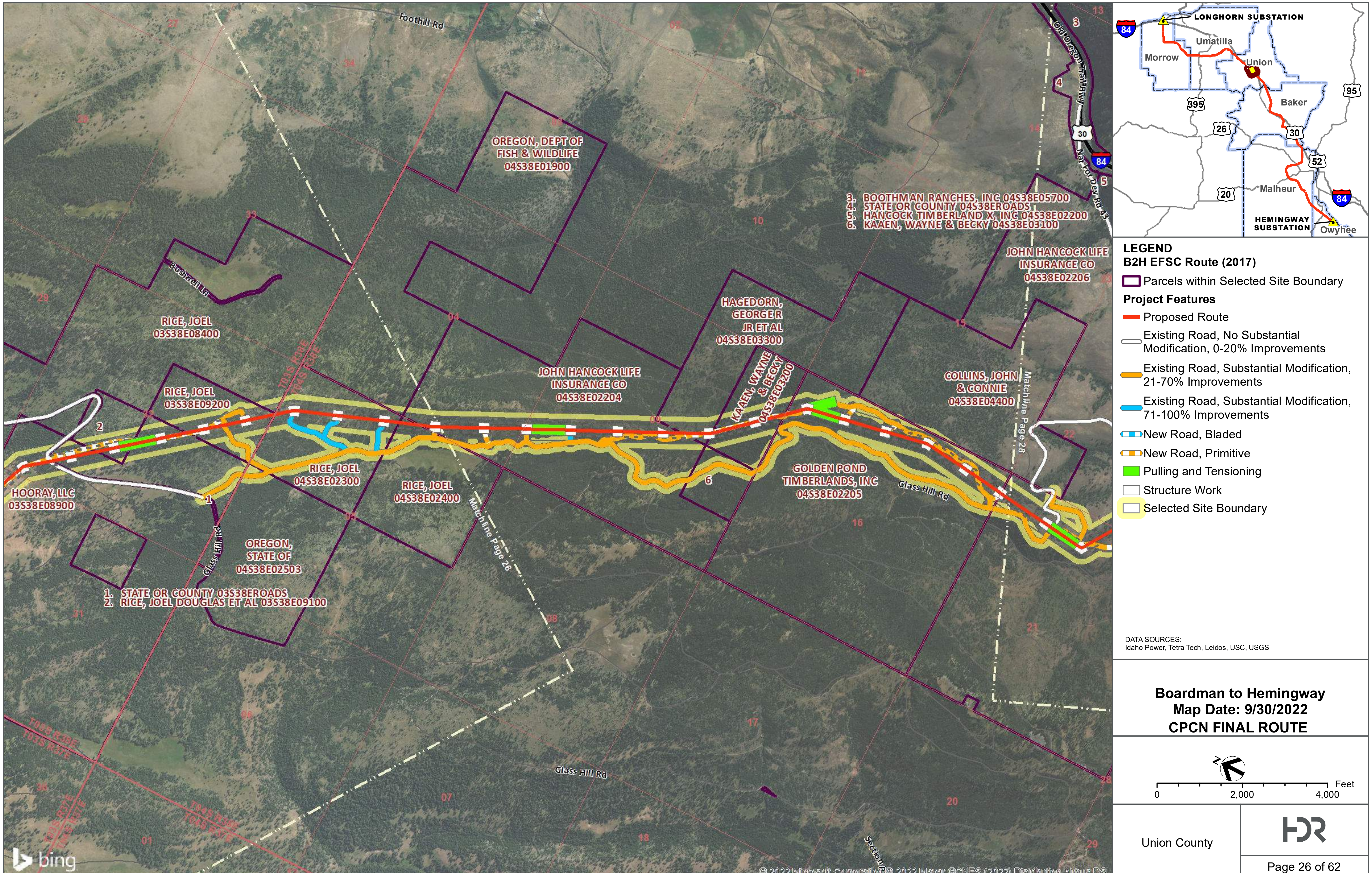

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Union County

HDR

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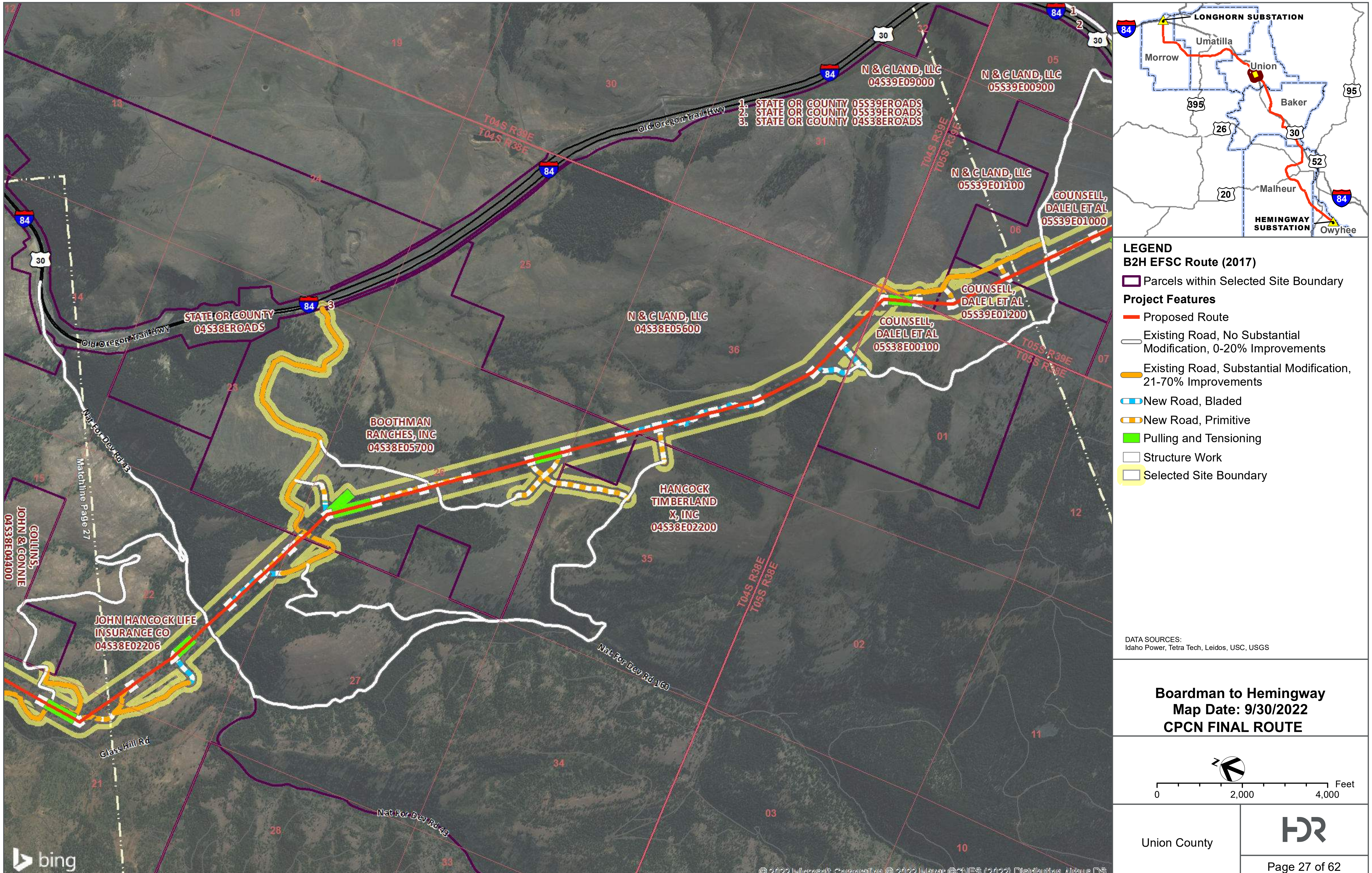

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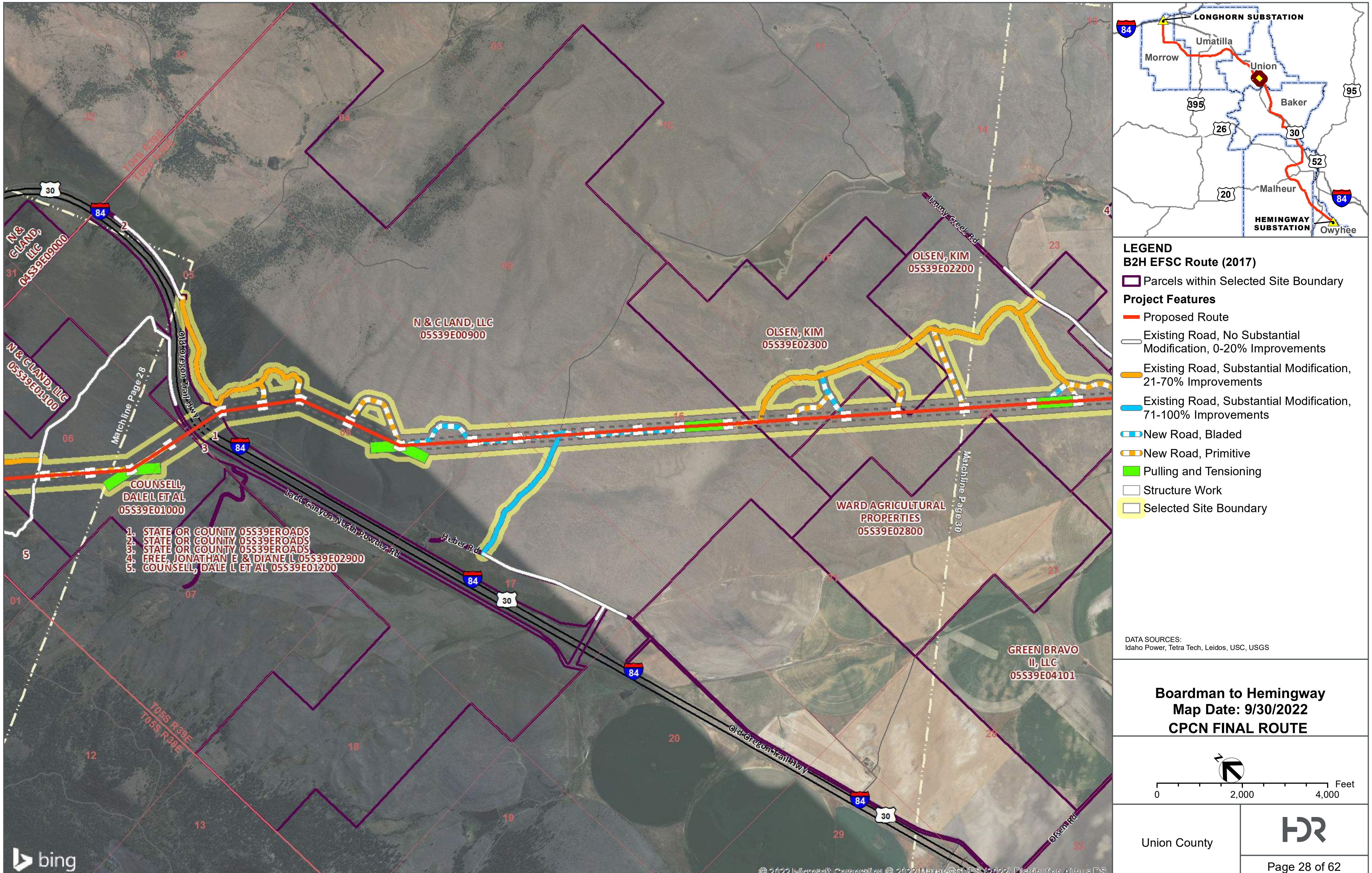
LONGHORN SUBSTATION
Umatilla
Morrow
Union
Baker
Malheur
HEMINGWAY SUBSTATION
Owyhee
LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work
Selected Site Boundary
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE
Feet
0
2,000
4,000
Union County
Page 28 of 62
N & C LAND, LLC
05S39E00900
OLSEN, KIM
05S39E02200
OLSEN, KIM
05S39E02300
N & C LAND, LLC
04S39E09000
N & C LAND, LLC
05S39E01100
COUNSELL, DALE L ET AL
05S39E01000
WARD AGRICULTURAL PROPERTIES
05S39E02800
GREEN BRAVO II, LLC
05S39E04101
1. STATE OR COUNTY 05S39EROADS
2. STATE OR COUNTY 05S39EROADS
3. STATE OR COUNTY 05S39EROADS
4. FREE, JONATHAN E & DIANE L 05S39E02900
5. COUNSELL, DALE L ET AL 05S39E01200
Matchline Page 28
Matchline Page 30
Old Oregon Trail Hwy
Ladd Canyon-North Powder Rd
Heber Rd
Olsen Rd
T05S R39E
T05S R38E
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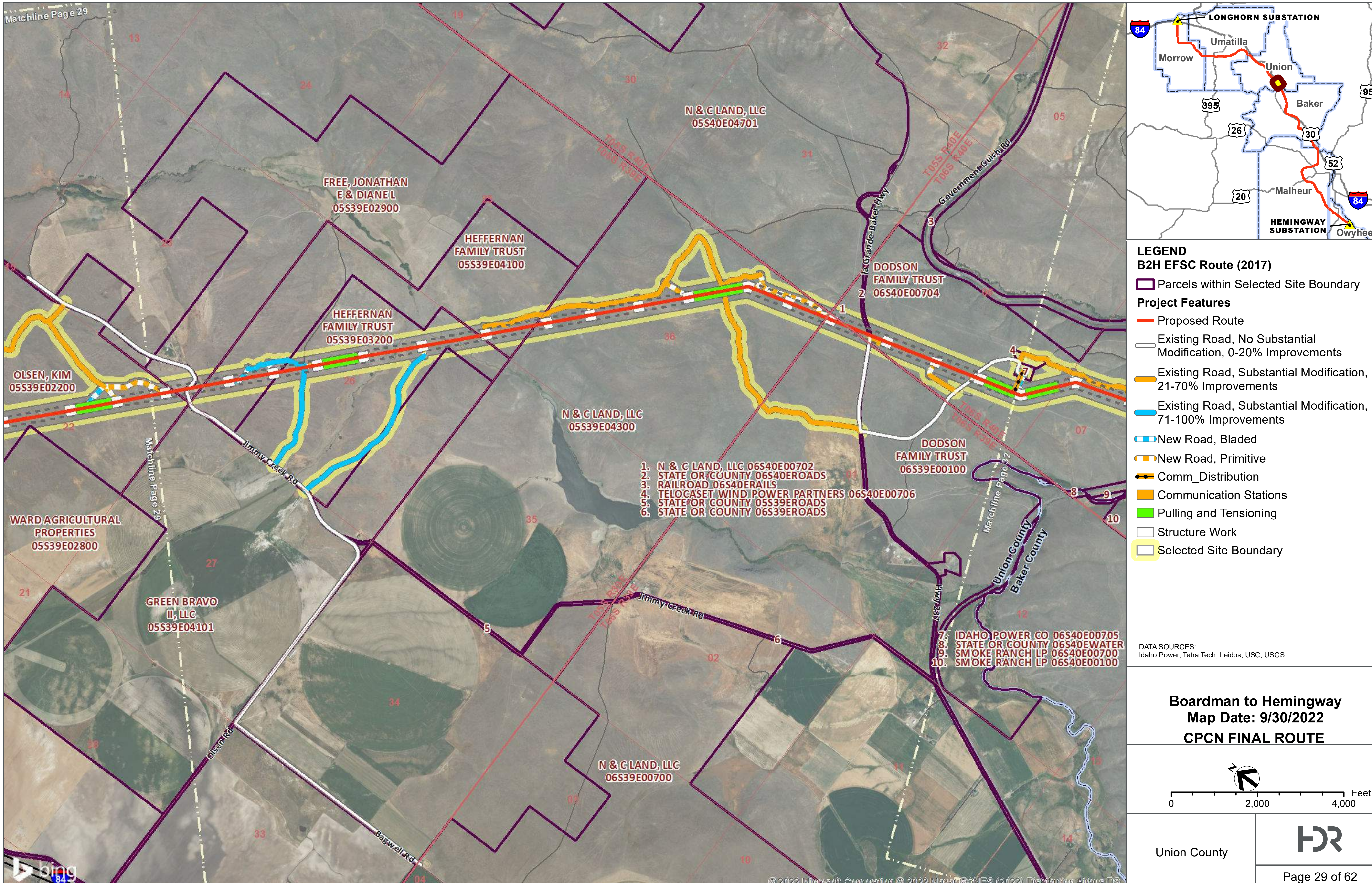
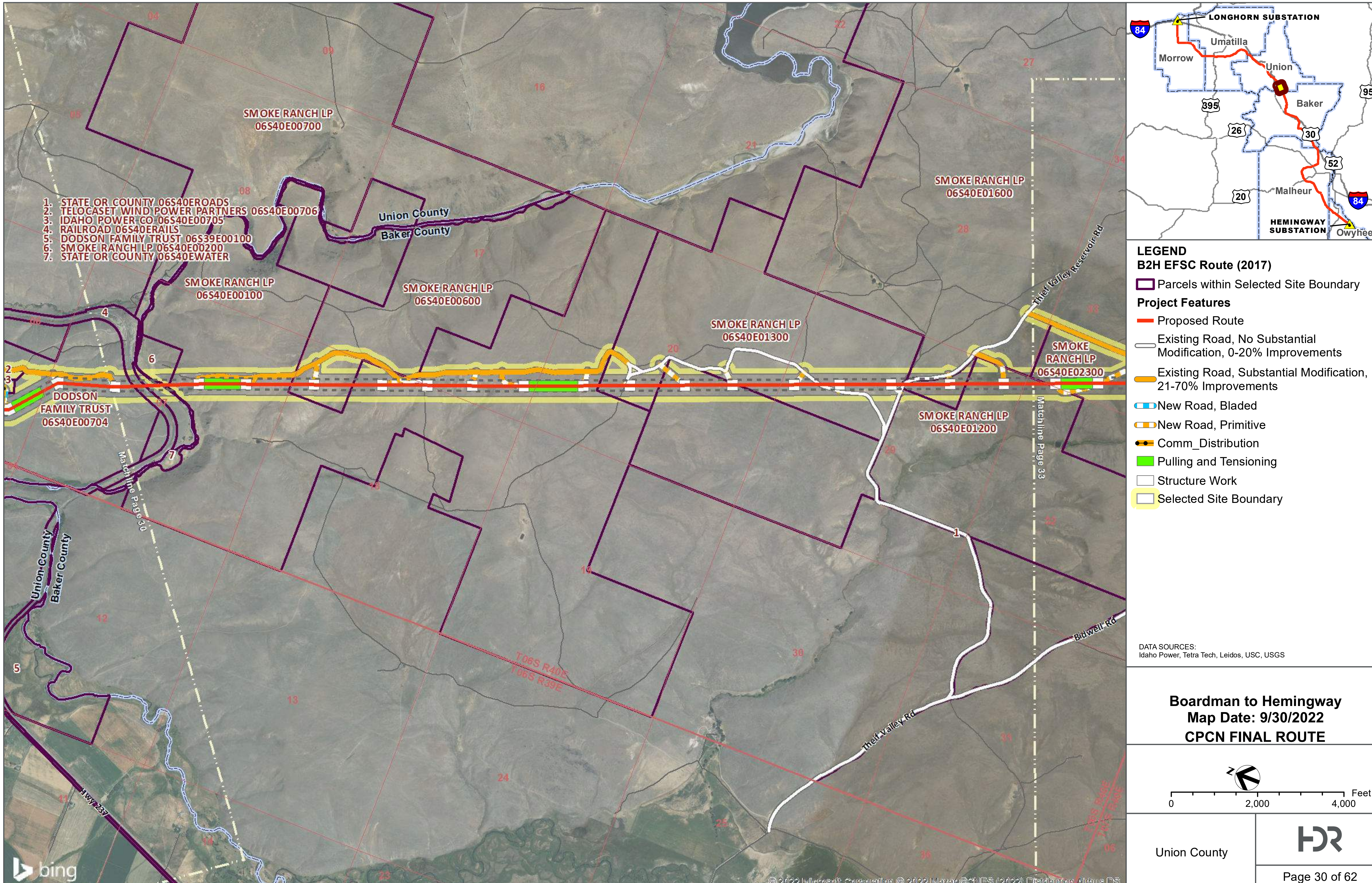


Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

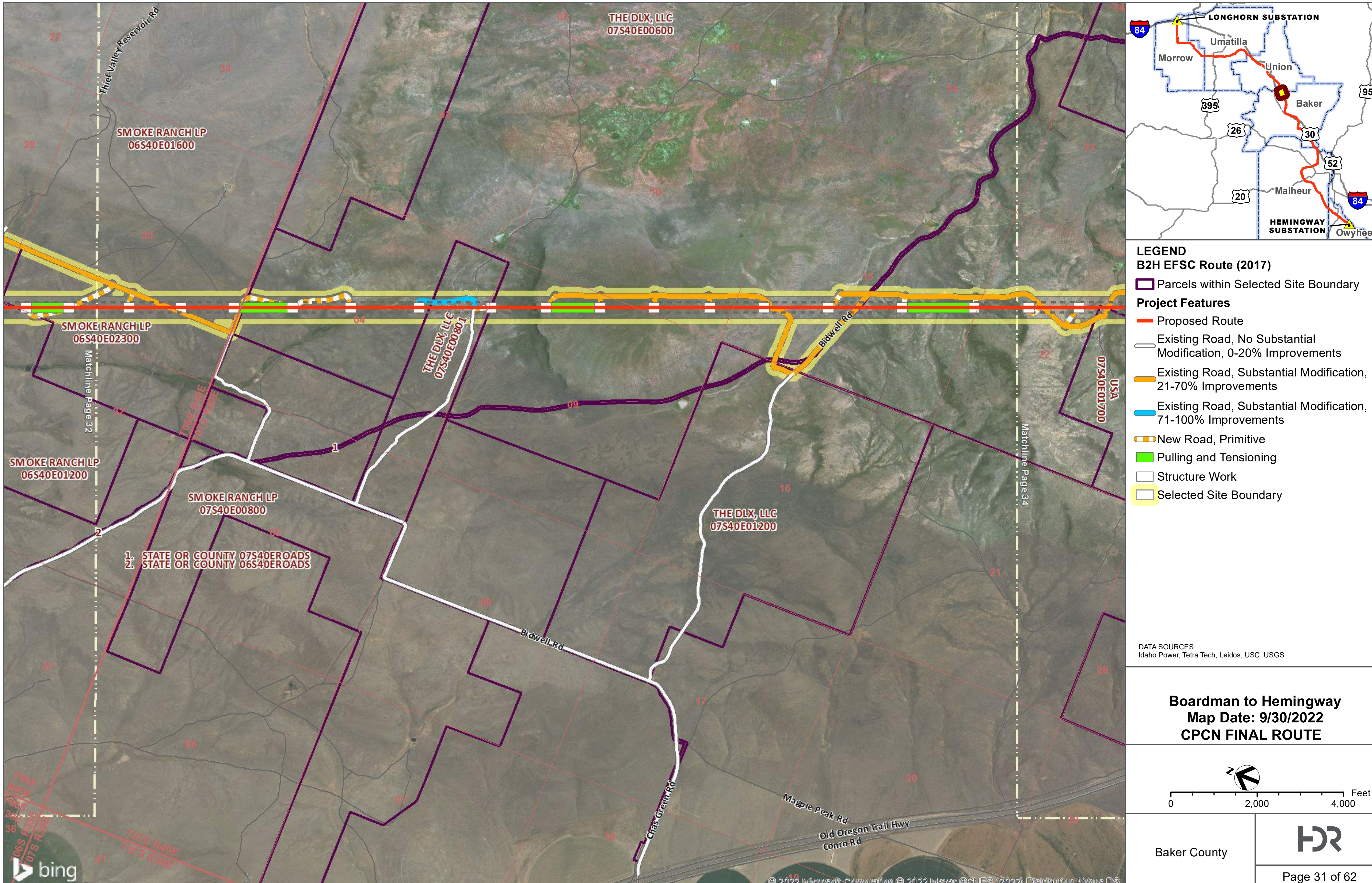
Union County

HDR



Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

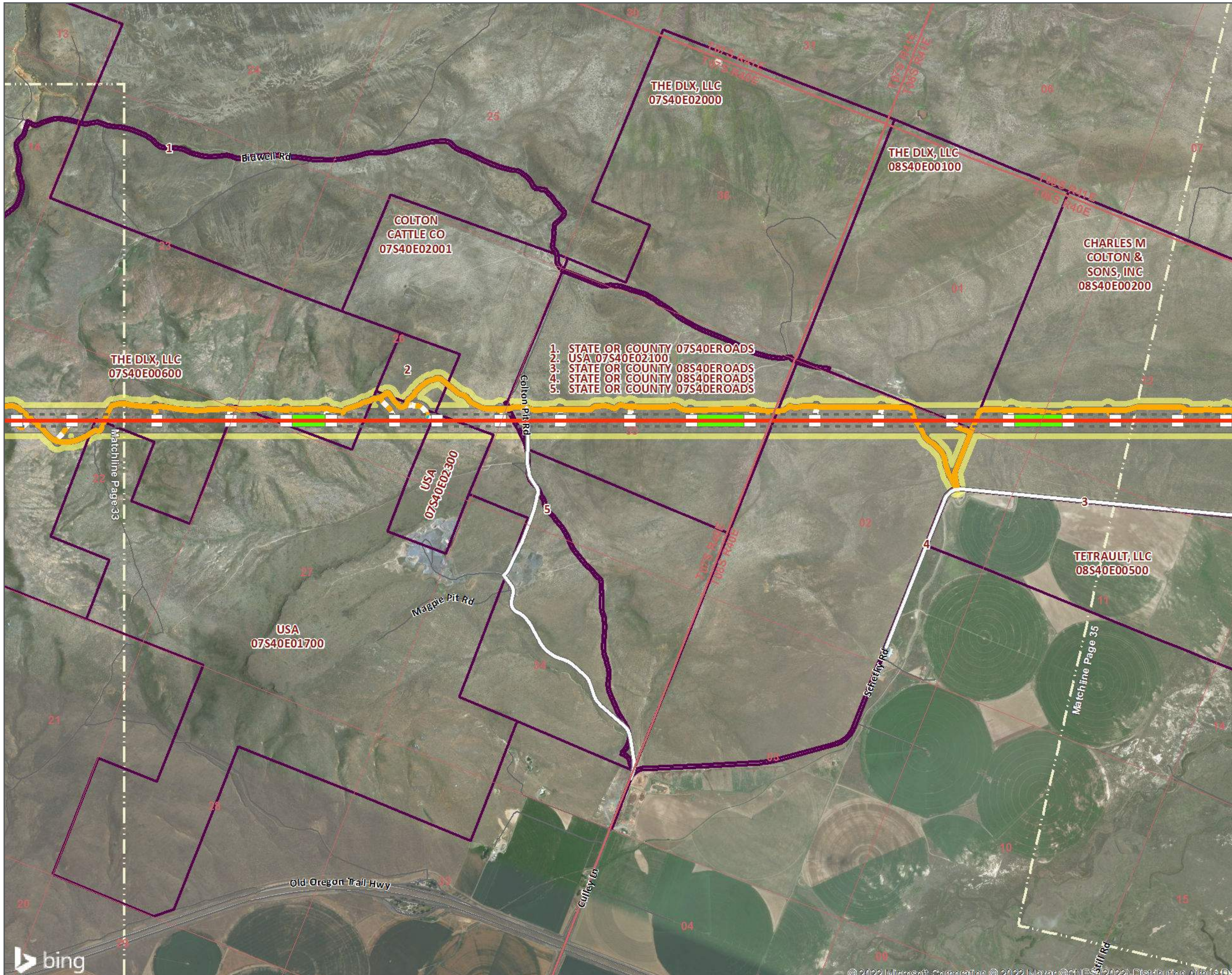
Union County

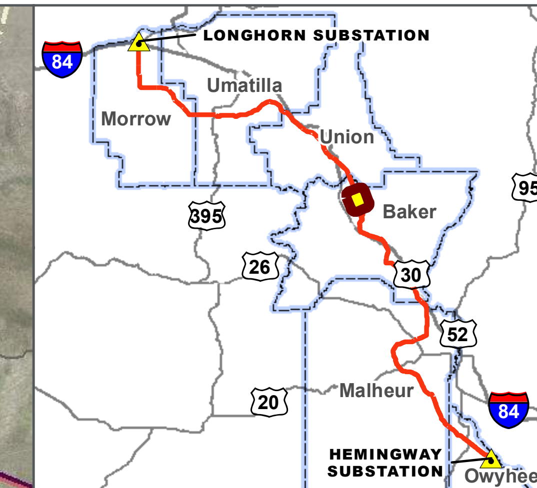


Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Baker County

HDR





LEGEND

B2H EFSC Route (2017)

Parcels within Selected Site Boundary

Project Features

Proposed Route

Existing Road, No Substantial Modification, 0-20% Improvements

Existing Road, Substantial Modification, 21-70% Improvements

New Road, Bladed

New Road, Primitive

Pulling and Tensioning

Structure Work

Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N

0 2,000 4,000 Feet

Baker County

HDR

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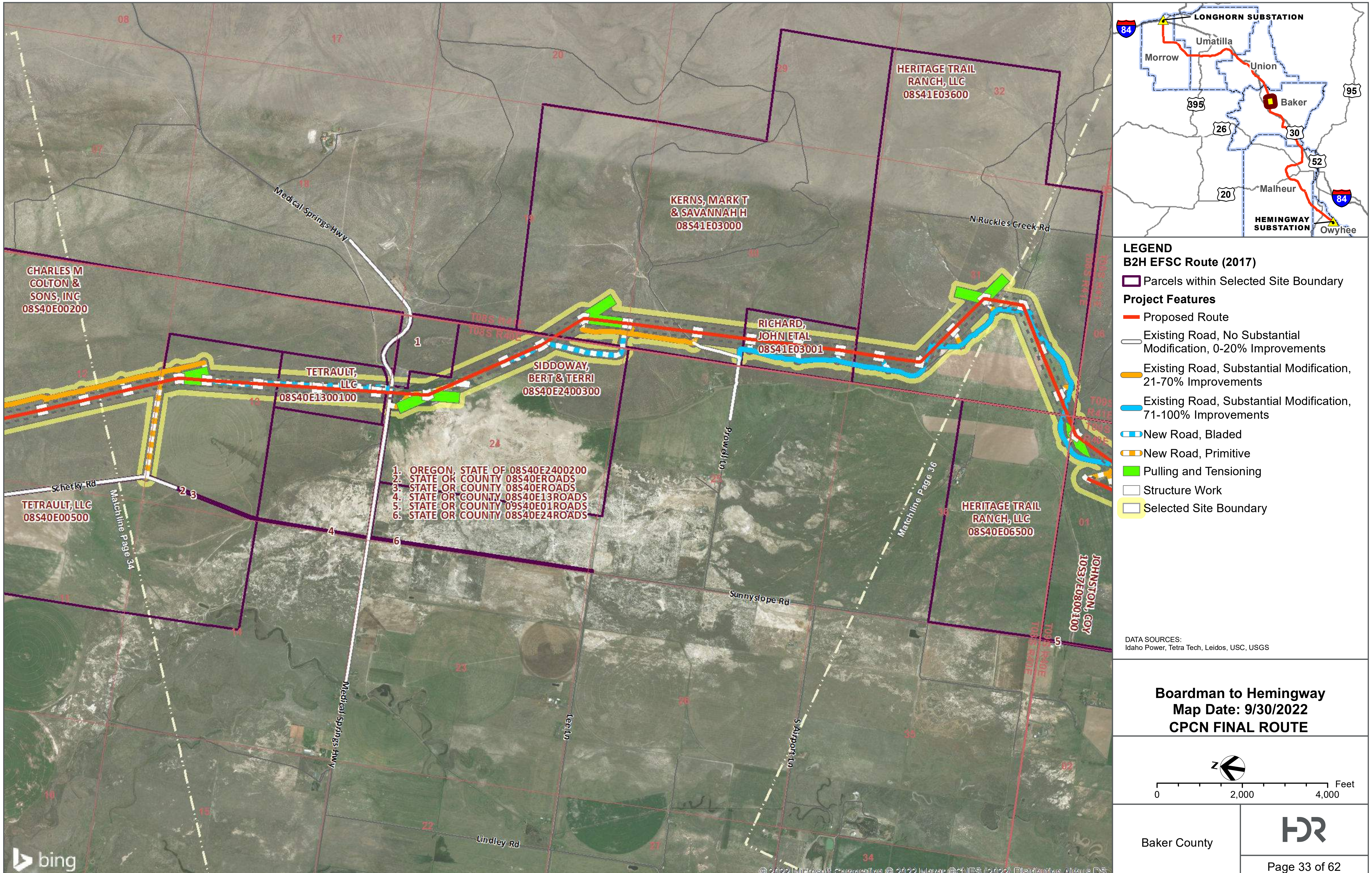

LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work
Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Feet 0 2,000 4,000

Baker County

HDR

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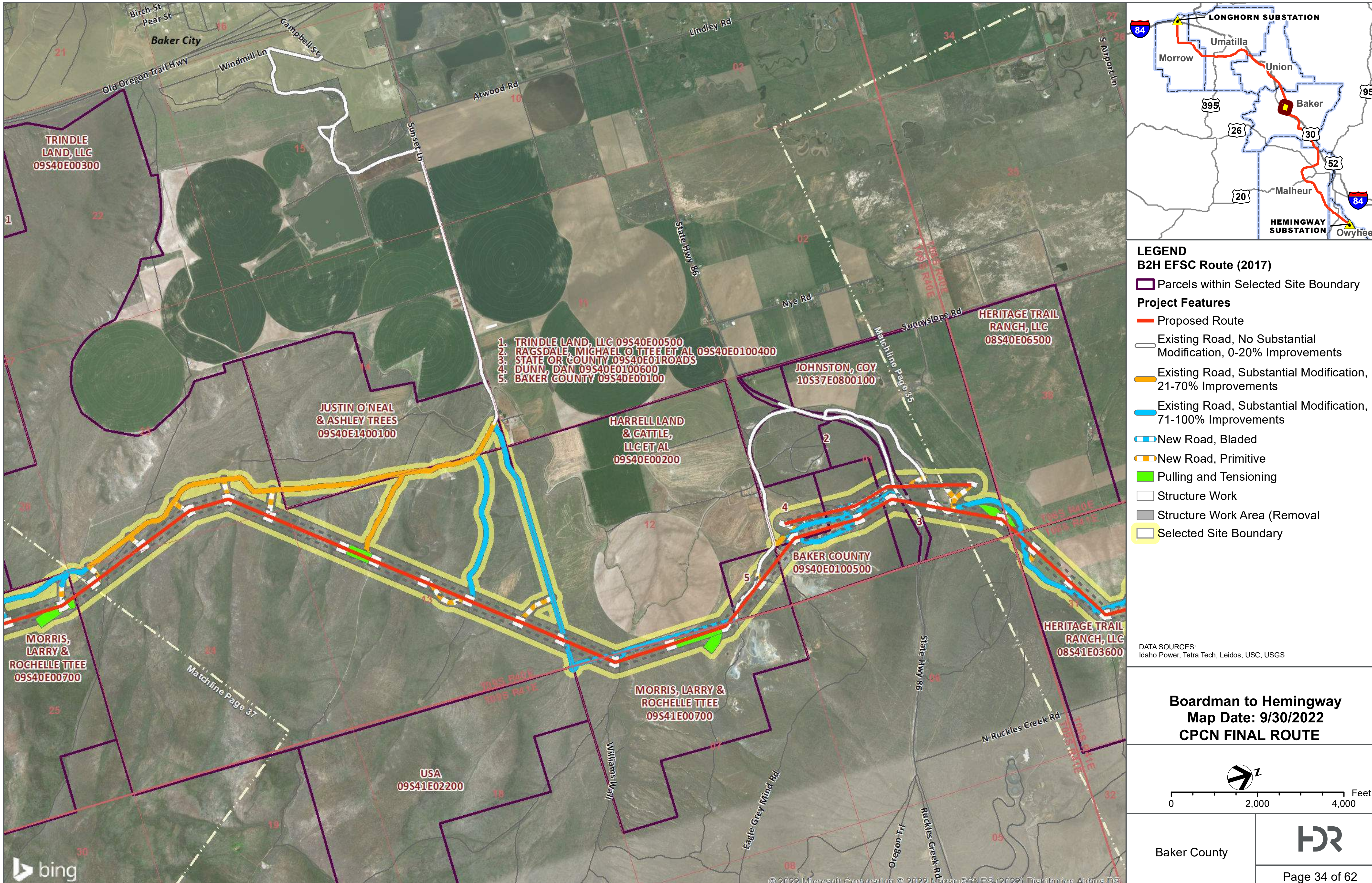

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Baker County

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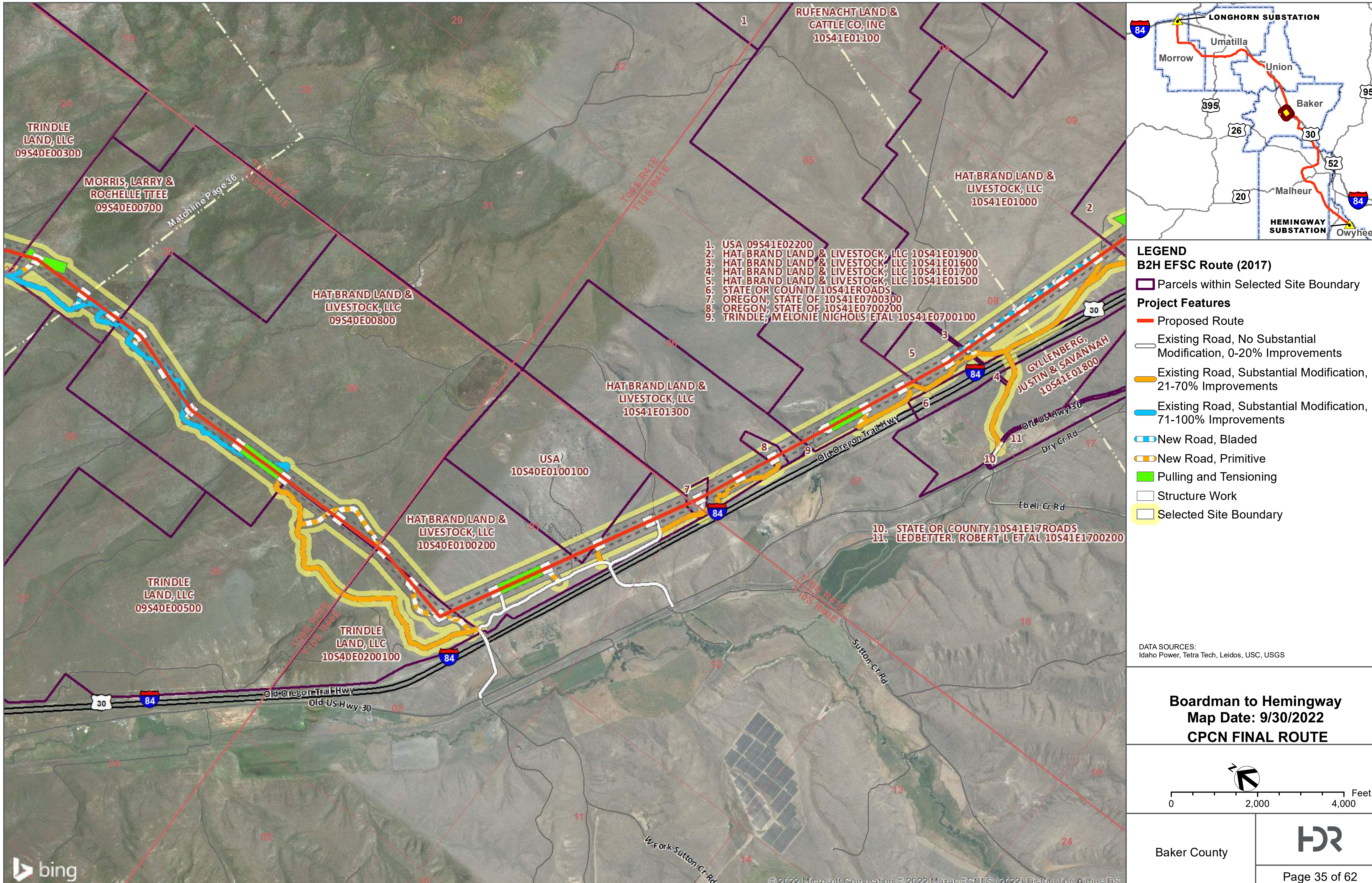
LONGHORN SUBSTATION
Umatilla
Morrow
Union
Baker
Malheur
HEMINGWAY SUBSTATION
Owyhee
LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work
Selected Site Boundary
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE
Feet
0
2,000
4,000
Baker County
Page 35 of 62
RUFENACHT LAND & CATTLE CO, INC 10S41E01100
TRINDLE LAND, LLC 09S40E00300
MORRIS, LARRY & ROCHELLE TTEE 09S40E00700
Matchline Page 36
HAT BRAND LAND & LIVESTOCK, LLC 09S40E00800
HAT BRAND LAND & LIVESTOCK, LLC 10S41E01000
HAT BRAND LAND & LIVESTOCK, LLC 10S41E01300
USA 10S40E0100100
HAT BRAND LAND & LIVESTOCK, LLC 10S40E0100200
TRINDLE LAND, LLC 09S40E00500
TRINDLE LAND, LLC 10S40E0200100
GYLLENBERG, JUSTIN & SAVANNAH 10S41E01800
1. USA 09S41E02200
2. HAT BRAND LAND & LIVESTOCK, LLC 10S41E01900
3. HAT BRAND LAND & LIVESTOCK, LLC 10S41E01600
4. HAT BRAND LAND & LIVESTOCK, LLC 10S41E01700
5. HAT BRAND LAND & LIVESTOCK, LLC 10S41E01500
6. STATE OR COUNTY 10S41EROADS
7. OREGON, STATE OF 10S41E0700300
8. OREGON, STATE OF 10S41E0700200
9. TRINDLE, MELONIE NICHOLS ETAL 10S41E0700100
10. STATE OR COUNTY 10S41E17ROADS
11. LEDBETTER, ROBERT L ET AL 10S41E1700200
Old Oregon Trail Hwy
Old US Hwy 30
Dry Cr Rd
Ebell Cr Rd
Sutton Cr Rd
W Fork Sutton Cr Rd
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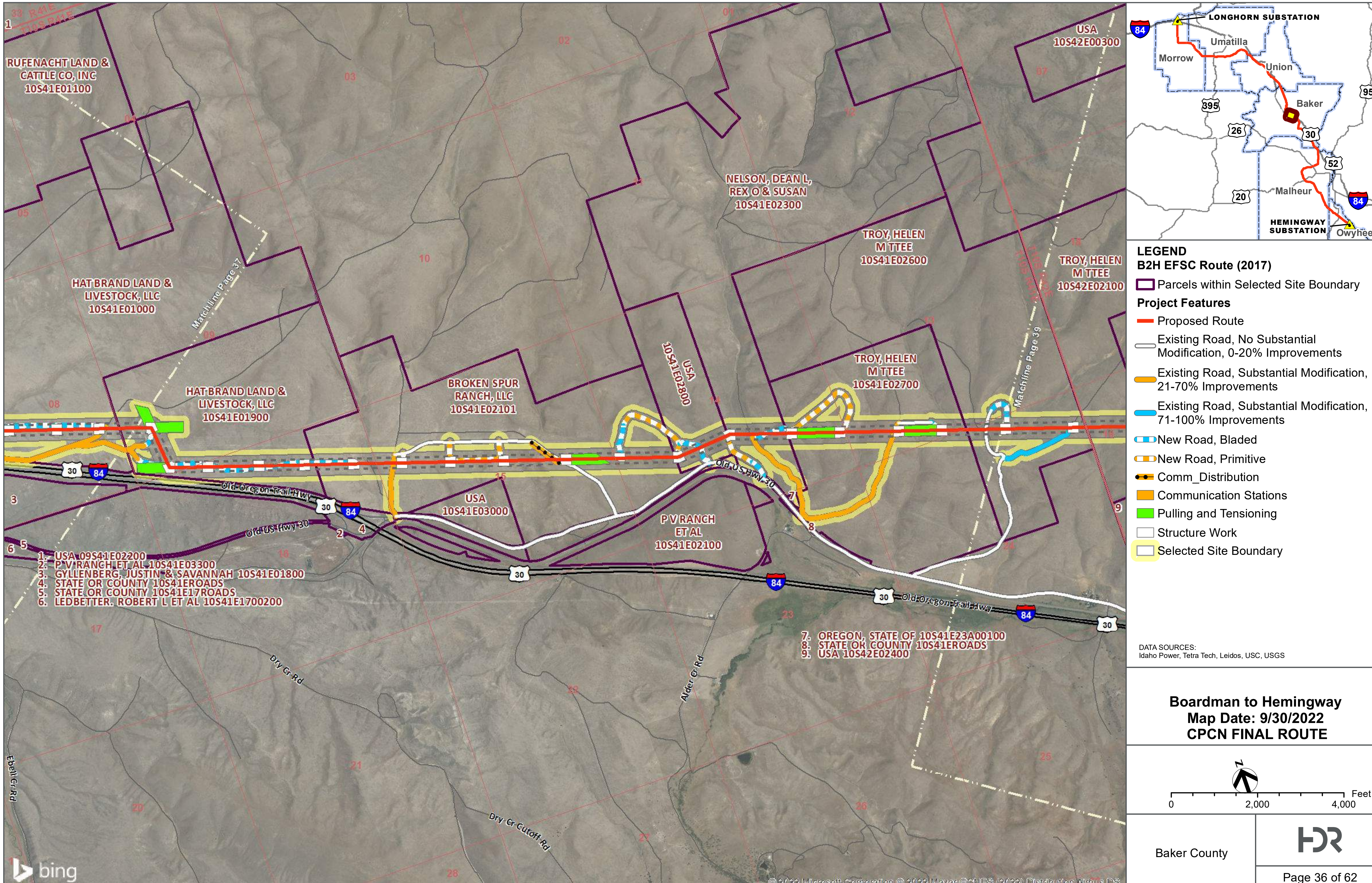

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Baker County

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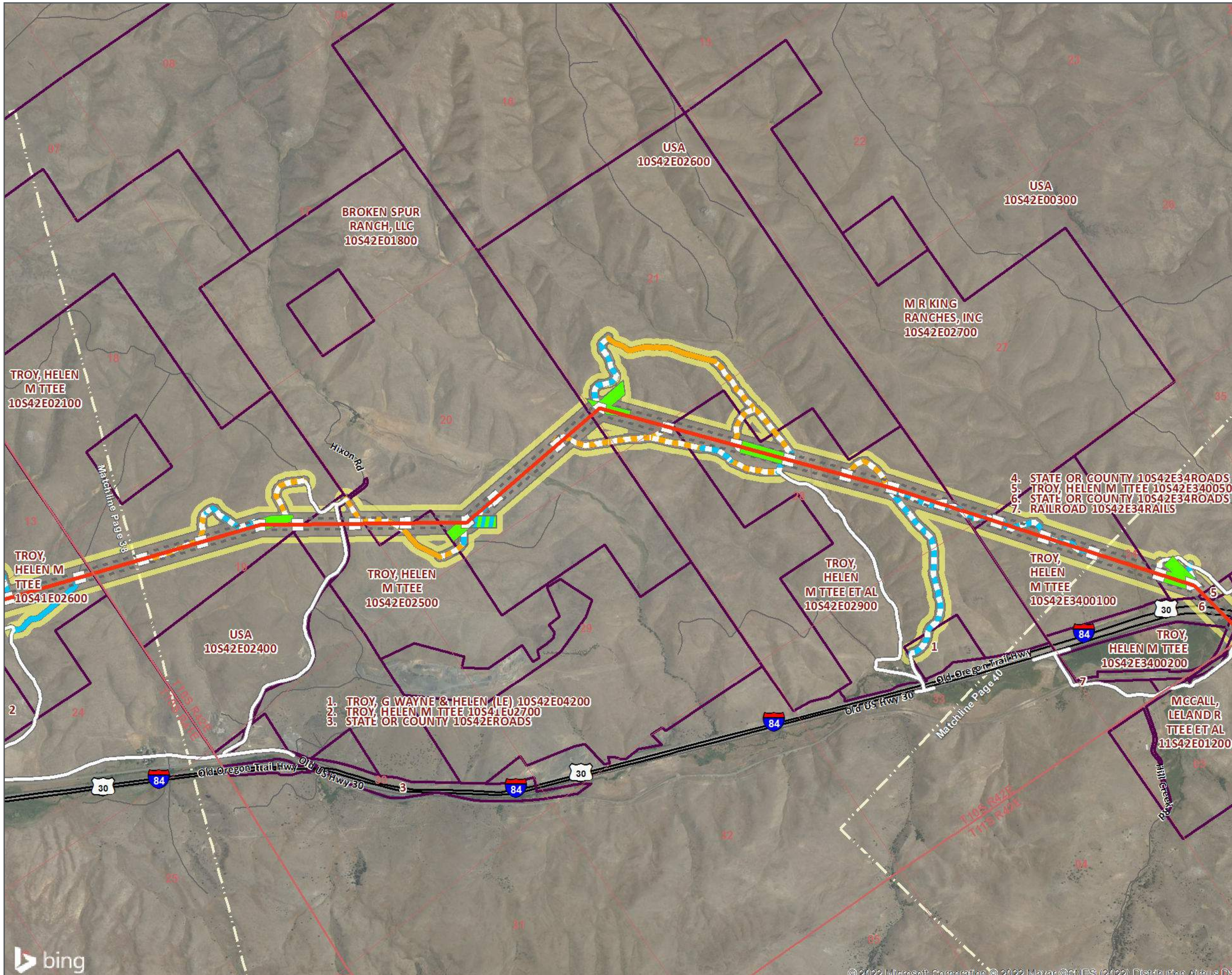
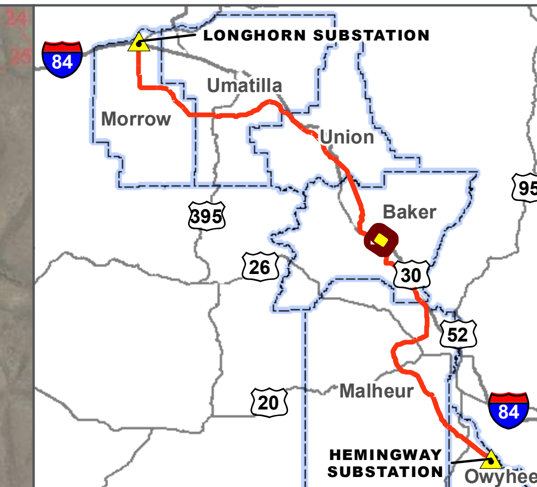




LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Light-Duty Fly Yards
Pulling and Tensioning
Structure Work
Selected Site Boundary

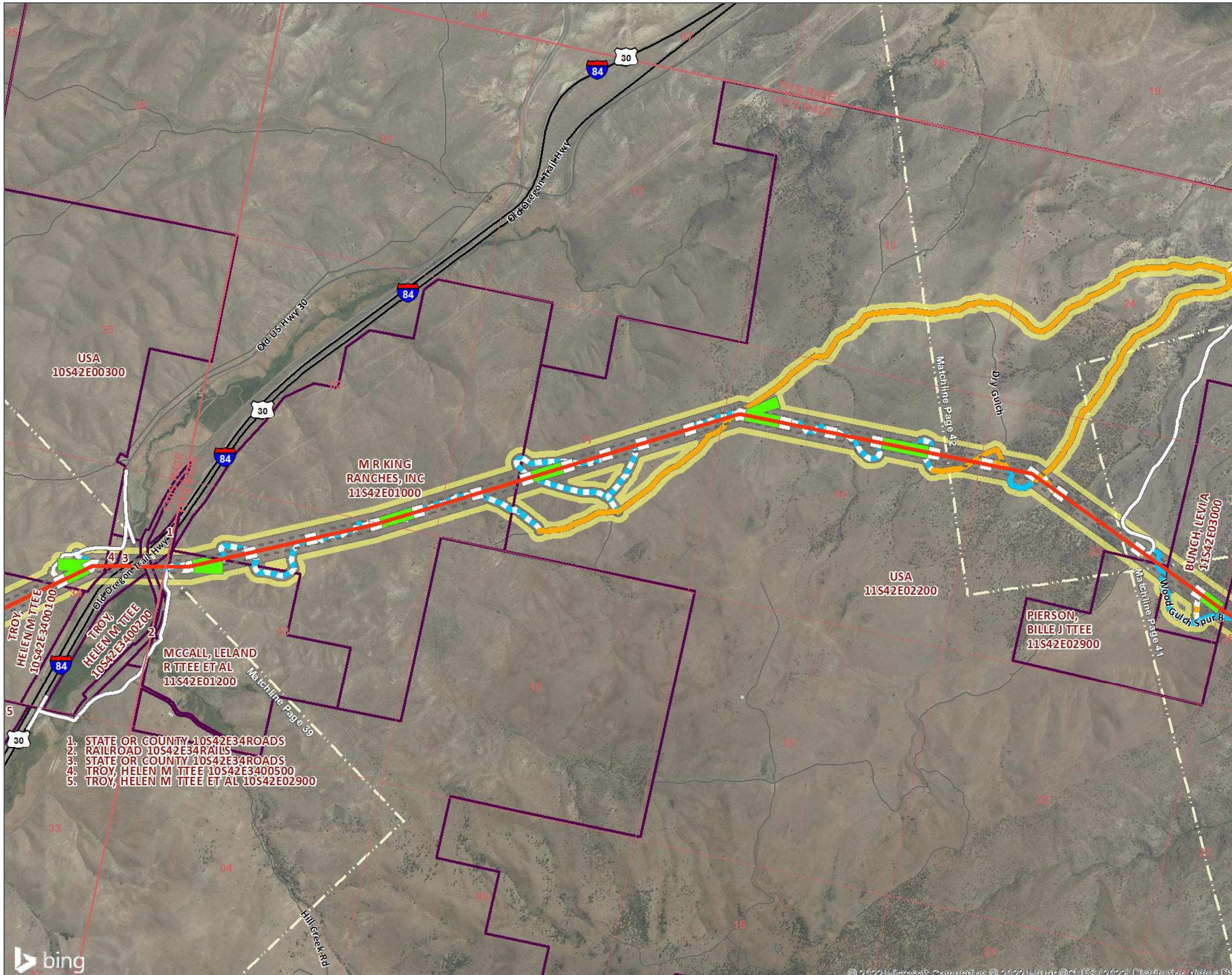
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

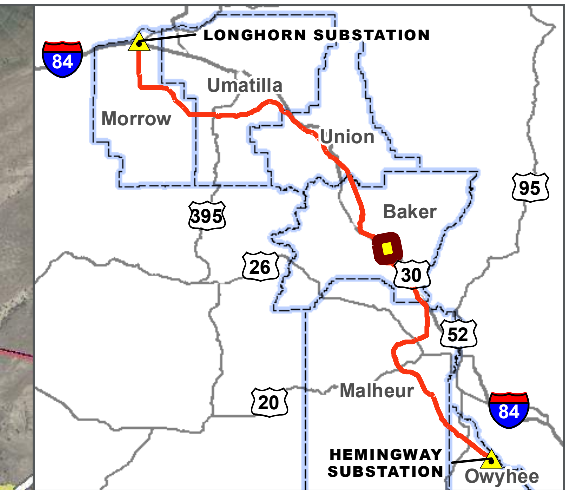
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N
0 2,000 4,000 Feet

Baker County

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022





LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work
Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N
0 2,000 4,000 Feet

Baker County

HDR

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022

LEGEND
B2H EFSC Route (2017)

- Parcels within Selected Site Boundary

Project Features

- Proposed Route
- Existing Road, No Substantial Modification, 0-20% Improvements
- Existing Road, Substantial Modification, 21-70% Improvements
- Existing Road, Substantial Modification, 71-100% Improvements
- New Road, Bladed
- New Road, Primitive
- Pulling and Tensioning
- Structure Work
- Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Feet
0 2,000 4,000

Baker County

HDR

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B2H EFSC Route (2017)
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Boardman to Hemingway
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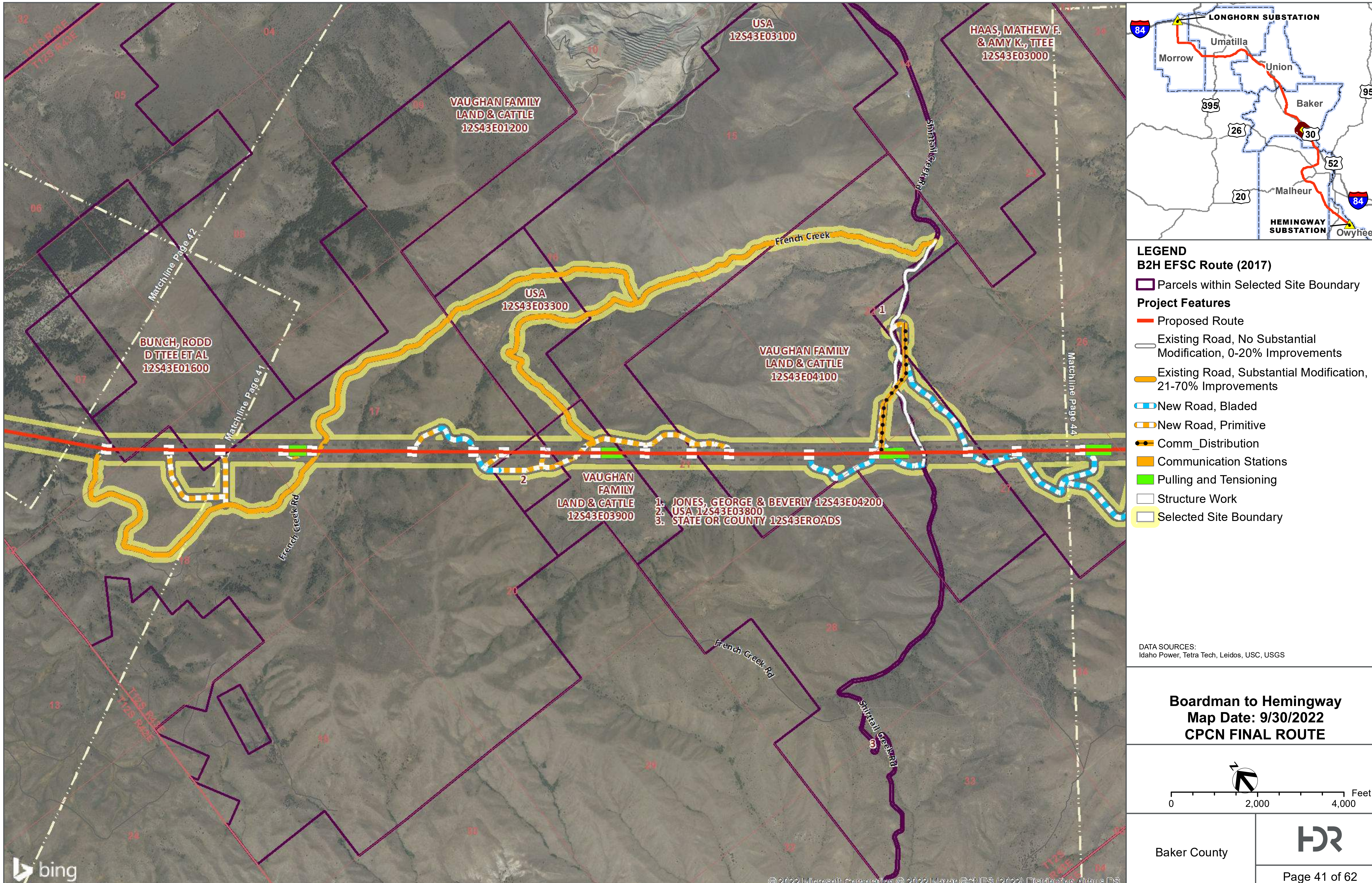
0 2,000 4,000

Baker County

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022



LEGEND
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Parcels within Selected Site Boundary
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Existing Road, Substantial Modification, 21-70% Improvements
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New Road, Primitive
Comm_Distribution
Communication Stations
Pulling and Tensioning
Structure Work
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Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Feet
0 2,000 4,000

Baker County

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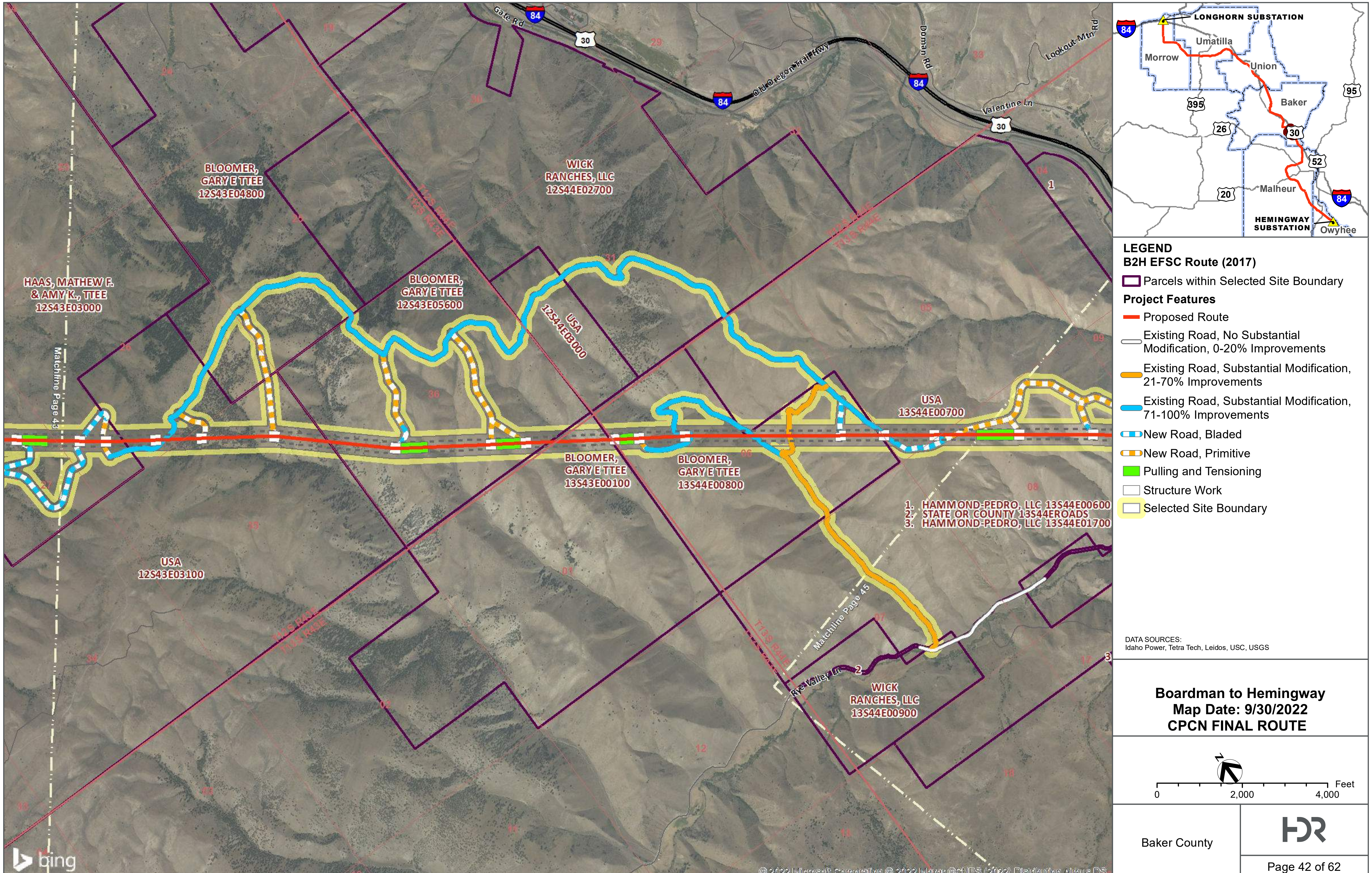

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Baker County

Page 42 of 62

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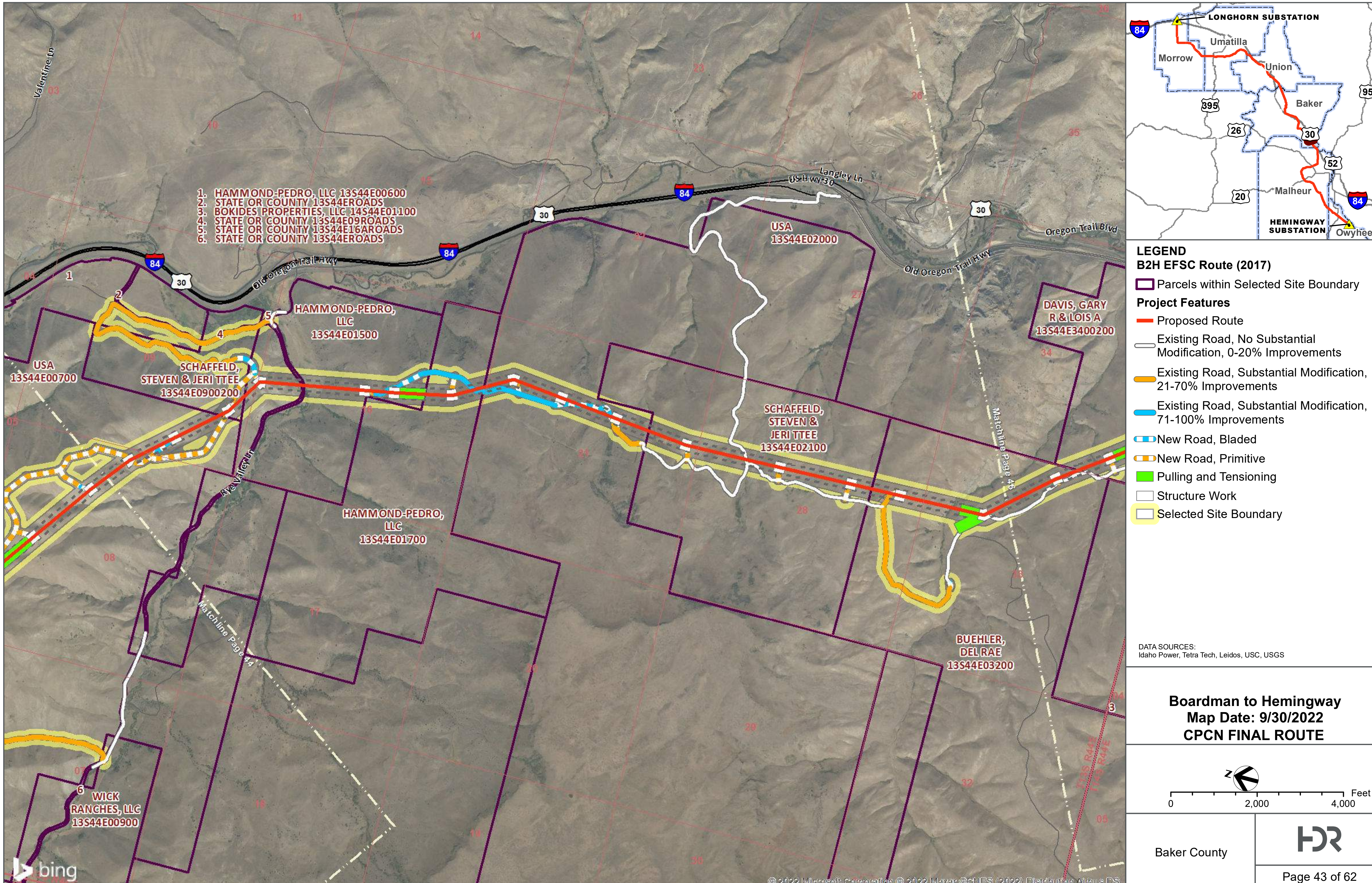
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2. STATE OR COUNTY 13S44EROADS
3. BOKIDES PROPERTIES, LLC 14S44E01100
4. STATE OR COUNTY 13S44E09ROADS
5. STATE OR COUNTY 13S44E16AROADS
6. STATE OR COUNTY 13S44EROADS
HAMMOND-PEDRO, LLC 13S44E01500
USA 13S44E00700
SCHAFFELD, STEVEN & JERI TTEE 13S44E0900200
USA 13S44E02000
SCHAFFELD, STEVEN & JERI TTEE 13S44E02100
DAVIS, GARY R & LOIS A 13S44E3400200
HAMMOND-PEDRO, LLC 13S44E01700
BUEHLER, DEL RAE 13S44E03200
WICK RANCHES, LLC 13S44E00900
Valentine Ln
Old Oregon Trail Hwy
Langley Ln
US Hwy 30
Oregon Trail Blvd
Rye Valley Ln
Matchline Page 44
Matchline Page 46
LONGHORN SUBSTATION
HEMINGWAY SUBSTATION
Morrow
Umatilla
Union
Baker
Malheur
Owyhee
LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work
Selected Site Boundary
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE
Feet
0
2,000
4,000
Baker County
Page 43 of 62
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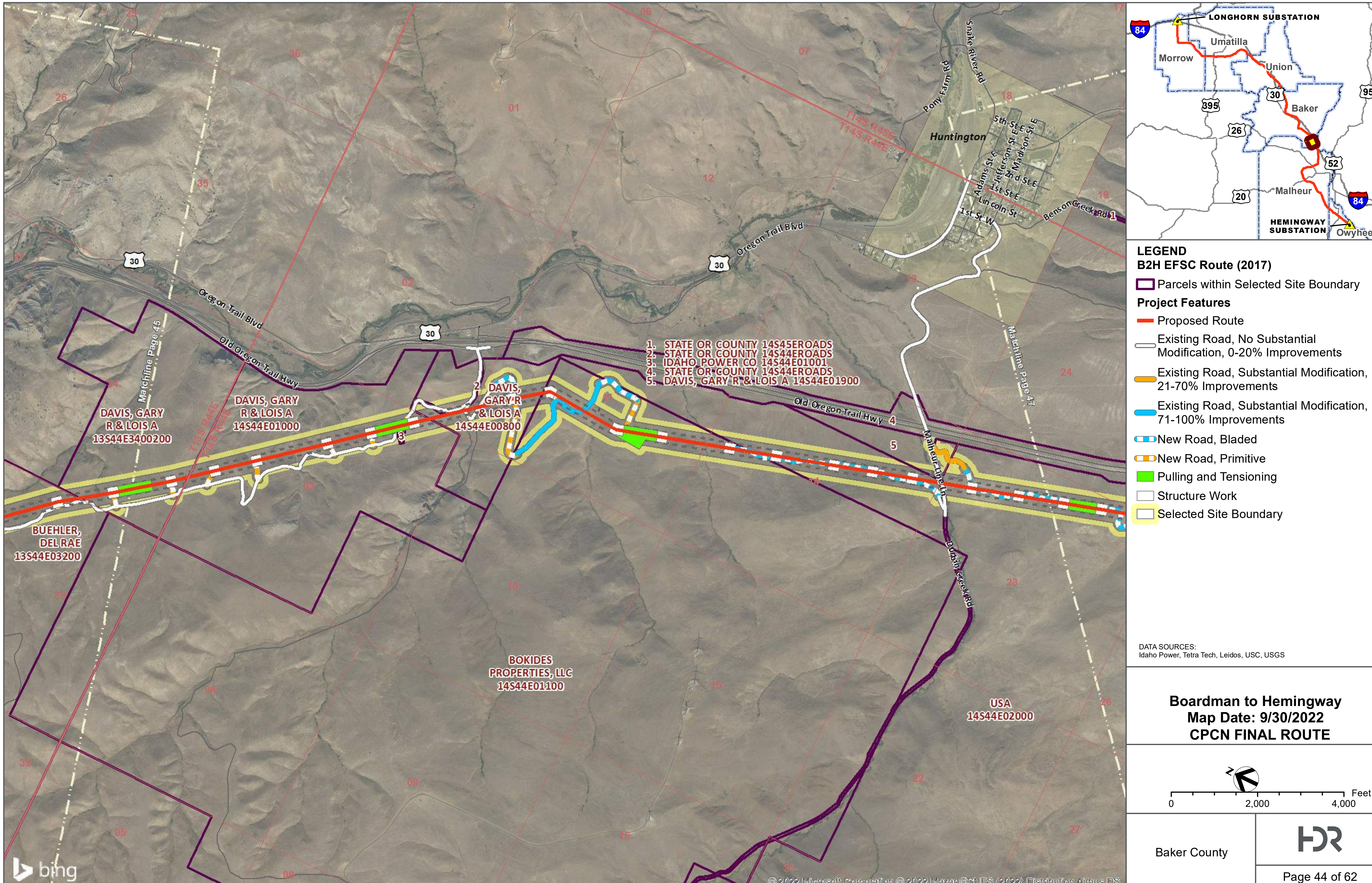

LEGEND
B2H EFSC Route (2017)
- Parcels within Selected Site Boundary

Project Features
- Proposed Route
- Existing Road, No Substantial Modification, 0-20% Improvements
- Existing Road, Substantial Modification, 21-70% Improvements
- Existing Road, Substantial Modification, 71-100% Improvements
- New Road, Bladed
- New Road, Primitive
- Pulling and Tensioning
- Structure Work
- Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Feet
0 2,000 4,000

Baker County

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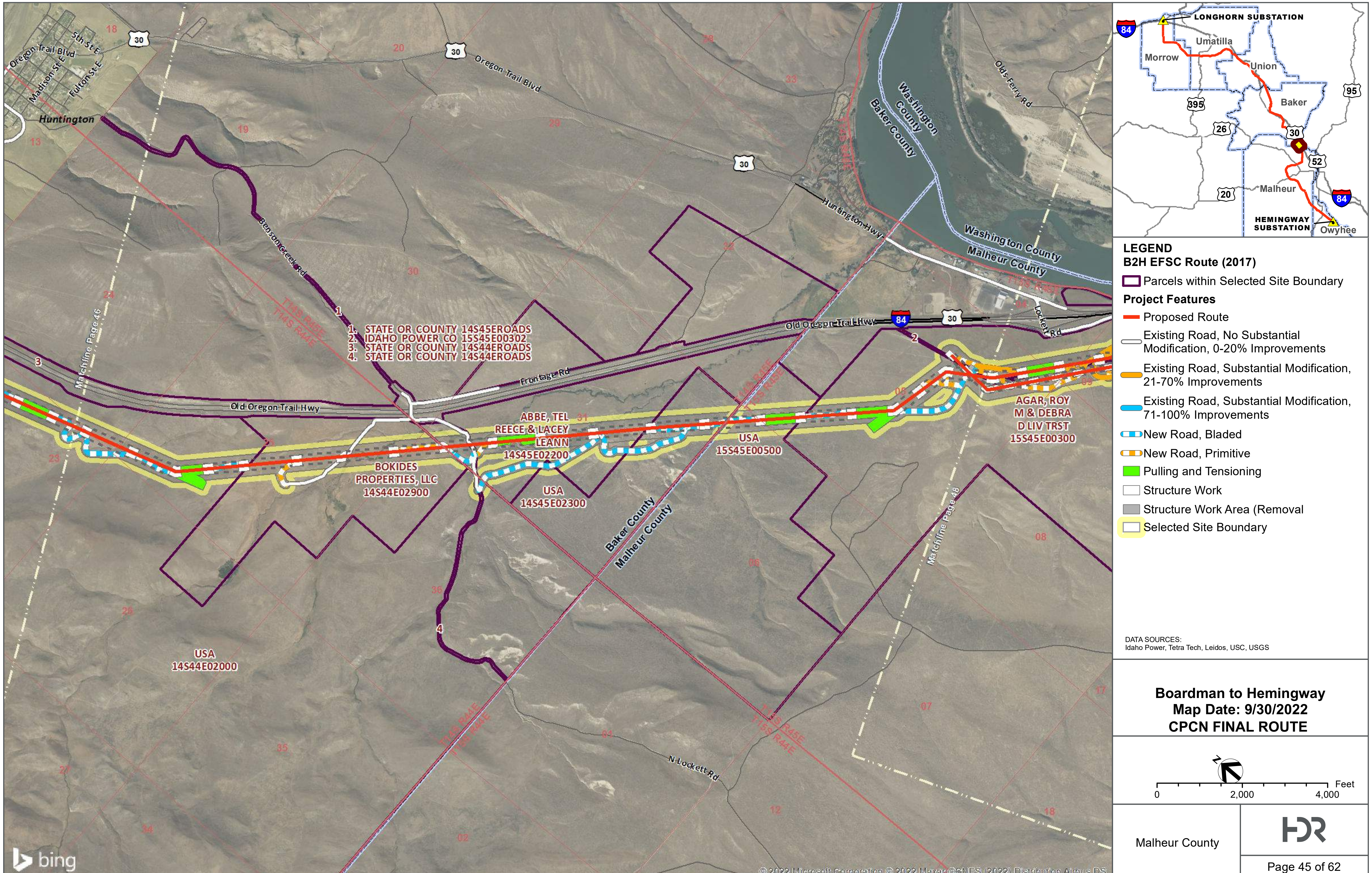
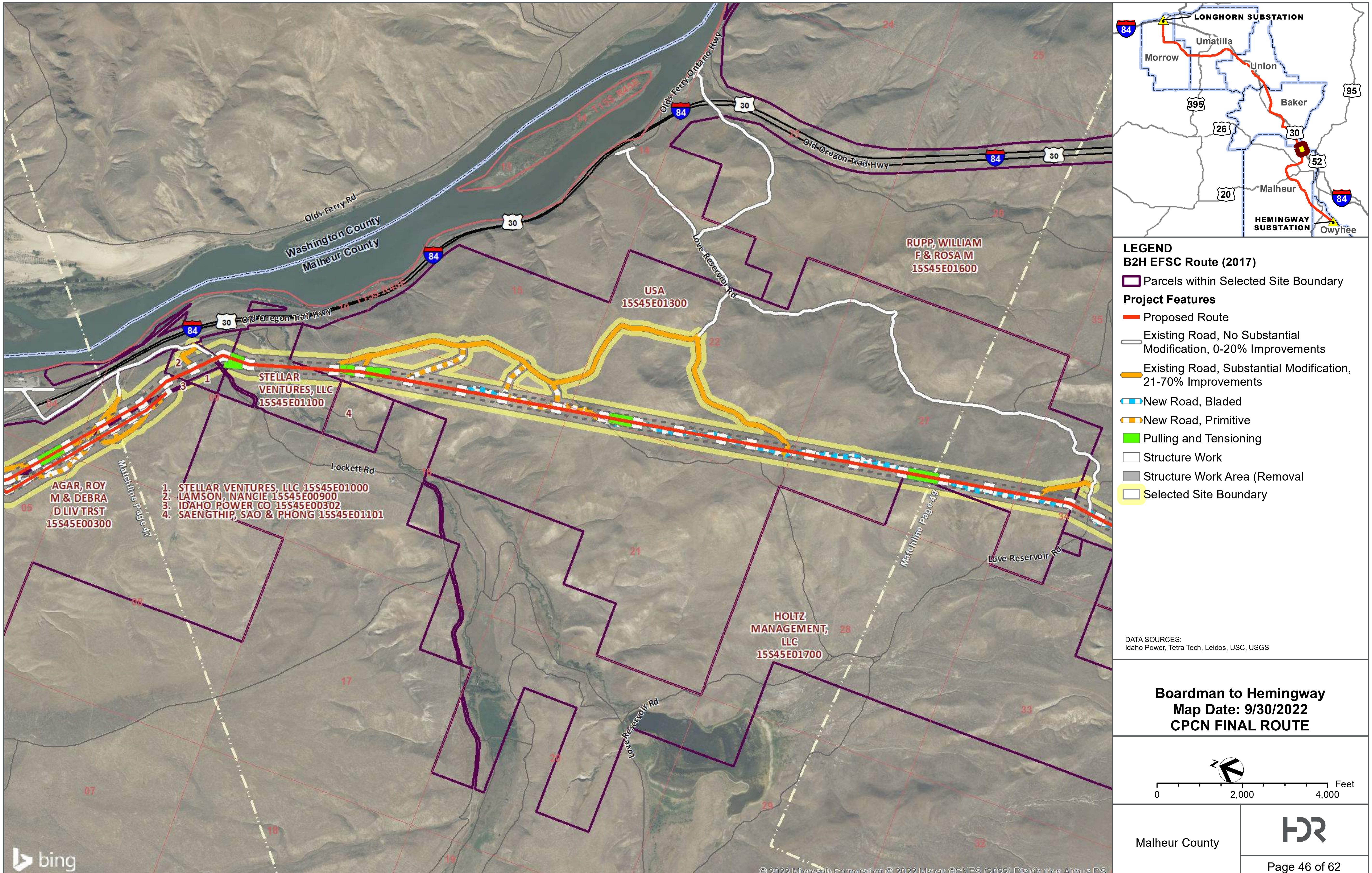


Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Malheur County


LONGHORN SUBSTATION
Morrow
Umatilla
Union
Baker
Malheur
HEMINGWAY SUBSTATION
Owyhee
84
395
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Washington County
Malheur County
Olds Ferry Rd
Olds Ferry Ontario Hwy
Old Oregon Trail Hwy
Love Reservoir Rd
Lockett Rd
RUPP, WILLIAM F & ROSA M 15S45E01600
USA 15S45E01300
STELLAR VENTURES, LLC 15S45E01100
AGAR, ROY M & DEBRA D LIV TRST 15S45E00300
1. STELLAR VENTURES, LLC 15S45E01000
2. LAMSON, NANCIE 15S45E00900
3. IDAHO POWER CO 15S45E00302
4. SAENGTHIP, SAO & PHONG 15S45E01101
HOLTZ MANAGEMENT, LLC 15S45E01700
Matchline Page 47
Matchline Page 49
LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work
Structure Work Area (Removal
Selected Site Boundary
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE
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2,000
4,000
Feet
Malheur County
HDR
Page 46 of 62
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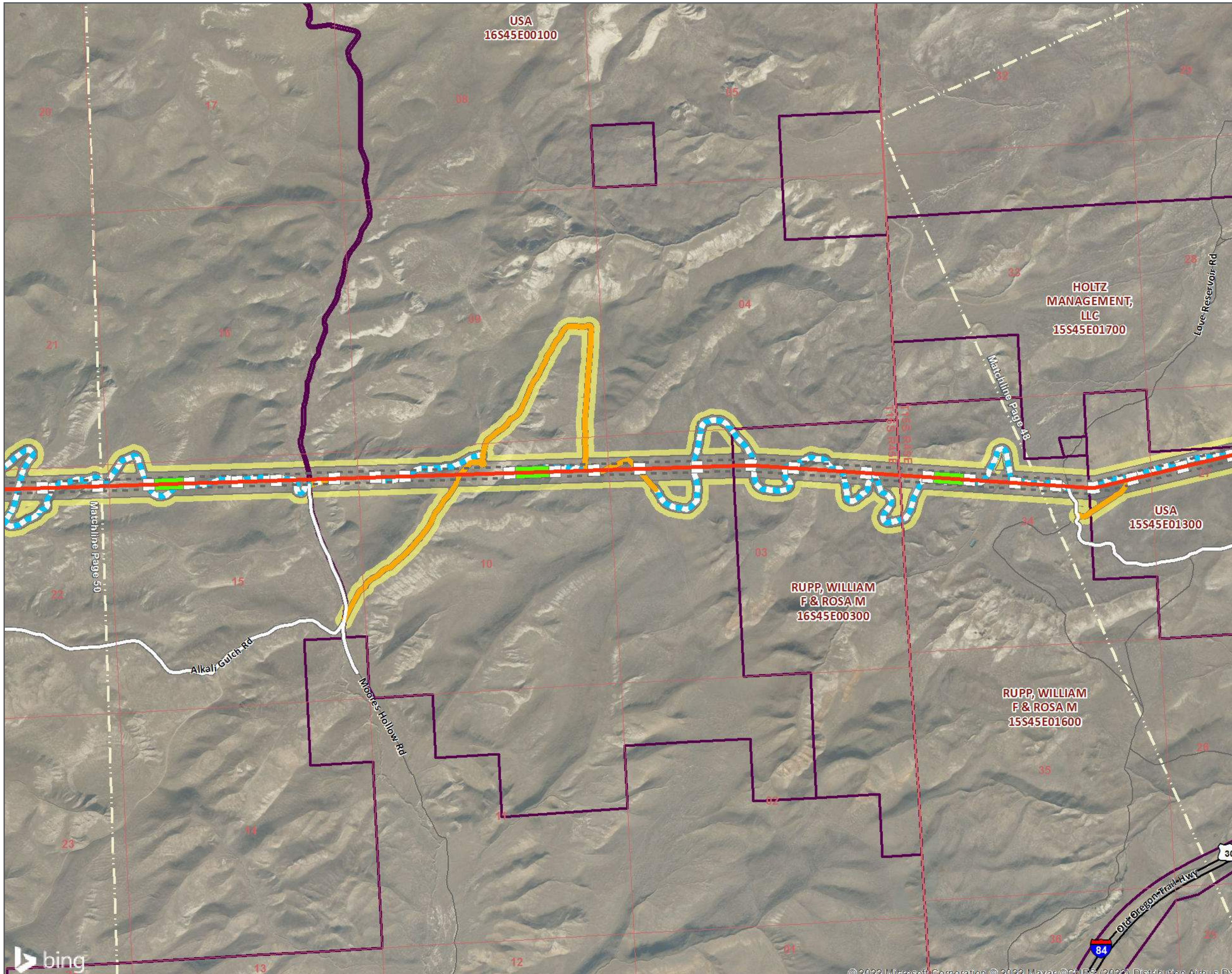

LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work
Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

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0 2,000 4,000 Feet

Malheur County

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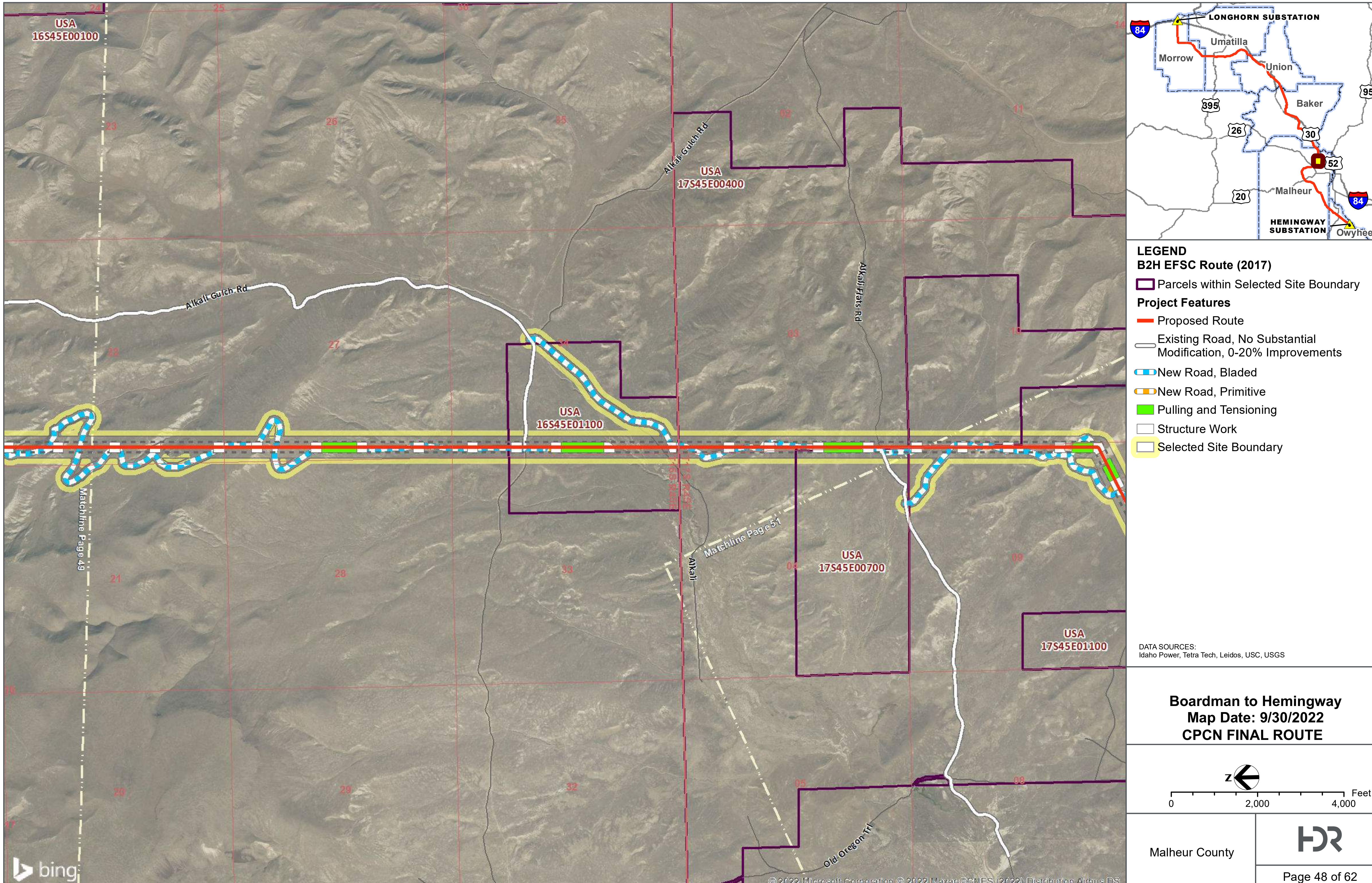
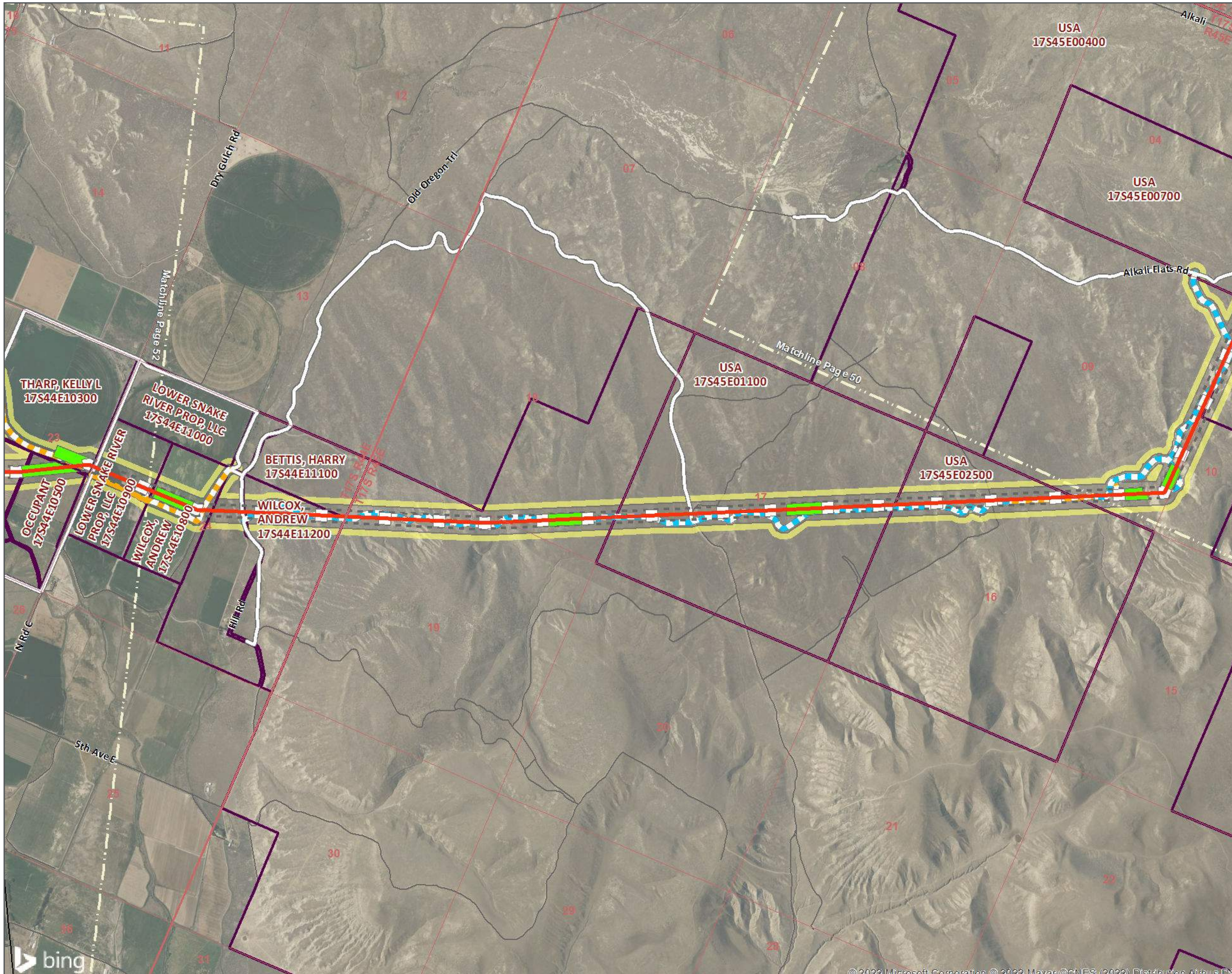
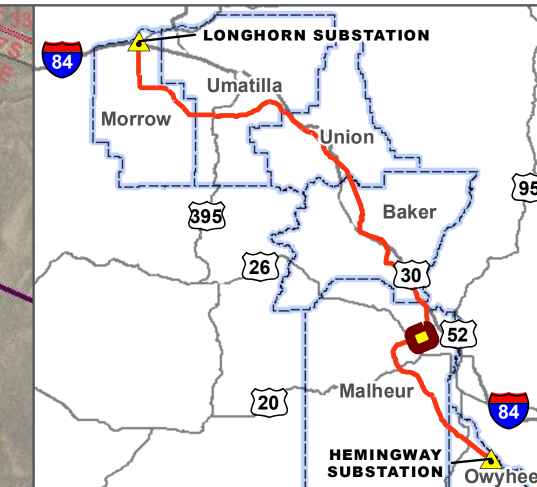


Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Malheur County

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022





LEGEND

B2H EFSC Route (2017)

Parcels within Selected Site Boundary

Project Features

Proposed Route

Existing Road, No Substantial Modification, 0-20% Improvements

Existing Road, Substantial Modification, 21-70% Improvements

New Road, Bladed

New Road, Primitive

Pulling and Tensioning

Structure Work Area

Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

0 2,000 4,000 Feet

Malheur County

HDR

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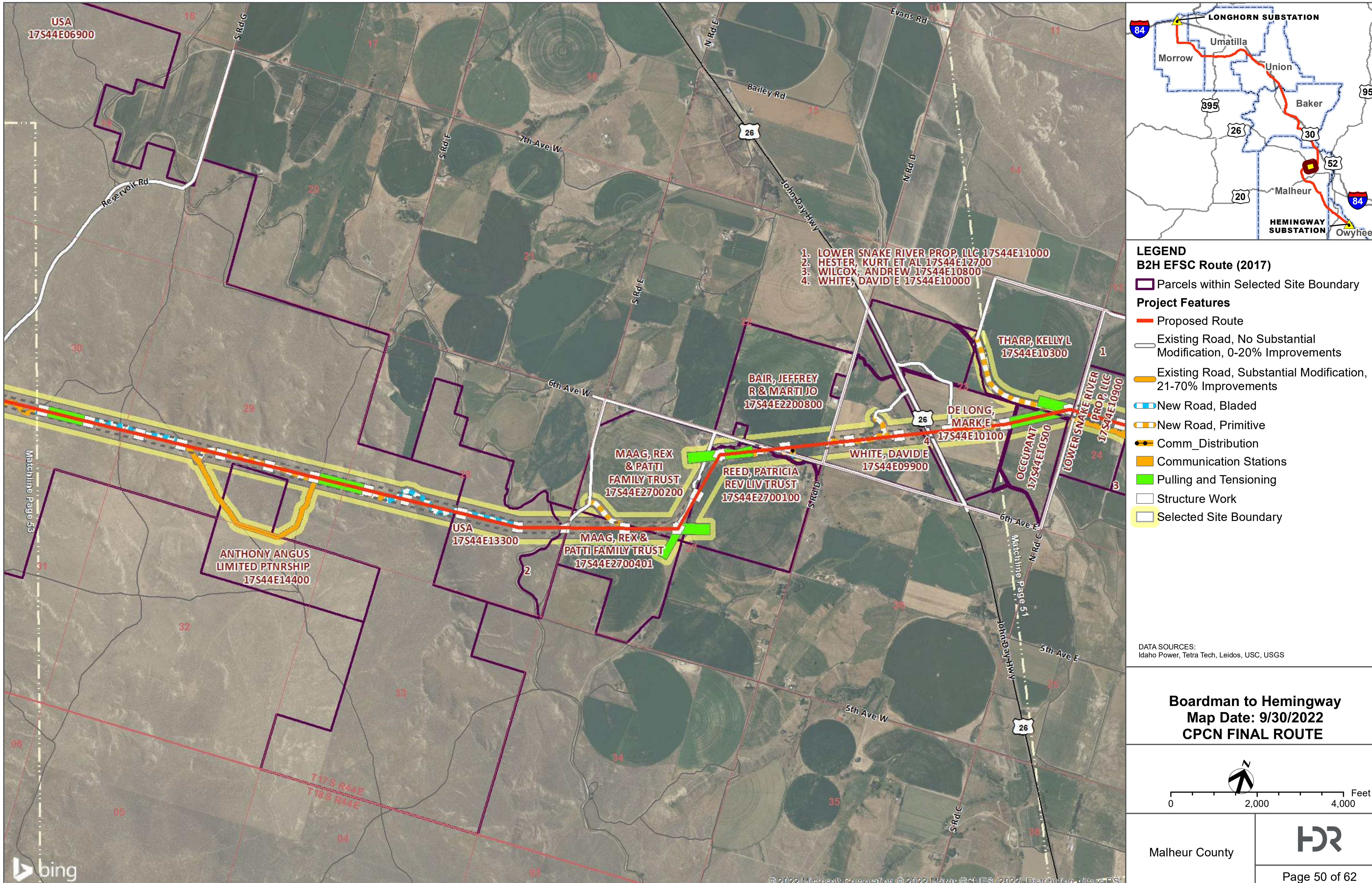

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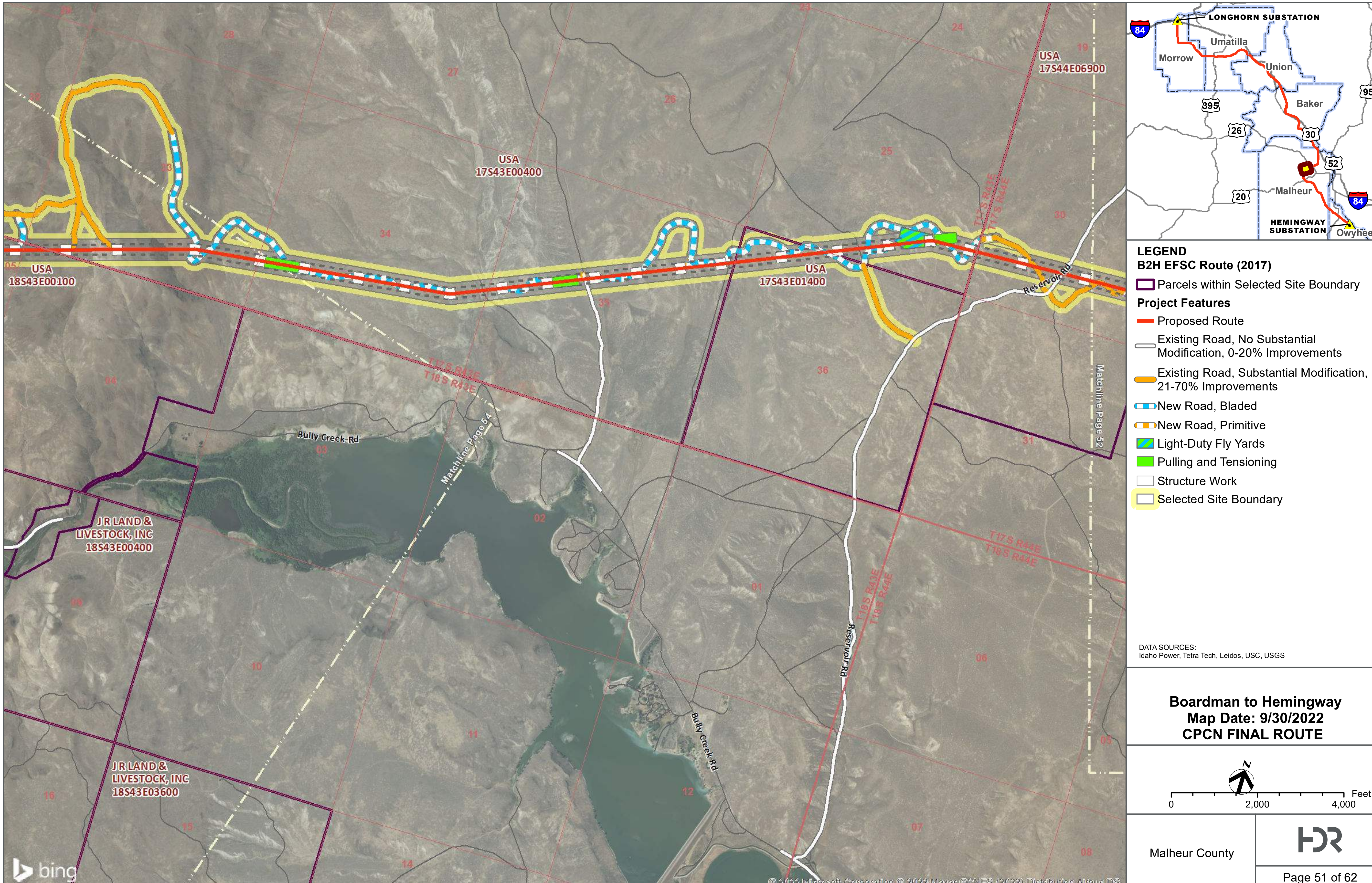

LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
New Road, Bladed
New Road, Primitive
Light-Duty Fly Yards
Pulling and Tensioning
Structure Work
Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

0 2,000 4,000 Feet

Malheur County

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022

Boardman to Hemingway
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CPCN FINAL ROUTE

Malheur County

HDR

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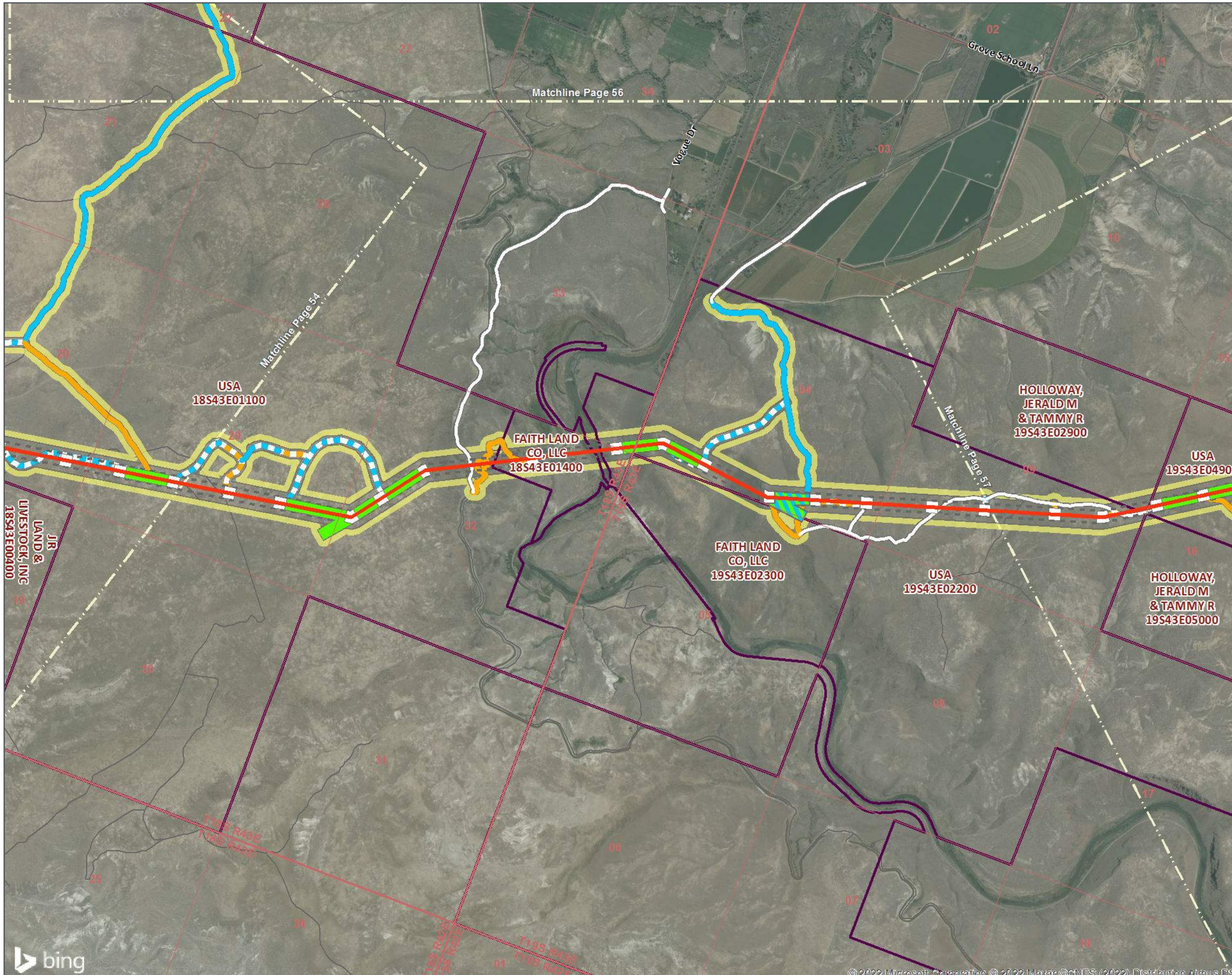
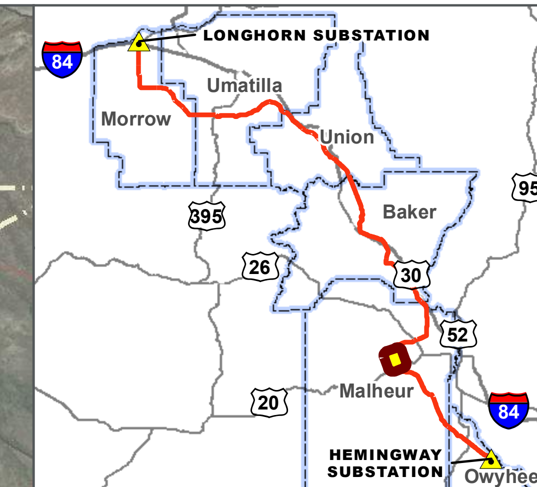




LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Light-Duty Fly Yards
Pulling and Tensioning
Structure Work
Selected Site Boundary

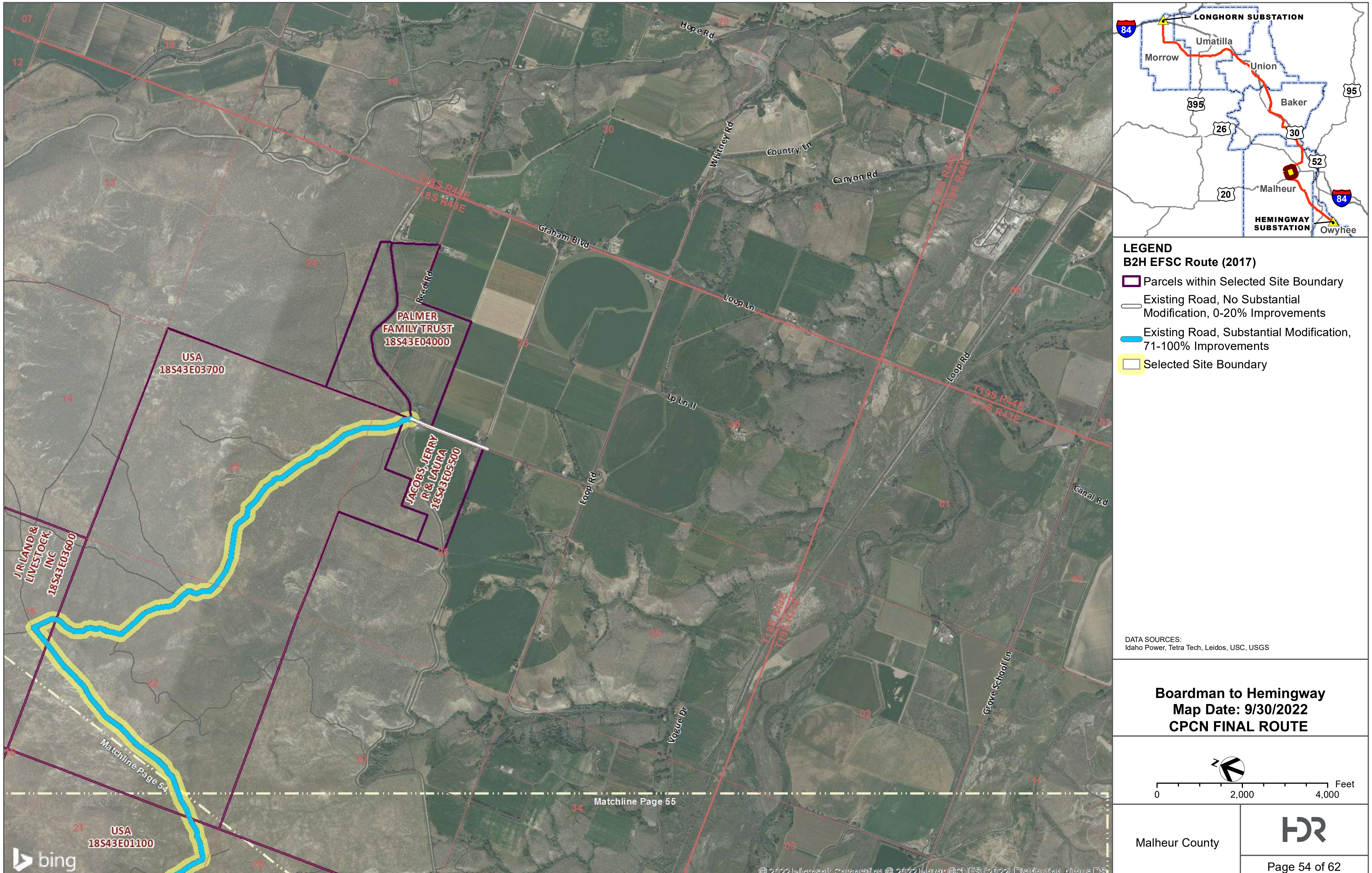
DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

N
0 2,000 4,000 Feet

Malheur County

HDR



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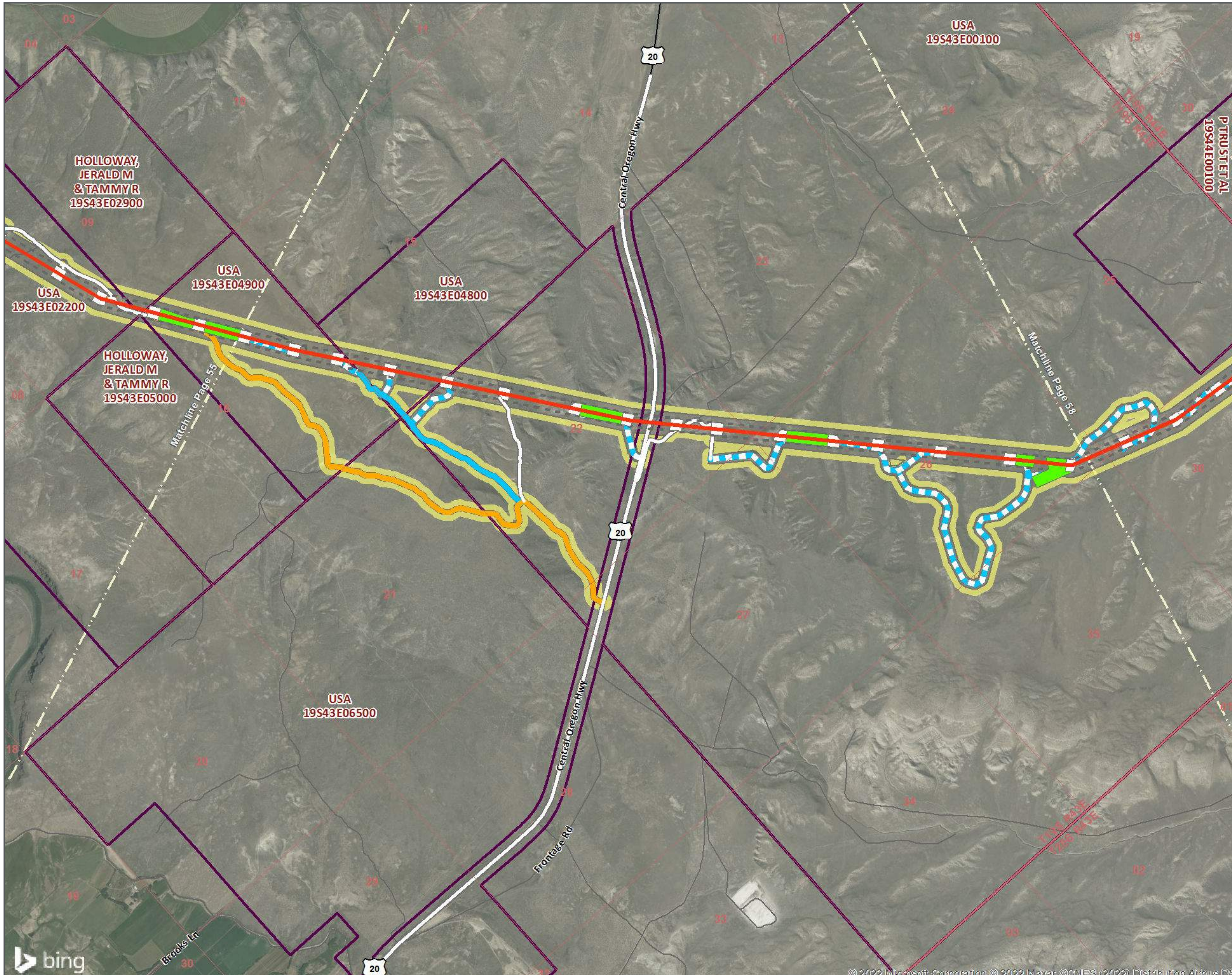

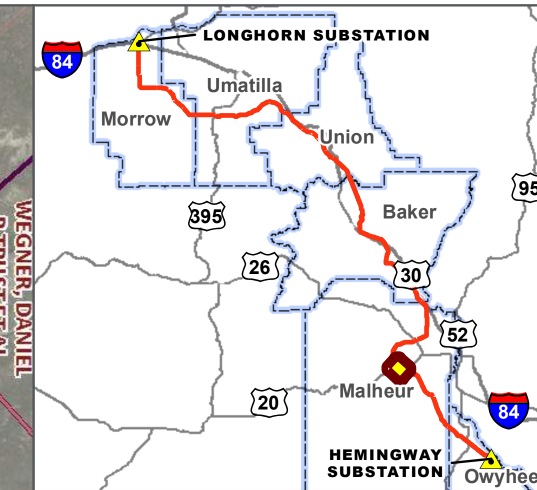

LEGEND

B2H EFSC Route (2017)

- Parcels within Selected Site Boundary

Project Features

- Proposed Route
- Existing Road, No Substantial Modification, 0-20% Improvements
- Existing Road, Substantial Modification, 21-70% Improvements
- Existing Road, Substantial Modification, 71-100% Improvements
- New Road, Bladed
- New Road, Primitive
- Pulling and Tensioning
- Structure Work
- Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

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0 2,000 4,000 Feet

Malheur County

HDR

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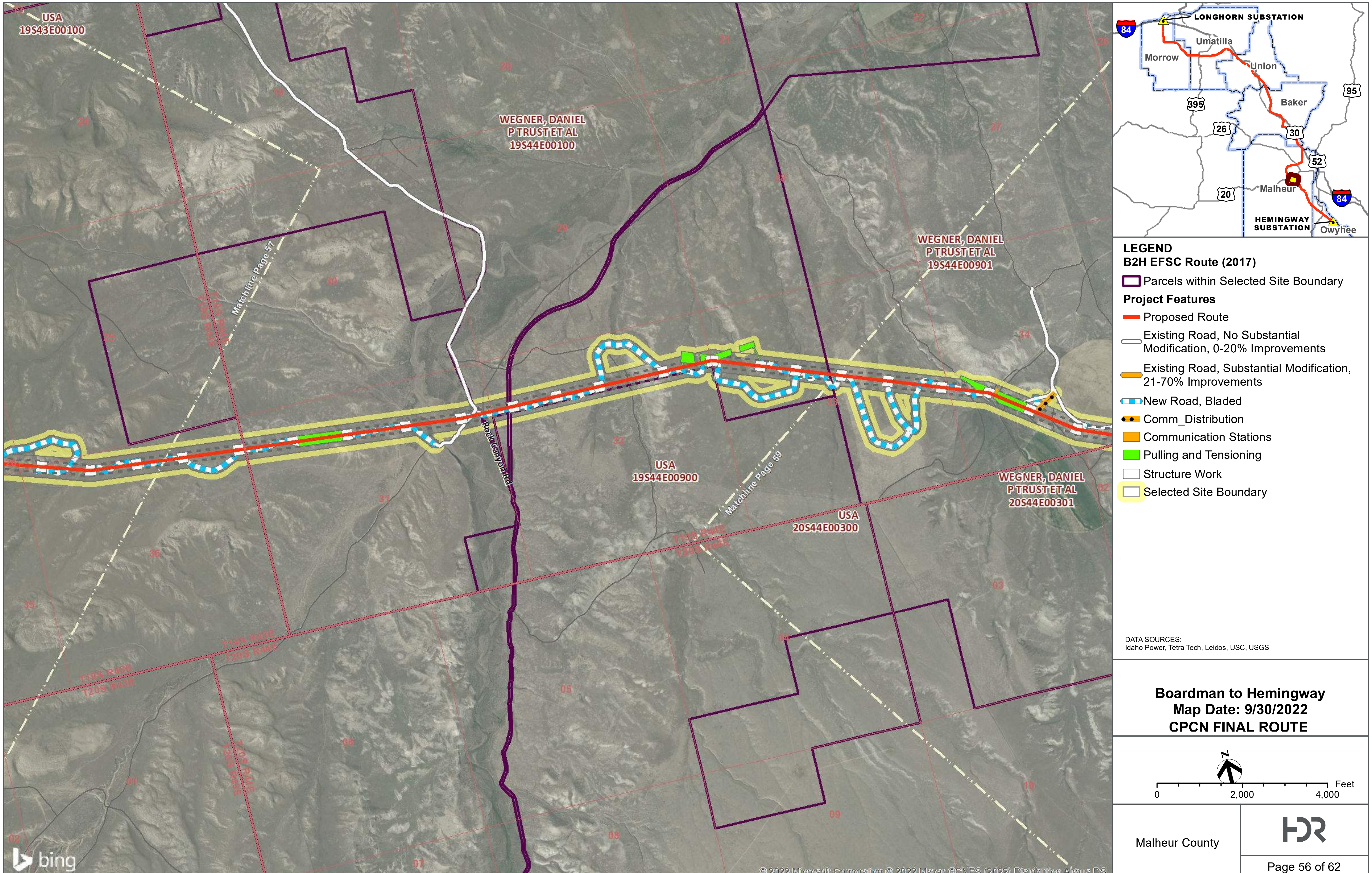
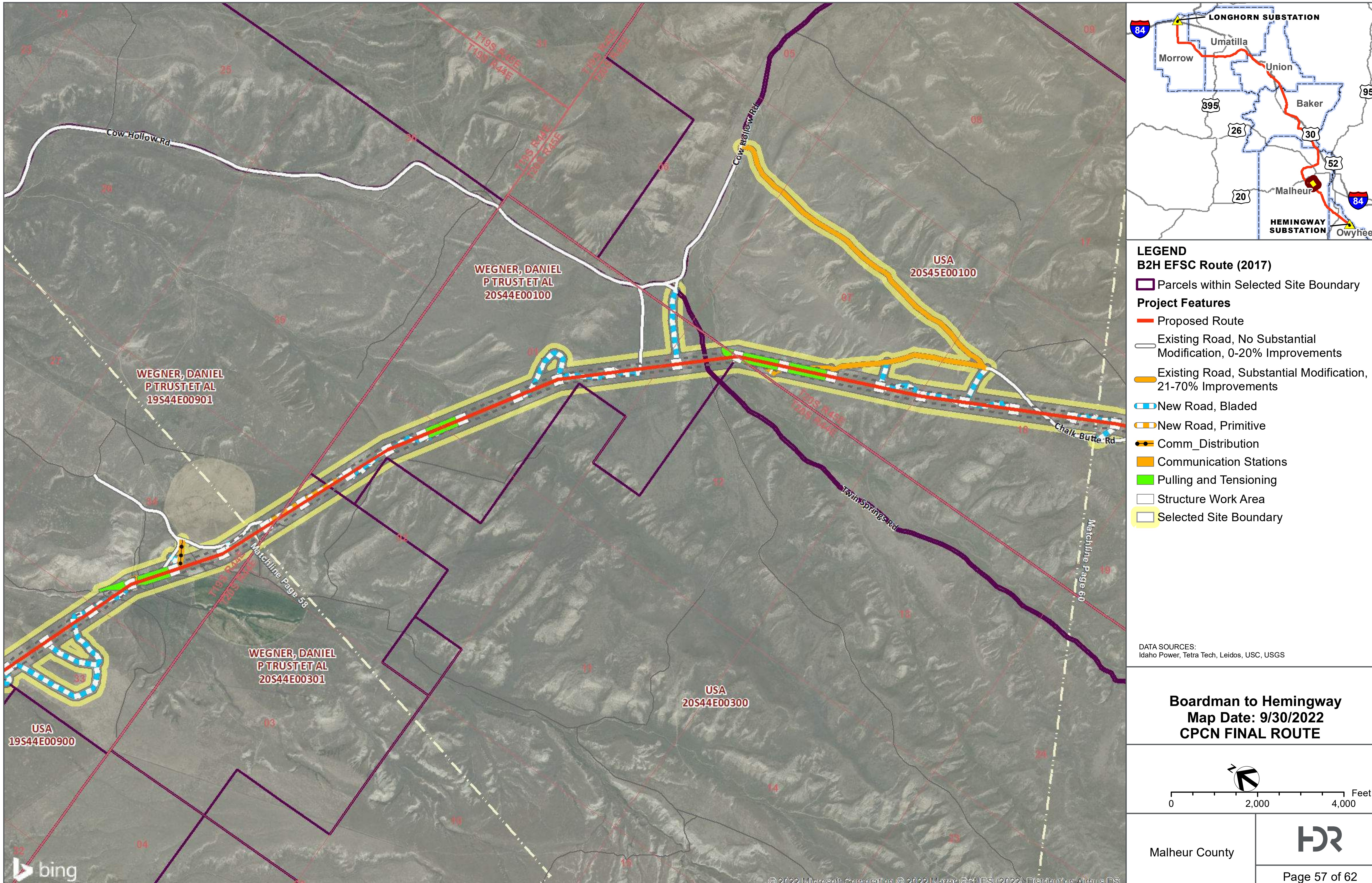


Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

Malheur County



LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
New Road, Bladed
New Road, Primitive
Comm_Distribution
Communication Stations
Pulling and Tensioning
Structure Work Area
Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

0 2,000 4,000 Feet

Malheur County

HDR

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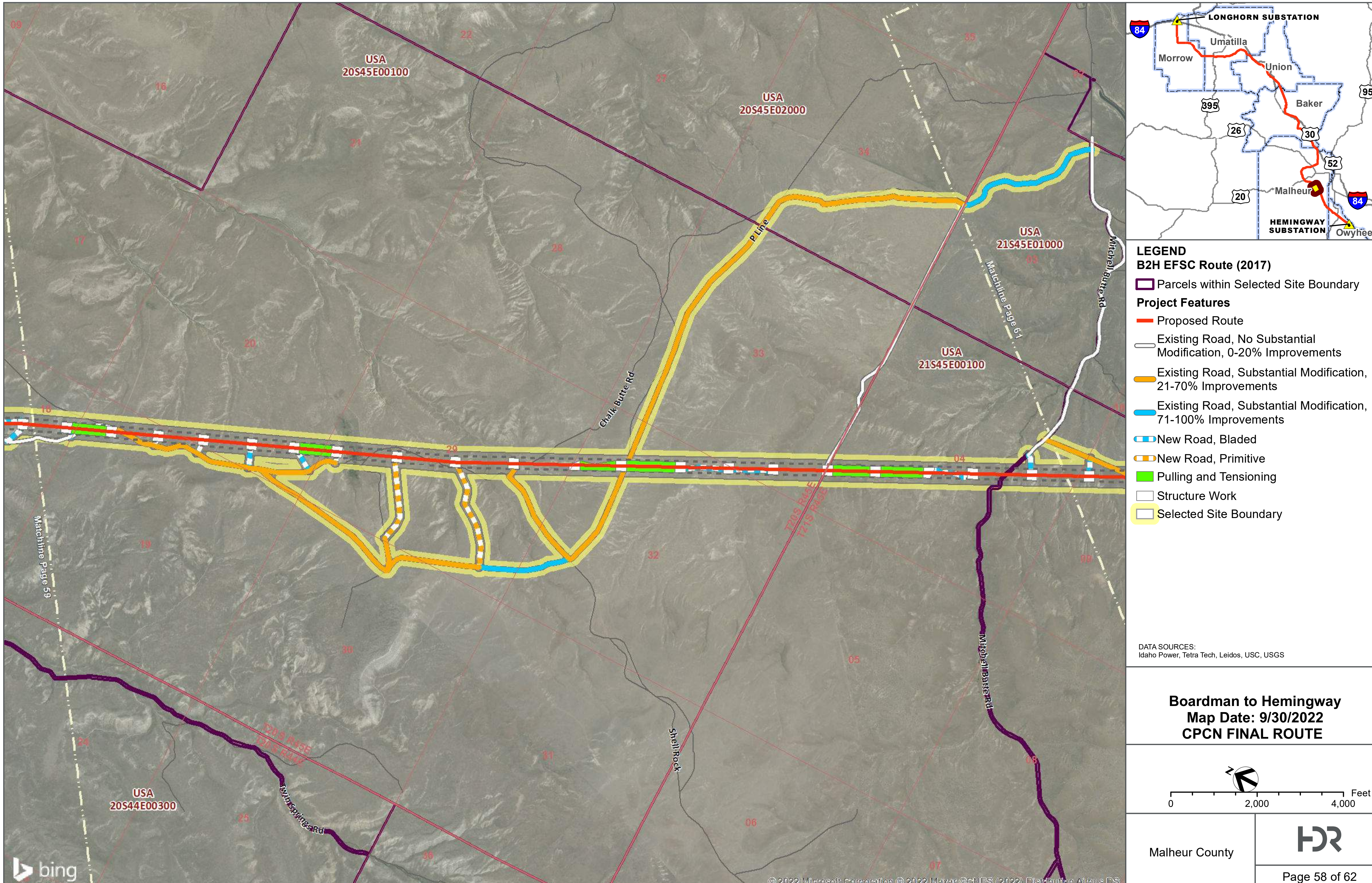

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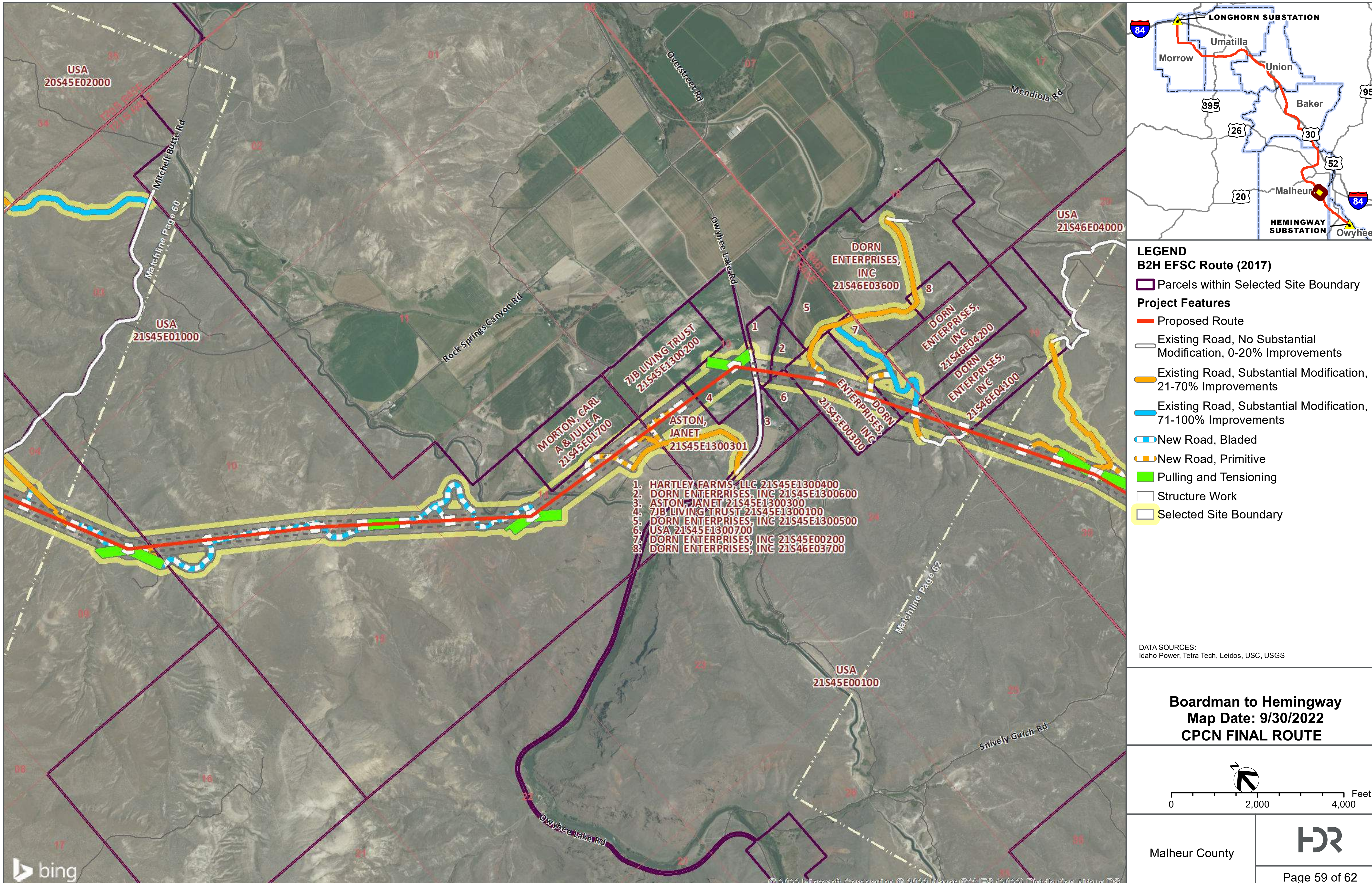


LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Project Features
Proposed Route
Existing Road, No Substantial Modification, 0-20% Improvements
Existing Road, Substantial Modification, 21-70% Improvements
Existing Road, Substantial Modification, 71-100% Improvements
New Road, Bladed
New Road, Primitive
Pulling and Tensioning
Structure Work
Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

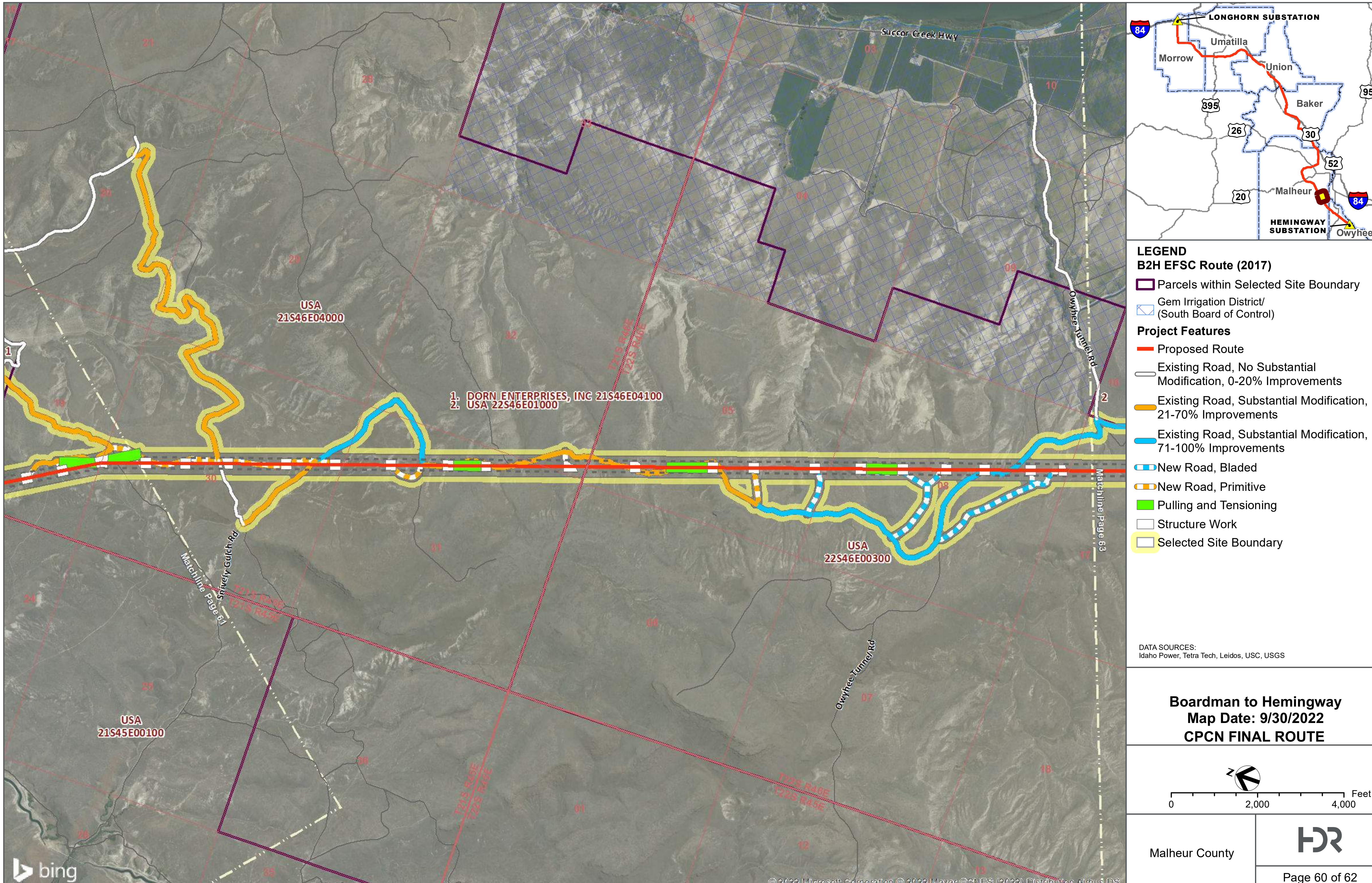
Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

0 2,000 4,000 Feet

Malheur County

HDR

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022



LEGEND

B2H EFSC Route (2017)

- Parcels within Selected Site Boundary
- Gem Irrigation District/ (South Board of Control)

Project Features

- Proposed Route
- Existing Road, No Substantial Modification, 0-20% Improvements
- Existing Road, Substantial Modification, 21-70% Improvements
- Existing Road, Substantial Modification, 71-100% Improvements
- New Road, Bladed
- New Road, Primitive
- Pulling and Tensioning
- Structure Work
- Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

0 2,000 4,000 Feet

Malheur County

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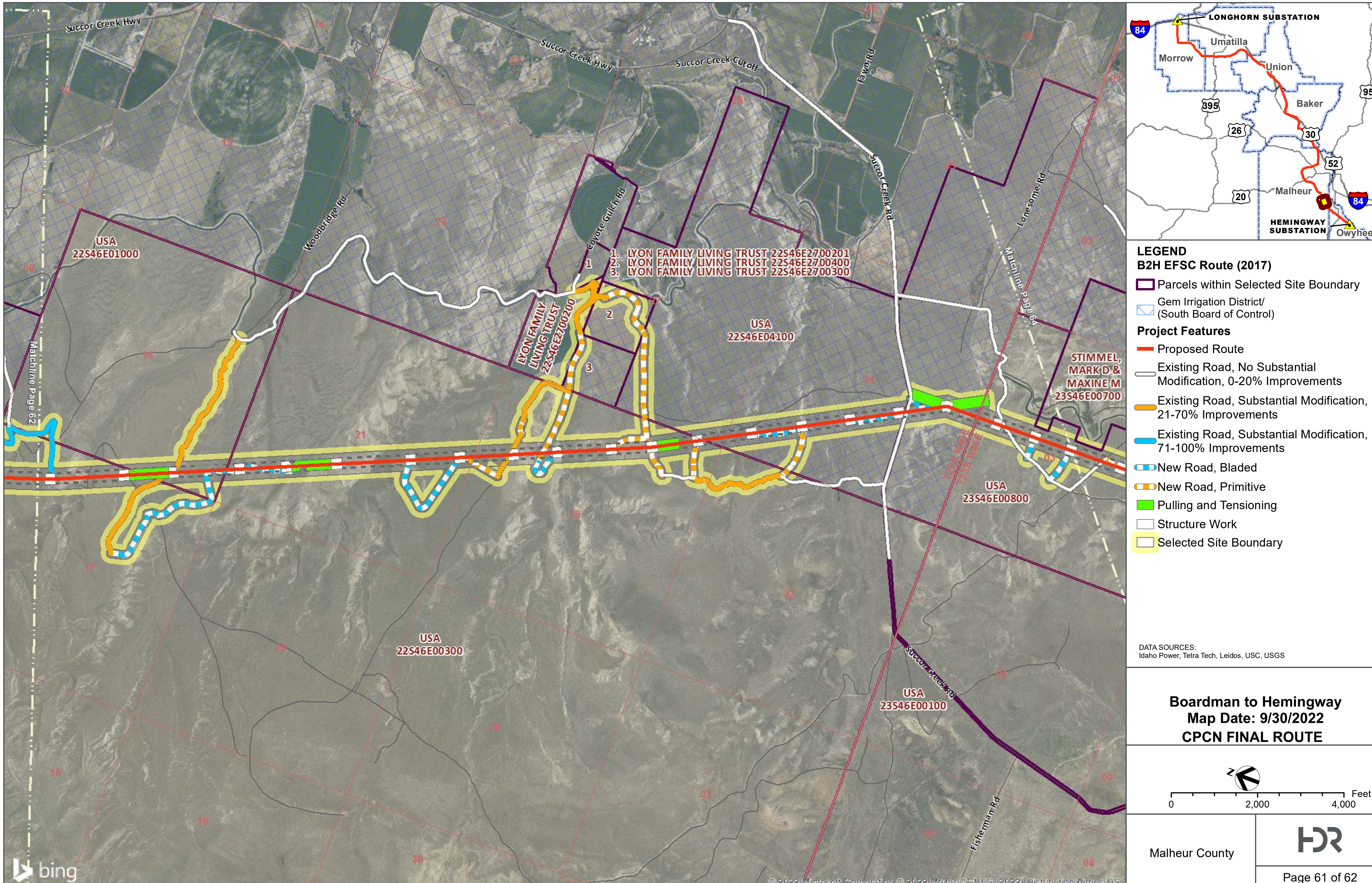

LEGEND

B2H EFSC Route (2017)

- Parcels within Selected Site Boundary
- Gem Irrigation District/ (South Board of Control)

Project Features

- Proposed Route
- Existing Road, No Substantial Modification, 0-20% Improvements
- Existing Road, Substantial Modification, 21-70% Improvements
- Existing Road, Substantial Modification, 71-100% Improvements
- New Road, Bladed
- New Road, Primitive
- Pulling and Tensioning
- Structure Work
- Selected Site Boundary

DATA SOURCES:
Idaho Power, Tetra Tech, Leidos, USC, USGS

Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

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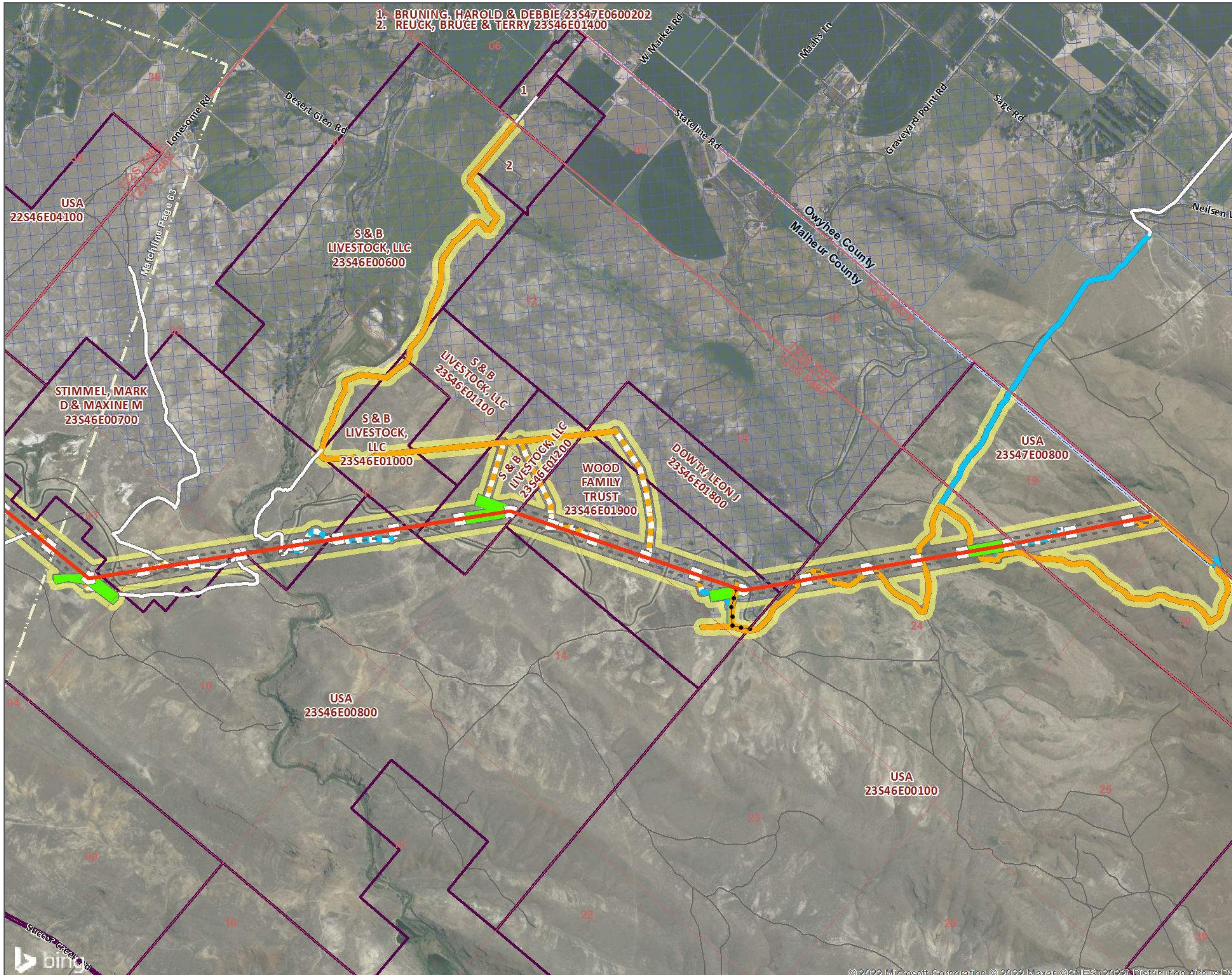
0 2,000 4,000 Feet

Malheur County

HDR

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022



LEGEND
B2H EFSC Route (2017)
Parcels within Selected Site Boundary
Gem Irrigation District/ (South Board of Control)

Project Features
- Proposed Route
- Existing Road, No Substantial Modification, 0-20% Improvements
- Existing Road, Substantial Modification, 21-70% Improvements
- Existing Road, Substantial Modification, 71-100% Improvements
- New Road, Bladed
- New Road, Primitive
- Comm_Distribution
- Communication Stations
- Pulling and Tensioning
- Structure Work
- Selected Site Boundary

DATA SOURCES:
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Boardman to Hemingway
Map Date: 9/30/2022
CPCN FINAL ROUTE

0 2,000 4,000 Feet

Malheur County

DOCUMENT: Q:\IDAHOPOWER\B2H\WORK_IN_PROGRESS\ARCHIVE\EXPORT\20220929_TO_JOES_2017PARCELSXSITEBNDRY_XLS\B2H_SBSELECT_PARCELS.MXD MAP DATE: 9/30/2022

BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON

Docket PCN 5

In the Matter of

IDAHO POWER COMPANY'S
PETITION FOR CERTIFICATE OF PUBLIC CONVENIENCE
AND NECESSITY

Attachment 11

Opinion on Authority Letter

September 30, 2022

Brian Buckham
Senior Vice President and General Counsel
1221 W. Idaho Street
Boise, Idaho 83702
BBuckham@idahopower.com

August 6, 2018

Oregon Department of Energy
550 Capitol St. NE, 1st Floor
Salem, Oregon 97301

Re: Opinion on Authority
Boardman to Hemingway Transmission Line Project

To Whom It May Concern:

I am the Senior Vice President and General Counsel of Idaho Power Company ("Idaho Power"). In such capacity and in rendering the opinion set forth in this letter, I have reviewed or supervised the review of the following documents: (1) Mortgage and Deed of Trust, dated as of October 1, 1937, between Idaho Power and Deutsche Bank Trust Company Americas (formerly known as Bankers Trust Company), as Trustee (the "Indenture"); (2) Supplemental Indentures numbered First through Forty-Eighth to the Indenture; (3) the Restated Articles of Incorporation of Idaho Power, and all amendments, designations, and share exchanges related thereto (the "Articles"); (4) Amended Bylaws of Idaho Power, amended on November 15, 2007 and presently in effect (the "Bylaws"), which, together with the Articles, contain all material covenants pertaining to common stock of Idaho Power; (5) Credit Agreement, dated November 6, 2015, among Idaho Power, various lenders, Wells Fargo Bank, National Association, as administrative agent, swingline lender, and LC issuer, JPMorgan Chase Bank, N.A., as syndication agent and LC issuer, KeyBank National Association and Union Bank, N.A., as documentation agents, and Wells Fargo Securities, LLC, J.P. Morgan Securities Inc., Keybanc Capital Markets, and MUFG Union Bank, N.A. as joint lead arrangers and joint book runners; (6) such other similar agreements that are material to Idaho Power and relate to currently outstanding or available financing arrangements for Idaho Power; (7) such minutes, resolutions, and actions by consent of the board of directors of Idaho Power as were related to the foregoing items (1) through (6) and necessary for the rendering of this opinion; (8) and a certificate of existence of Idaho Power, issued by the Secretary of State of the State of Idaho on August 6, 2018.

The documents referenced in (1) through (6) above are referred to as the "Finance Governing Instruments." I have also examined such other documents and have made examination of law as I have deemed necessary to enable the rendering of the opinion expressed below.

Based upon the foregoing and to the best of my knowledge, I am of the opinion that, subject to Idaho Power's meeting all applicable federal, state, and local laws and regulations, Idaho Power has the authority to construct and operate the Boardman-to-Hemingway Transmission Line that Idaho Power proposes in the Application without conflicting with or resulting in the violation of the Finance Governing Instruments.

This opinion is limited to the matters stated herein and no opinion is implied or may be inferred beyond the matters expressly stated. This opinion is rendered pursuant to, and shall be deemed limited in scope to, the matters required by OAR 345-021-001O(l)(m)(A). Accordingly, I express no opinion as to the applicability of any federal, state, or local laws or regulations to construction and operation of the project contemplated by the Application or as to the effect of the foregoing laws on such construction and operation. This opinion is rendered solely as of the date hereof, and I assume no obligation to update or supplement this opinion to reflect any actions or events subsequent to the date hereof.

This opinion is being furnished to you solely for your benefit and only with respect to the transaction contemplated by the Application. Accordingly, it may not be relied upon for any other purpose or by any other person, firm, or entity for any purpose, without, in each instance, my prior written consent.

Sincerely,

Brian Buckham

BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON

Docket PCN 5

In the Matter of

IDAHO POWER COMPANY'S
PETITION FOR CERTIFICATE OF PUBLIC CONVENIENCE
AND NECESSITY

Attachment 12

Wells Fargo Financial Assurance Letter

September 30, 2022

WELLS FARGO

Corporate Banking Group
Energy Power & Utilities
90 S. 7th Street
Minneapolis, MN 55402

wellsfargo.com

August 14, 2018

Mr. Steven R. Keen
Idaho Power Company
1221 W. Idaho Street
Boise, Idaho 83702

Re: Boardman-to-Hemingway Transmission Project – Financial Assurance Requirements Under EFSC Process

Mr. Keen:

Wells Fargo Bank, National Association ("Wells Fargo Bank" and together with its affiliates, "Wells Fargo") has a long standing business relationship with Idaho Power Company ("Idaho Power"). Wells Fargo has acted as a joint book-runner for Idaho Power in the arrangement of senior secured debt and participated as a lender to Idaho Power under various credit agreements, including Idaho Power's current $300 million syndicated credit agreement, under which Wells Fargo Bank also acts as the administrative agent on behalf of all the lenders under the credit facility.

Based upon Idaho Power's current credit ratings, profile, and information we have as of the date hereof, and subject to acceptable pricing, terms, and requisite internal approvals, and assuming no market disruption, Wells Fargo confirms to you that it would be highly interested in arranging (as administrative agent under the existing credit facility or otherwise), and believes it would be successful at arranging, a syndicated letter of credit in an amount up to $141 million for a period not to exceed three years (the "LC Facility") for the purpose of ensuring Idaho Power's obligation that the site of the Boardman-to-Hemingway transmission project be restored to a useful and non-hazardous condition.

This letter is for informational purposes only. This letter does not constitute or give rise to (i) any legal obligation on the Wells Fargo, or any of its affiliates, to arrange, underwrite or provide, or commit to arrange, underwrite or provide, the LC Facility or any other financings; or (ii) any representation or warranties in respect of any of the foregoing. In addition, such obligations or liabilities would arise only under separate written agreements in form and substance satisfactory to Wells Fargo in its sole discretion.

This letter shall be governed by and construed in accordance with New York law.

Should you have any questions or require any clarification, please do not hesitate to contact any of the Wells Fargo Team.

Sincerely,

Wells Fargo Bank, National Association

Michael McDuffie

Wells Fargo Securities, LLC

Together we'll go far

BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON

Docket PCN 5

In the Matter of

IDAHO POWER COMPANY'S
PETITION FOR CERTIFICATE OF PUBLIC CONVENIENCE
AND NECESSITY

Attachment 13

Idaho Power's 2021 IRP
Appendix A Sales and Load Forecast

September 30, 2022

IDAHO POWER
An IDACORP Company

IRP
INTEGRATED RESOURCE PLAN

APPENDIX A: SALES & LOAD FORECAST

SAFE HARBOR STATEMENT

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INTRODUCTION

Idaho Power has prepared *Appendix A—Sales and Load Forecast* as part of the *2021 Integrated Resource Plan* (IRP). Appendix A includes details on the energy sales and load forecast of future demand for electricity within the company's service area. The above-mentioned forecast covers a 20-year period from 2021 through 2040.

This appendix describes the development of the anticipated monthly sales forecast.
The forecast is Idaho Power's estimate of the most probable outcome for sales growth during the 20-year planning period. In addition, to account for inherent uncertainty in the forecast, additional forecast cases are prepared to test ranges of variability to the anticipated case.

Economic and demographic (non-weather-related) assumptions are modified to create scenarios for a low and a high economic-related case. By holding weather variability constant, these forecasts test the assumptions of the anticipated case economic/demographic variables by applying historically based parameters of growth on both the low and high side of the economic determinants of the anticipated case forecast.

Economic data in the forecast models is primarily sourced from Moody's Analytics and Woods & Poole Economics. The national, state, metropolitan statistical area (MSA), and county economic and demographic projections are tailored to Idaho Power's service area using an in-house historic economic database. Specific demographic projections are also developed for the service area from national and local census data. Additional data sources used to substantiate said economic data include, but are not limited to, the Idaho Department of Labor, Construction Monitor, and Federal Reserve economic databases.

As economic growth assumptions influence several classes of service growth rates it is important to review several key components. The number of households in Idaho is projected to grow at an annual rate of 2% during the forecast period. The growth in the number of households within individual counties in Idaho Power's service area is projected to grow faster than the remainder of the state over the planning period. Similarly, the number of households in the Boise–Nampa MSA is projected to grow faster than the state of Idaho as well, at an annual rate of 2.6% during the forecast period. The Boise MSA (or the Treasure Valley) is an area that encompasses Ada, Boise, Canyon, Gem, and Owyhee counties in southwestern Idaho. In addition to the number of households, incomes, employment, economic output, and real retail electricity prices are used to develop load projections.

Scenarios of weather-related influence on potential ranges of the anticipated forecast are tested utilizing a probabilistic distribution of normal weather (temperature and precipitation) applied to the weather assumptions in the anticipated case. This provides a comparative range of outcome that isolates long-term sustained weather influences on the forecast.

The forecast of the anticipated scenario shows, Idaho Power's system load is forecast to increase to 2,482 average megawatts (aMW) by 2040 from 1,895 aMW in 2021, representing an average yearly growth rate of 1.4% over the 20-year planning period (2021–2040). A similar annual average growth rate in system load is reflected in various weather-related scenarios. From an annual peak-hour demand perspective, the anticipated case of the peak demand forecast will grow to 4,700 megawatts (MW) in 2040 from the all-time system peak of 3,751 MW that occurred on Wednesday, June 30, 2021, at 5 p.m. Idaho Power's system peak increases at an average growth rate of 1.4% per year over the 20-year planning period (2021–2040) under this case. Over this same term, the number of Idaho Power active retail customers is expected to increase from the December 2020 level of 586,071 customers to nearly 851,849 customers by year-end 2040.

Beyond the weather, climate, economic and demographic assumptions used to drive the anticipated case forecast scenario, several additional assumptions were incorporated into the forecasts of the residential, commercial, industrial, and irrigation sectors.

Some examples include conservation influences on the load forecast, including Idaho Power energy efficiency demand side management (DSM) programs, statutory programs, and non-programmatic trends in conservation. These influences are included in the load forecasts. Idaho Power DSM programs are described in detail in Idaho Power's *Demand-Side Management 2020 Annual Report*, which is incorporated into this IRP document as Appendix B. Idaho Power also recognizes the impact of on-site generation and electric vehicles in its service territory and does include the energy reduction or addition in the long-term sales and load forecast due to their impact. Further discussions of these assumptions are presented in the appropriate section.

Outside of weather, potential primary risks during the 20-year forecast horizon include major shifts in the electric utility industry (e.g., state and federal regulations and varying electricity prices) which could influence the load forecast. In addition, the price and volatility of substitute fuels, such as natural gas, may also impact future demand for electricity. The uncertainty associated with such changes is reflected in the economic high and low load growth scenarios described previously. The alternative sales and load scenarios in *Appendix A—Sales and Load Forecast* were prepared under the assumption that Idaho Power's geographic service area remains unchanged during the planning period.

Data describing the historical and projected figures for the sales and load forecast are presented in Appendix A1 of this report.

2021 IRP SALES AND LOAD FORECAST

Average Load

The economic and demographic variables driving the 2021 forecast have the impact of increasing current annual sales levels throughout the planning period. The extended business cycle recovery process after the Great Recession in 2008 for the national and service area economy muted load growth post-recession through 2011. However, in 2012, the extended recovery process was evident, and on-balance stronger growth was exhibited in most economic drivers relative to post Great Recession history. From that point, the global pandemic recession in 2020 had profound effects across the national and global economy. For the company, residential sales increased approximately 5% in 2020 and into 2021. This growth is attributable to both work-from-home edicts as well as continued strong in-migration trends.
Negative energy use was initially exhibited by the commercial and industrial classes but have since stabilized and, overall, rebounded quickly. Irrigation sales were mostly unaffected by the pandemic. It is expected that economic conditions return to long-term fundamentals during the 2021 IRP forecast term. COVID-19 impacts are further discussed in the individual class sections below. Additional significant factors and considerations that influenced the outcome of the 2021 IRP load forecast include the following:

- Weather plays a primary role in impacting the load forecast on a monthly and seasonal basis. In the anticipated case load forecast of energy and peak-hour demand, Idaho Power assumes average temperatures and precipitation over a 30-year meteorological measurement period or defined as normal climatology. Probabilistic variations of weather are also analyzed.
- The economic forecast used for the 2021 IRP reflects the continued expansion of the Idaho economy in the near-term and reversion to the long-term trend of the service area economy. Customer growth was at a near standstill until 2012, but since then acceleration of net migration and business investment has resulted in renewed positive activity. The state of Idaho had the highest residential population growth rate of any state in the United States over the past 5 years (ending 2020). Customer additions experienced prior to the housing bubble are expected to continue.
- Conservation impacts, including DSM energy efficiency programs, codes, and standards, and other naturally occurring efficiencies are integrated into the sales forecast. These impacts are expected to continue to erode use per customer over much of the forecast period. Impacts of demand response programs (on peak) are accounted for in the load and resource balance analysis within supply-side planning (i.e., demand response is treated as a supply-side peaking resource). The amount of committed and implemented DSM programs for each month of the planning period is

shown in the load and resource balance in *Appendix C—Technical Appendix*. Additional impacts from on-site generation customers and electric vehicles are included as well.

- Although interest from large customers has been robust, there is some uncertainty associated with these industrial and special contract customers due to the number of parties that contact Idaho Power expressing interest in locating operations within Idaho Power's service area, typically with an uncertain magnitude of the energy and peak-demand requirements. The anticipated load forecast reflects only those industrial customers that have made a sufficient and significant binding investment and/or interest indicating a commitment of the highest probability of locating in the service area. The large numbers of prospective businesses that have indicated some interest in locating in Idaho Power's service area but have not made sufficient commitments are not included in the anticipated sales and load forecast.
- The electricity price forecast used to prepare the sales and load forecast in the 2021 IRP reflects the additional plant investment and variable costs of integrating the resources identified in the 2019 IRP preferred portfolio. When compared to the electricity price forecast used to prepare the 2019 IRP sales and load forecast, the 2021 IRP price forecast yields lower future prices. The retail prices are mostly lower throughout the planning period which can impact the sales forecast, a consequence of the inverse relationship between electricity prices and electricity demand.
- As discussed above, the response to the novel corona virus influenced electric usage behavior across the major rate classes. Discernably, these impacts tended to balance one another; e.g., increased residential consumption due to work-from-home behavior was offset by decreased use from office and other commercial facilities. While these impacts continue to play out in decreasing importance, the impact on the long-term forecast horizon is essentially inconsequential.

Peak-Hour Demands

Average loads, as discussed in the preceding section, are an integral component to the load forecast, as is the impact of the peak-hour demands on the system. Like the sales forecast discussed in the preceding section, the peak models incorporate several peak forecast scenarios based on historical probabilities of peak day temperatures at the 50th, 90th, and 95th-percentiles of occurrence for each month of the year. The peak-hour demands (peaks) are forecasted separately using regressions that are expressed as a function of the sales (average load) forecast as well as the impact of peak-day temperatures, more discussion is provided in forthcoming sections.

The peak forecast results and comparisons with previous forecasts differ for many reasons that include the following:

- The all-time system summer peak demand was 3,751 MW, recorded on Wednesday, June 30, 2021, at 7 p.m. The previous all-time system summer peak demand, adjusted for demand response, was 3,437 MW, recorded on Friday, July 2, 2013, at 5 p.m. Idaho Power's winter peak-hour load record is 2,527 MW, recorded on January 6, 2017, at 9 a.m. and matched the previous record peak dated December 10, 2009, at 8 a.m.
- The peak model develops peak-scenario impacts based on historical probabilities of peak day temperatures at the 50th, 90th, and 95th-percentiles of occurrence for each month of the year. These average peak-day temperature drivers are calculated over the 1991 to 2020 time period (the most recent 30 years).
- The 2021 IRP peak-demand forecast considers the impact of the current actualized committed and implemented energy efficiency DSM programs on peak demand.

OVERVIEW OF THE FORECAST AND SCENARIOS

The sales and load forecast are constructed by developing a separate energy forecast for each of the major customer classes: residential, commercial, irrigation, industrial, and special contracts. In conjunction with this load (or sales) forecast, an hourly peak-load (peak) forecast was prepared. In addition, several probability cases were developed for the energy and peak forecasts. Assumptions for each of the individual categories, the peak hour impacts, and probabilistic case methodologies are described in greater detail in the following sections.

Forecast Probabilities

Load Forecasts Based on Weather Variability

The future demand for electricity by customers in Idaho Power's service area is represented by three load forecasts reflecting a range of load uncertainty due to weather. The anticipated average load forecast represents the most probable projection of system load growth during the planning period and is based on the most recent national, state, MSA, and county economic forecasts and the resulting derived economic forecast for Idaho Power's service area.

The anticipated average load forecast assumes median temperatures and median precipitation (i.e., there is a 50% chance loads will be higher or lower than the anticipated loads due to colder-than-median or hotter-than-median temperatures or wetter-than-median or drier-than-median precipitation). Since actual loads can vary significantly depending on weather conditions, alternative scenarios were developed that address load variability due to varying weather conditions.

Illustratively, Idaho Power's maximum annual average load occurs when the highest recorded levels of heating degree days (HDD) are assumed in winter and the highest recorded levels of cooling and growing degree days (CDD and GDD) combined with the lowest recorded level of precipitation are assumed in summer. Conversely, the minimum annual average load occurs when the opposite of what is described above takes place. In the 70^{th}-percentile residential and commercial load forecasts, temperatures in each month were assumed to be at the 70^{th}-percentile of HDD in wintertime and at the 70^{th}-percentile of CDD in summertime. In the 70^{th}-percentile irrigation load forecast, GDD were assumed to be at the 70^{th}-percentile and precipitation at the 30^{th}-percentile, reflecting drier-than-median weather. The 90^{th}-percentile load forecast was similarly constructed.

For example, the median HDD in December from 1991 to 2020 (the most recent 30 years) was 1,024 at the Boise Weather Service office. The 70^{th}-percentile HDD is 1,048 and would be exceeded in 3 out of 10 years. The 90^{th}-percentile HDD is 1,130 and would be exceeded in 1 out of 10 years. As an example, for a single month, the near 100^{th}-percentile HDD (the coldest December over the 30 years) is 1,284, which occurred in December 2016. This same concept was applied in each month throughout the year for the weather-sensitive customer classes: residential, commercial, and irrigation.

Since Idaho Power loads are highly dependent on weather, and the development of the above mentioned two scenarios allows the careful examination of load variability and how it may impact future resource requirements, it is important to understand that the probabilities associated with these forecasts apply to each month. This assumes temperatures and precipitation would maintain at the 70th-percentile or 90th-percentile level continuously, throughout the entire year. Table 1 summarizes the load scenarios prepared for the 2021 IRP.

Table 1. Average load and peak-demand forecast scenarios

Scenario	Weather Probability	Probability of Exceeding	Weather Driver
Forecasts of Average Load			
90th Percentile	90%	1 in 10 years	HDD, CDD, GDD, precipitation
70th Percentile	70%	3 in 10 years	HDD, CDD, GDD, precipitation
Anticipated Case	50%	1 in 2 years	HDD, CDD, GDD, precipitation
Forecasts of Peak Demand			
95th Percentile	95%	1 in 20 years	Peak-day temperatures
90th Percentile	90%	1 in 10 years	Peak-day temperatures
50th Percentile	50%	1 in 2 years	Peak-day temperatures

Results of Idaho Power's weather-related probabilistic system load projections are reported in Table 2 and shown in Figure 1.

Table 2. System load growth (aMW)

Growth	2021	2025	2030	2040	Annual Growth Rate 2021–2040
90th Percentile	2,001	2,197	2,427	2,620	1.4%
70th Percentile	1,941	2,132	2,357	2,541	1.4%
Anticipated Case	1,895	2,082	2,304	2,482	1.4%

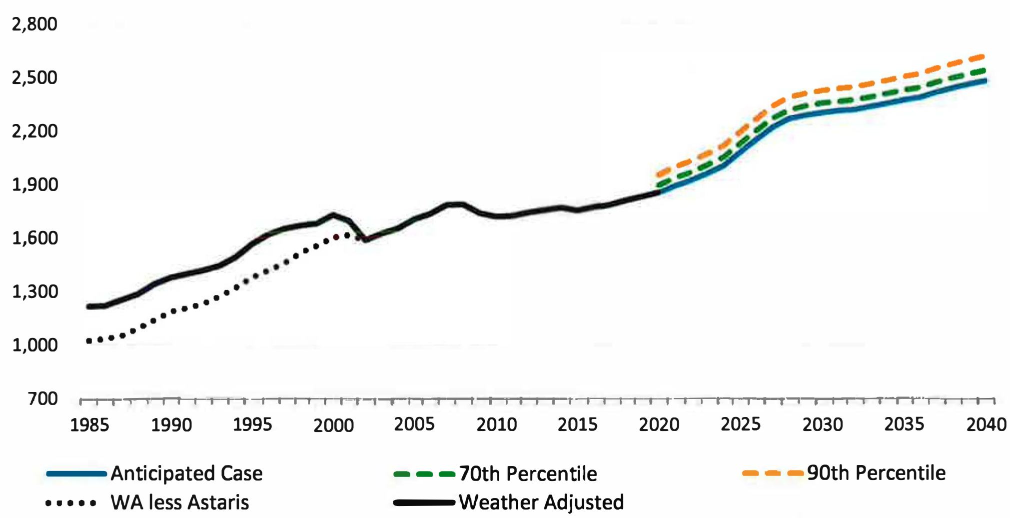

Figure 1. **Forecast system load (aMW)**[1]

Load Forecasts Based on Economic Uncertainty

The anticipated load forecast is based on the most recent economic forecast for Idaho Power's service area and represents Idaho Power's most probable outcome for load growth during the planning period.

To provide risk assessment to economic uncertainty, two additional load forecasts for Idaho Power's service area were prepared based on the anticipated case forecast. The forecasts provide a range of possible load growth rates for the 2021 to 2040 planning period due to high and low economic and demographic conditions. The average growth rates for these high and low growth scenarios were derived from the historical distribution of one-year growth rates over the past 25 years (1996–2020).

Of the three scenarios 1) the anticipated forecast is the median growth path, 2) the standard deviation observed during the historical time is used to estimate the dispersion around the anticipated scenario, and 3) the variation in growth rates will be equivalent to the variation in growth rates observed over the past 25 years (1996–2020).

From the above methodology, two views of probable outcomes form the forecast scenarios—the probability of exceeding and the probability of occurrence—were developed

[1] The Astaris elemental phosphorous plant (previously FMC) was located at the western edge of Pocatello, Idaho. Although no longer a customer of Idaho Power, Astaris had been Idaho Power's largest individual customer and, in some years, averaged nearly 200 aMW each month. In April 2002, the special contract between Astaris and Idaho Power was terminated.

and are reported in Table 3. The probability of exceeding the likelihood the actual load growth will be greater than the projected growth rate in the specified scenario. For example, over the next 20 years, there is a 10% probability the actual growth rate will exceed the growth rate projected in the high scenario; additionally, it can be inferred that for the stated periods there is an 80% probability the actual growth rate will fall between the low and high scenarios.

The second probability estimate, the probability of occurrence, indicates the likelihood the actual growth will be closer to the growth rate specified in that scenario than to the growth rate specified in any other scenario. For example, there is a 26% probability the actual growth rate will be closer to the high scenario than to any other forecast scenario for the entire 20-year planning horizon.

Table 3. Forecast probabilities

Probability of Exceeding				
Scenario	**1-year**	**5-year**	**10-year**	**20-year**
Low Growth	90%	90%	90%	90%
Anticipated Case	50%	50%	50%	50%
High Growth	10%	10%	10%	10%
Probability of Occurrence				
Scenario	**1-year**	**5-year**	**10-year**	**20-year**
Low Growth	26%	26%	26%	26%
Anticipated Case	48%	48%	48%	48%
High Growth	26%	26%	26%	26%

This probabilistic analysis was applied to Idaho Power's system load forecast. Its impact on the system load forecast is the sum of the individual loads of residential, commercial, industrial, and irrigation customers, as well as special contracts (including past sales to Astaris, Inc. [aka FMC]) and on system contracts (including past sales to Raft River Coop and the City of Weiser).

Results of Idaho Power's economic scenario probabilistic system load projections are reported in Table 4 and shown in Figure 2. The anticipated system load-forecast growth rate averages 1.4% per year over the 20-year planning period. The low scenario projects the system load will increase at an average rate of 1.1% per year throughout the forecast period. The high scenario projects a load growth of 1.8% per year. Idaho Power has experienced both the high- and low-growth rates in the past. These forecasts provide a range of projected growth rates that cover approximately 80% of the probable outcomes as measured by Idaho Power's historical experience.

Table 4. System load growth (aMW)

Growth	2021	2025	2030	2040	Annual Growth Rate 2021–2040
Low	1,859	1,991	2,166	2,277	1.1%
Anticipated	1,895	2,082	2,304	2,482	1.4%
High	1,942	2,190	2,461	2,731	1.8%

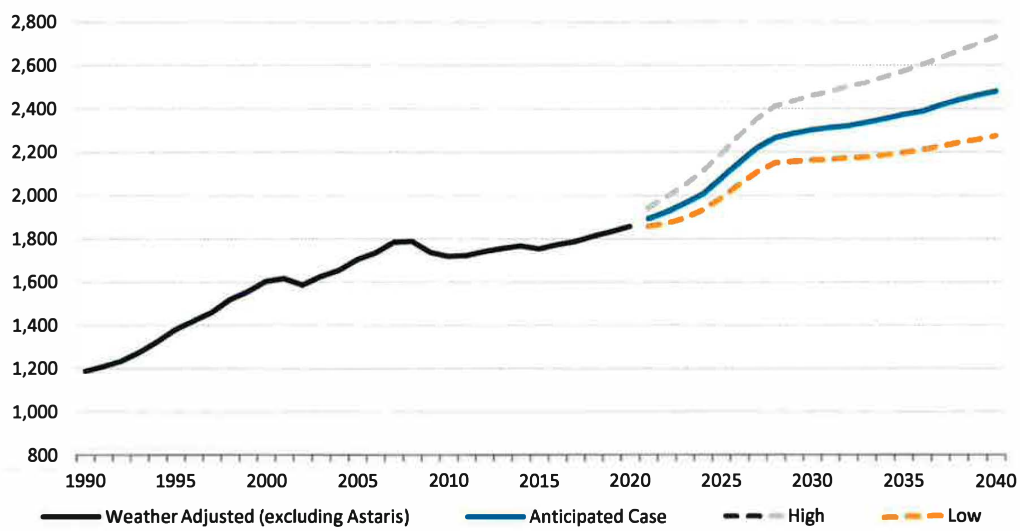

Figure 2. **Forecast system load (aMW)**

COMPANY SYSTEM LOAD

System load is the sum of the individual loads of residential, commercial, industrial, and irrigation customers, as well as special contracts (including past sales to Astaris) and system contracts (including past sales to Raft River and the City of Weiser). The system load excludes all long-term, firm off-system contracts.

The anticipated system load forecast is based on the output of the regression and forecasting models referenced previously and represents Idaho Power's most probable load growth during the planning period. The load growth of the anticipated system forecast averages 1.4% per year from 2021 to 2040. Company system load projections are reported in Table 2 and shown in Figure 1.

In the anticipated forecast, the company system load is expected to increase from 1,895 aMW in 2021 to 2,482 aMW in 2040, an average annual growth rate of 1.4%. In the weather sensitive scenarios, the 70th-percentile and 90th-percentile forecasts, the company system load is expected to increase from 1,941 aMW in 2021 to 2,541 aMW by 2040 and increase from 2,001 aMW in 2021 to 2,620 aMW, respectively. All scenarios have an average growth rate of 1.4% per year over the planning period. In the economic probability scenarios, the company system load is expected to increase in the low case from 1,859 aMW in 2021 to 2,277 aMW in 2040, an average annual growth rate of 1.1% and in the high case from 1,942 aMW to 2,731 aMW, an average annual growth rate of 1.8% (Table 2).

The system load, excluding Astaris (formerly known as FMC), portrays the current underlying general business growth trend within the service area. However, the system load with Astaris is instructive regarding the impact of a loss or gain of a significant large-load customer on system load.

Accompanied by the outlook of economic growth for Idaho Power's service area throughout the forecast period, continued growth in Idaho Power's system load is expected. Total load is made up of system load plus long-term, firm, off-system contracts. Currently, there are no contracts in effect to provide long-term, firm energy off-system.

The composition of system company electricity sales by year is shown in Figure 3. Residential sales are forecast to be about 16% higher in 2040, gaining 0.9 million megawatt-hours (MWh) over 2021. Commercial sales are expected to be 19% higher, or 0.8 million MWh, followed by industrial (35% higher, or 0.9 million additional MWh) and irrigation (12% higher in 2040 than 2021). Additional firm sales are expected to more than triple by 2040, gaining 2.1 million MWh over 2021.

In addition to the above anticipated sales forecast, differing weather probabilities, high and low economic cases, and alternative sales and load cases were developed for analysis within the

2021 IRP. These include high growth within commercial and industrial classification of an additional approximate 250 MW of capacity requirements, high penetration future of building and transportation electrification, and future potential climate change impacts to the load forecast.

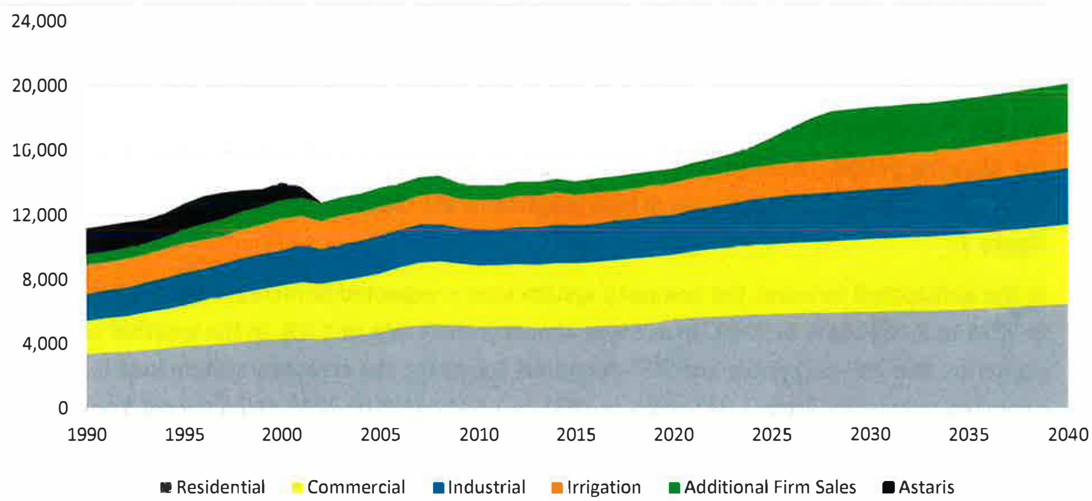

Figure 3. **Composition of system company electricity sales (thousands of MWh)**

COMPANY SYSTEM PEAK

System peak load includes the sum of the coincident peak demands of residential, commercial, industrial, and irrigation customers, as well as special contracts (including Astaris, historically) and on-system contracts (Raft River and the City of Weiser, historically).

Seasonal Peak Forecast

Idaho Power has two peak periods: 1) a winter peak, resulting primarily from space-heating demand that normally occurs in December, January, or February and 2) a larger summer peak that normally occurs in late June, July, or August, which coincides with cooling load and irrigation pumping demand. The summer peak is reflective of the annual peak for the company.

The all-time system summer peak demand was 3,751 MW, recorded on Wednesday, June 30, 2021, at 7 p.m. The previous all-time system summer peak demand, adjusted for demand response, was 3,437 MW, recorded on Friday, July 2, 2013, at 5 p.m. The system summer peak load growth accelerated from 1998 to 2008 as a record number of residential, commercial, and industrial customers were added to the system and air conditioning (A/C) became standard in nearly all new residential homes and new commercial buildings.

In the 95th-percentile forecast, the system summer peak load is expected to increase from 3,771 MW in 2021 to 4,868 MW in 2040. In the 90th-percentile forecast, the system summer peak load is expected to increase from 3,745 MW in 2021 to 4,842 MW in 2040. Finally, in the 50th-percentile, or anticipated case, the system summer peak load increases from 3,603 MW in 2021 to 4,700 MW in 2040. All of which represent an average summer peak growth rate of 1.4% per year over the planning period (Table 5).

Table 5. System summer peak load growth (MW)

Growth	2021	2025	2030	2040	Annual Growth Rate 2021–2040
95th Percentile	3,771	4,071	4,421	4,868	1.4%
90th Percentile	3,745	4,045	4,394	4,842	1.4%
50th Percentile	3,603	3,903	4,252	4,700	1.4%

The three scenarios of projected system summer peak loads are illustrated in Figure 4. Much of the variation in peak load is due to weather conditions. Note that unique economic events have occurred, as an example in the summer of 2001 the summer peak was dampened by a nearly 30% curtailment in irrigation load due to a voluntary load reduction program.

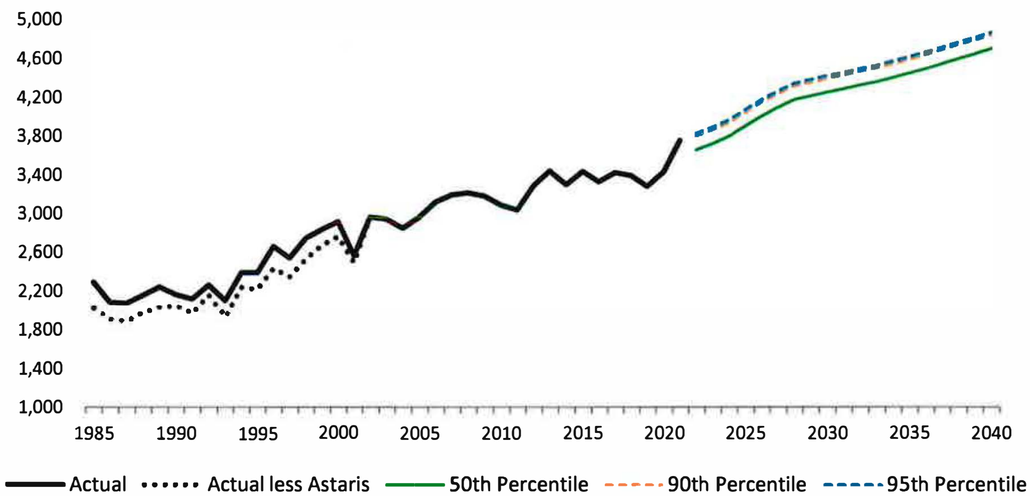

Figure 4. **Forecast system summer peak (MW)**

As of December 31, 2019, the all-time system winter peak demand of 2,527 MW, realized on Thursday, December 10, 2009, at 8 a.m. was matched on January 6, 2017, at 9 a.m. As shown in Figure 5, the historical system winter peak load is much more variable than the summer system peak load. This is because the variability of peak-day temperatures in winter months is greater than the variability of peak-day temperatures in summer months. The wider spread of the winter peak forecast lines in Figure 5 illustrates the higher variability associated with winter peak-day temperatures.

In the 95th-percentile forecast, the system winter peak load is expected to increase from 2,699 MW in 2021 to 3,328 MW in 2040, an average growth rate of 1.1% per year over the planning period. In the 90th-percentile forecast, the system winter peak load is expected to increase from 2,584 MW in 2021 to 3,262 MW in 2040, an average growth rate of 1.2% per year over the planning period. In the 50th-percentile, or anticipated case forecast, the system winter peak load is expected to increase from 2,367 MW in 2021 to 3,132 MW in 2040, an average growth rate of 1.5% per year over the planning period. This data is represented in Table 6. The three scenarios of projected system winter peak load are illustrated in Figure 5.[2]

[2] Idaho Power uses a median peak-day temperature driver in lieu of an average peak-day temperature driver in the 50/50 peak-demand forecast scenario. The median peak-day temperature has a 50% probability of being exceeded. Peak-day temperatures are not normally distributed and can be skewed by one or more extreme observations; therefore, the median temperature better reflects expected temperatures within the context of probabilistic percentiles. The weighted average peak-day temperature drivers are calculated over the 1991 to 2020 time (the most recent 30 years).

Table 6. System winter peak load growth (MW)

Growth	2021	2025	2030	2040	Annual Growth Rate 2021–2040
95th Percentile	2,699	2,918	3,142	3,328	1.1%
90th Percentile	2,584	2,803	3,028	3,262	1.2%
50th Percentile	2,367	2,586	2,878	3,132	1.5%

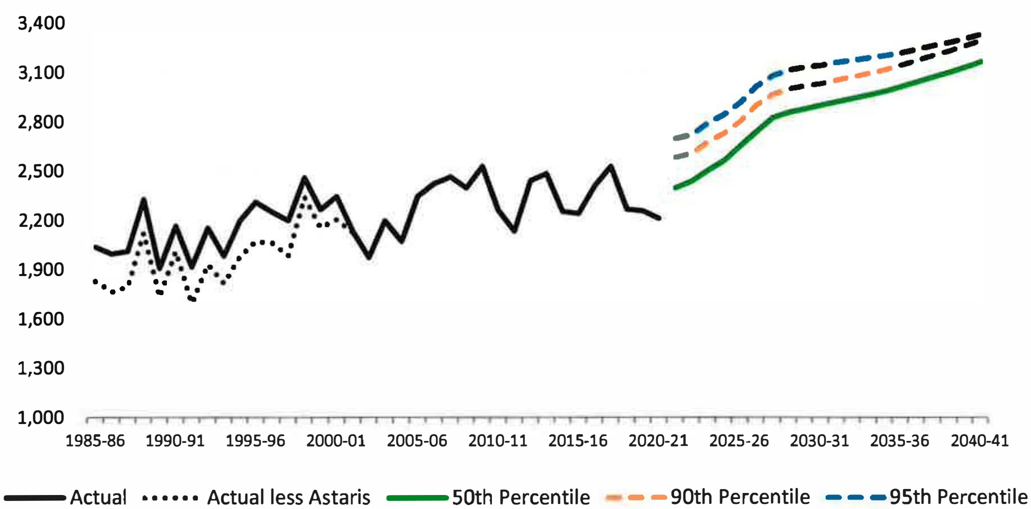

Figure 5. **Forecast system winter peak (MW)**

Combining the historic relationship of summer and winter peaks as depicted in Figure 6, the growth in the summer peak over the past several decades in Idaho Power's service territory, as evidenced by the shift in the most-recent slope lines, has been significantly greater due to the increased presence of urban cooling load in the peak summer months.

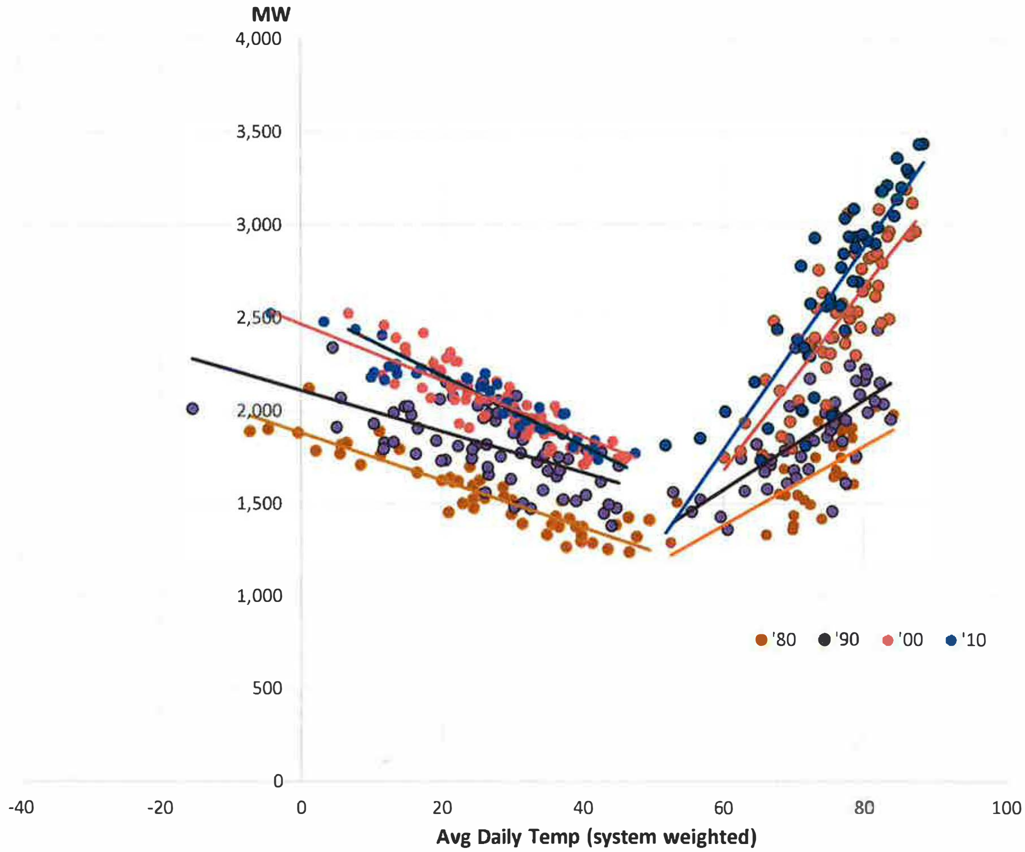

Figure 6. **Idaho Power monthly peaks (MW)**

Note that the 2021 IRP peak-demand forecast model explicitly excludes the impact of demand response programs to establish peak impacts. The exclusion allows for planning for demand response programs and supply-side resources in meeting peak demand without the interference of load intervention on causal variables. Demand response program impacts are accounted for in the IRP load and resource balance and are reflected as a reduction in peak demand.

Peak Model Design

Peak-hour demands are integral components to the company's system planning. Peak-hour demands are forecast using a system of 12 regression equations, one for each month of the year. For most monthly models the regressions are estimated using 25 years of historical data, however, the estimation periods vary. The peak-hour forecasting regressions express system peak-hour demand as a function of calendar sales (stated in average megawatts) as well as the impact of peak-day temperatures, real electricity prices, and in some months precipitation. The contribution to the system peak of the company's three special contract customers is determined independently, using historical coincident peak factors, and then added to determine the system peak.

The forecast of average peak-day temperatures is a key driver of the monthly system peak models. The normal average peak-day temperature drivers are calculated over the 1991 to 2020 period (the most recent 30 years). In addition, the peak model develops peak scenarios based on historical probabilities of peak day temperatures at the 50th, 90th, and 95th percentiles of occurrence for each month of the year.

Note the summertime (June, July, and August) system peak regression models were re-specified to account for the upward trend in weighted average peak-day temperatures over time. The trendlines were fitted to the historical weighted average peak-day temperatures and then projected through the end of the forecast period, the year 2040. These are added as explanatory variables in the summertime regression models. The addition of these variables resulted in models that better fit the actual historical summertime system peaks.

CLASS SALES FORECAST

Residential

The anticipated residential load is forecast to increase from 644 aMW in 2021 to 743 aMW in 2040, an average annual compound growth rate of 0.8%. In the 70th-percentile scenario, the residential load is forecast to increase from 664 aMW in 2021 to 773 aMW in 2040, an average annual compound growth rate of 0.8%, matching the anticipated residential growth rate. The residential load forecasts are reported in Table 7 and shown in Figure 7.

Table 7. Residential load growth (aMW)

Growth	2021	2025	2030	2040	Annual Growth Rate 2021–2040
90th Percentile	691	723	746	812	0.9%
70th Percentile	664	692	712	773	0.8%
Anticipated Case	644	670	687	743	0.8%

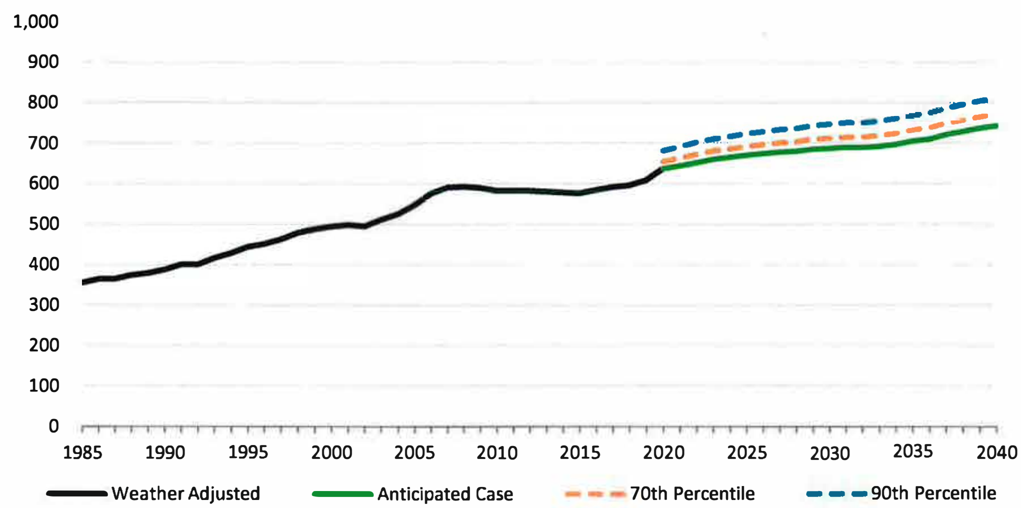

Figure 7. Forecast residential load (aMW)

Sales to residential customers made up 30% of Idaho Power's system sales in 1990 and 37% of system sales in 2020. The number of residential customers is projected to increase to nearly 719,500 by December 2040.

The average sales per residential customer increased to nearly 14,800 kilowatt-hours (kWh) in 1980 before declining to 13,200 kWh in 2001. In 2002, residential use per customer dropped dramatically—over 500 kWh per customer from 2001—the result of significantly higher electricity prices combined with a weak national and service area economy. The reduction in electricity prices in June 2003 and a recovery in the service-area economy caused residential use per customer to stabilize through 2007. However, conservation efforts have placed downward pressure on residential use per customer since that point. This trend is expected to continue, declining at 1.1% per year, as the average sales per residential customer are expected to decrease to approximately 9,100 kWh per year by 2040. Average annual sales per residential customer are shown in Figure 8. Although, it is important to note—as evident in figures 7 and 8—the impacts of the COVID pandemic on residential electricity sales (Figure 7) and residential use-per-customer (Figure 8). Major shifts in early 2020 to working and schooling from home, which required retooling homes with computers and electronics, served to boost residential electricity sales and use-per-customer. Residential sales (weather-adjusted) were 4% to 5% higher in 2020 than 2019. In addition to the overall increase in use per customer, the pandemic accelerated in-migration allowing those searching for affordable housing, a more reasonable cost of living, and ability to work from home to move from larger, more populated metro areas. This impact is fortified by Idaho having the highest population growth rate of any state in the United States over the past 5 years (ending 2019)[3] which continues today, as evidenced by Idaho Power's strong customer growth through year-to-date 2021.

[3] United States Census Bureau Population, Population Change, and Estimated Components of Population Change 2010 to 2019.

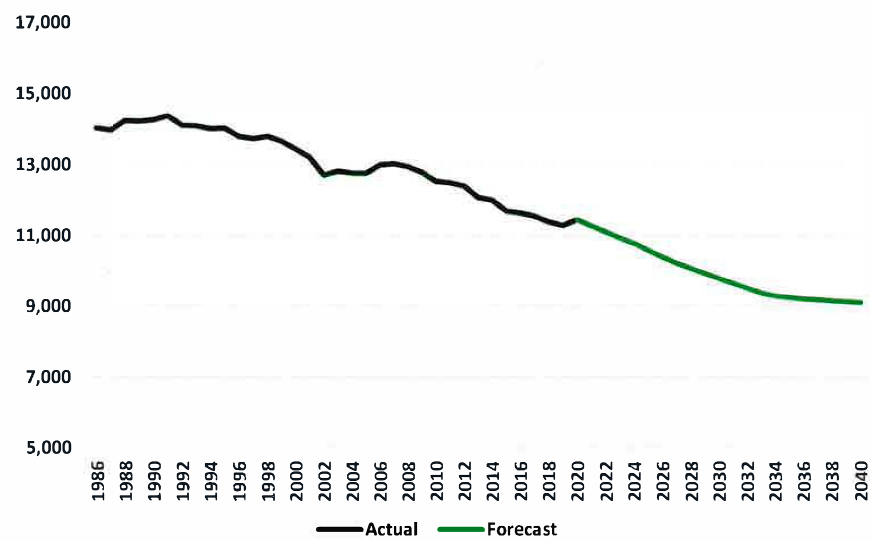

Figure 8. **Forecast residential use per customer (weather-adjusted kWh)**

Residential customer growth in Idaho Power's service area is a function of the number of new service-area households as derived from Moody's Analytics' forecast of county housing stock and demographic data. The residential-customer forecast for 2021 to 2040 shows an average annual growth rate of 1.9% as shown in Figure 9.

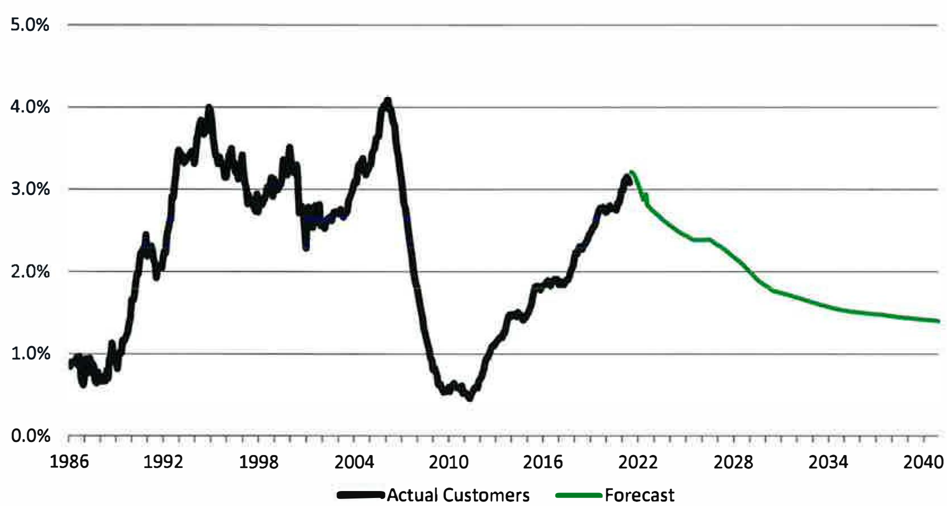

Figure 9. **Residential customer growth rates (12-month change)**

Final sales to residential retail customers can be framed in an equation that considers several factors affecting electricity sales to the residential sector. Residential sales are a function of

HDD (wintertime); CDD (summertime); historic energy efficiency trends in Idaho Power's residential customer base; saturation and replacement cycle of appliances; the number of service-area households; the real price of electricity; and the real price of natural gas to name a few. A general schematic of the forecasting methodology using a statistically adjusted end-use (SAE) forecast model as described above that is used in Idaho Power's forecast residential sales is provided in Figure 10.

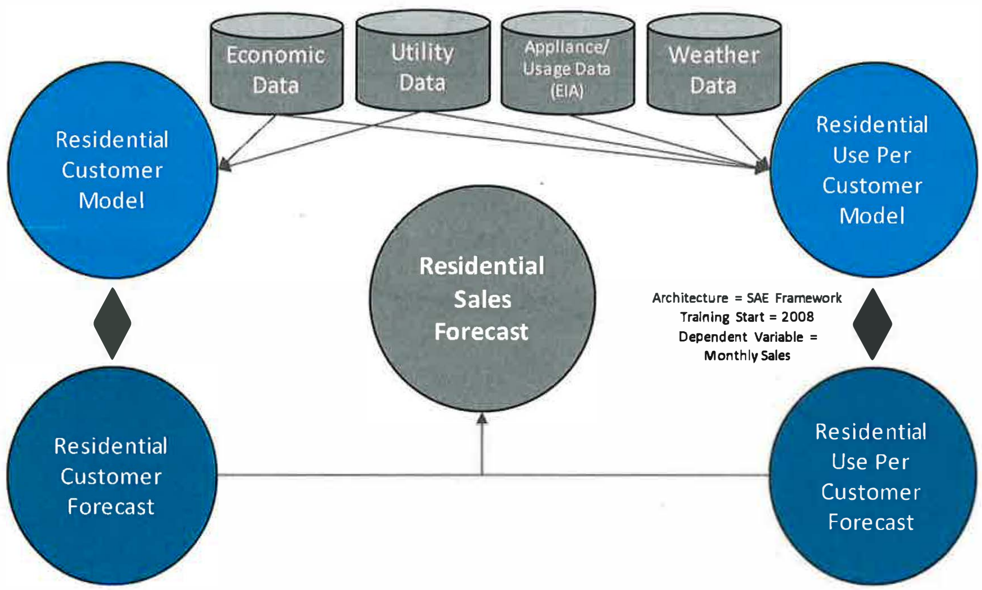

Figure 10. Residential sales forecast methodology framework

Further, there were several instances in the SAE framework where the overall outcomes could benefit from the inclusion of indicator variables. In assessing these and combination thereof, Idaho Power selected the best statistical result across a menu of options using cross validation methods.

Commercial

The commercial category is primarily made up of Idaho Power's small general-service and large general-service customers. Additional customer types associated with this category include small general-service on-site generation, customer energy production net-metering, unmetered general service, street-lighting service, traffic-control signal lighting service, and dusk-to-dawn customer lighting.

Within the anticipated scenario, the commercial load is projected to increase from 475 aMW in 2021 to 564 aMW in 2040 (Table 8). The average annual compound-growth rate of the commercial load in the anticipated scenario is 0.9% during the forecast period. The commercial load in the 70th-percentile scenario is projected to increase from 481 aMW in 2021 to 572 aMW in 2040. The commercial load forecast scenarios are illustrated in Figure 11.

Table 8. Commercial load growth (aMW)

Growth	2021	2025	2030	2040	Annual Growth Rate 2021–2040
90th Percentile	489	515	535	585	0.9%
70th Percentile	481	505	524	572	0.9%
Anticipated Case	475	499	517	564	0.9%

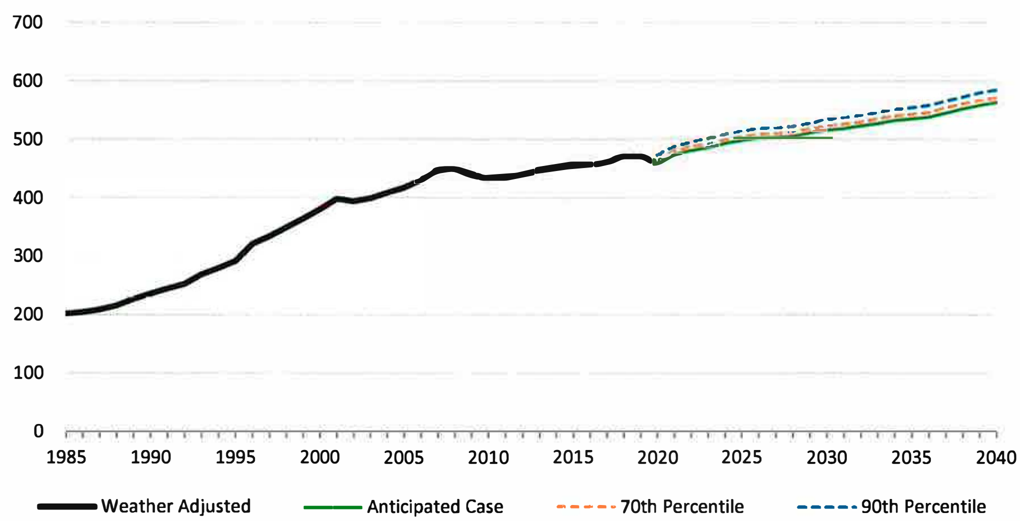

Figure 11. Forecast commercial load (aMW)

With a customer base of over 75,500, the commercial class represents the diversity of the service area economy, ranging from residential subdivision pressurized irrigation to large manufacturers. Due to this diversity in load intensity and use—for analytical purposes—the category is segmented into categories associated with common elements of energy-use influences, such as economic variables (e.g., employment), industry (e.g., manufacturing), and building structure characteristics (e.g., offices). Figure 12 shows the breakdown of the categories and their relative sizes based on 2020 billed energy sales.

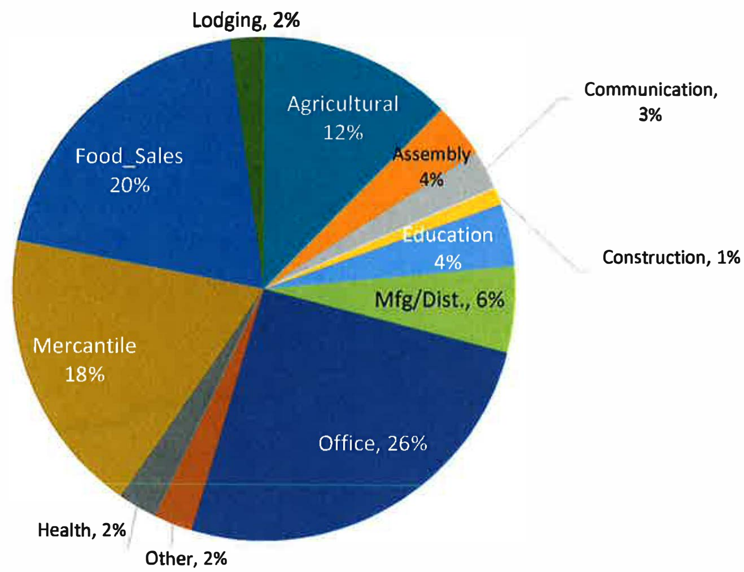

Figure 12. **Commercial building share—energy bills**

As indicated in Figure 12, agricultural-related, food sales, and the retail goods and service providers of the mercantile category represent nearly half of the sector. Recent trends in the sector show that mercantile growth has moderated. This moderation is primarily due to customer consolidation, growth in internet-based sales, energy efficient retrofitting, and new-construction technology implementation (particularly around lighting). Categories showing significant growth over the past 5 years are reflective of the changing profile of economic and demographic growth in the service territory. Residential growth has led to a construction boom that has seen construction energy use grow by 10% per year. Agricultural and manufacturing operations continue to migrate and flourish with growth rates of 2.2% and 2.5% respectively.

The number of commercial customers is expected to increase at an average annual rate of 1.8%, reaching approximately 107,000 customers by December 2040.

In 1990, customers in the commercial category consumed approximately 18% of Idaho Power system sales, growing to 27% by 2020. This share is forecast to remain at the upper end of this range throughout the planning period.

Figure 13 shows historical and forecast average use per customer (UPC) for the entire category. The commercial-use-per-customer metric in Figure 13 represents an aggregated metric for a highly diverse group of customers with significant differences in total energy use per customer, nonetheless it is instructive in aggregate for comparative purposes.

The UPC peaked in 2001 at 67,800 kWh and has declined at approximately 1.1% compounded annually to 2020. The UPC is forecast to decrease at an annual rate of 0.9% over the planning period. For this category, common elements that drive use down include a shift toward service-based over industrial customer dominance, adoption of energy efficiency technology, and electricity prices.

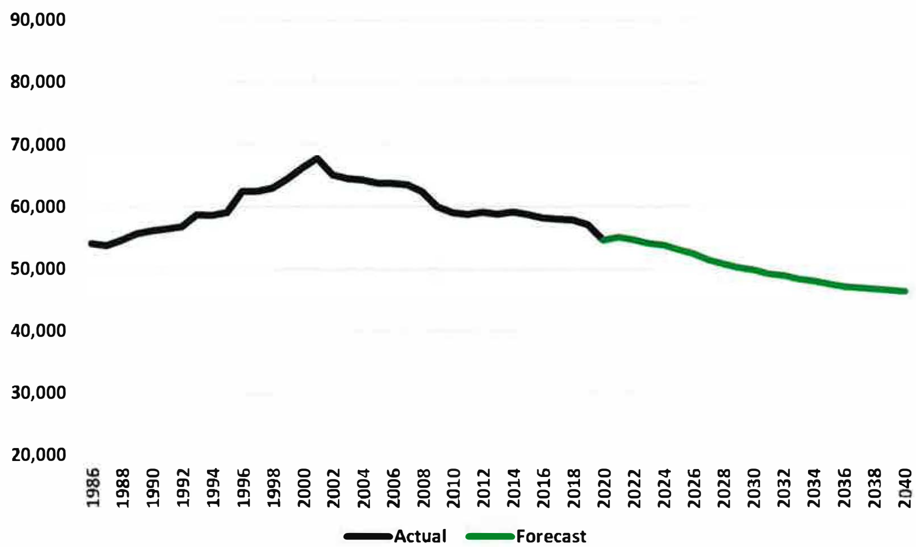

Figure 13. **Forecast commercial use per customer (weather-adjusted kWh)**

Figure 14 shows the diversity in the commercial segment's UPC as well as the trend for these sectors. The figure shows the 2020 UPC for each segment relative to the 2013 UPC. A value greater than 100% indicates the UPC has risen over the period. The figure supports the general decline of the aggregated trend of Figure 13 but highlights differences in energy and economic dynamics within the heterogeneous commercial category not evident in the residential category. The decline in Figure 14 is also significantly exacerbated by the COVID-19 crisis, which saw many commercial customer segments close or significantly limit operations during 2020. The subsequent reduction in energy use during this period varied by segment, however they were concentrated in the service-oriented customers—particularly Education, Office, Lodging, Restaurant, and Mercantile segments. The models and independent analysis have shown a significant and ongoing rebound to normal energy use profiles in 2021 for the commercial sector. The recovery is expected to be complete by the first quarter of 2022.

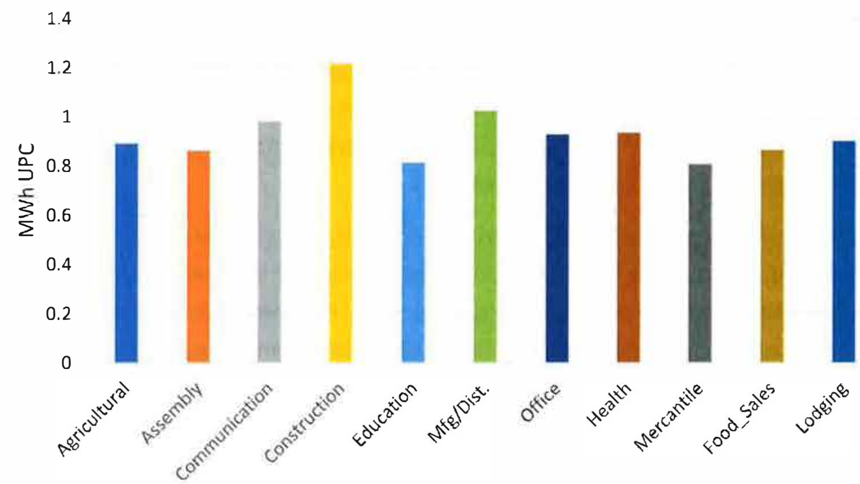

Figure 14. **Commercial categories UPC, 2020 relative to 2013**

Energy efficiency implementation is a large determinant in UPC decline over time. In the commercial sector, the primary DSM technology impact has come from lighting, however manufacturing motors are significant for that sector. Understandably, aggressive DSM measures can reduce a customer's usage to trigger a rate-class change from industrial to commercial class. These shifts are evident in the chart (COVID notwithstanding) with the most aggressive DSM implementation categories of Education and Food Sales. Other influences on UPC include differences in price sensitivity, sensitivity to business cycles and weather, and degree and trends in automation. In addition, category UPC can vary when a customer's total use increases to the point where it must, by tariff rules, migrate to an industrial (Rate 19) category. Tariff migration occurs at the boundary of Schedule 9P (large primary commercial) and Schedule 19 (large industrial). Note that the forecast models aggregate the energy use of these two schedules to mitigate this influence.

The commercial-sales forecast equations consider several varying factors, as informed by the regression models, and vary depending on the category. Typical variables include corporate earnings; government spending; wholesale/retail trade; HDD (wintertime); CDD (summertime); specific industry growth characteristics and outlook; service-area demographics such as households, employment, small business conditions; the real price of electricity; and energy efficiency adoption.

Industrial

The industrial category is comprised of Idaho Power's large power service (Schedule 19) customers requiring monthly metered demands between 1,000 kilowatts (kW) and 20,000 kW. The category name "Industrial" is reflective of load requirements and not necessarily indicative of the industrial nature of the customers' business.

In 1980, Idaho Power had about 112 industrial customers, which represented about 12% of Idaho Power's system sales. By December 2020, the number of industrial customers had risen to 123, representing approximately 17% of system sales. As mentioned earlier in the commercial discussion, customer counts in this tariff class are impacted by migration to and from the commercial class as dictated by the tariff rules. However, customer count growth is primarily illustrative of the positive economic conditions in the service area. Customers with load greater than Schedule 19 ranges are known as special contract customers and are addressed in the Additional Firm Load section of this document.

In the anticipated forecast, industrial load grows from 295 aMW in 2021 to 397 aMW in 2040, an average annual growth rate of 1.6% (Table 9). To a large degree, industrial load variability is not associated with weather conditions as is the case with residential, commercial, and irrigation; therefore, the forecasts in the 70th- and 90th-percentile weather scenarios are identical to the anticipated industrial load scenario. The industrial load forecast is pictured in Figure 15.

Table 9. Industrial load growth (aMW)

Growth	2021	2025	2030	2040	Annual Growth Rate 2021–2040
Anticipated Case	295	332	351	397	1.6%

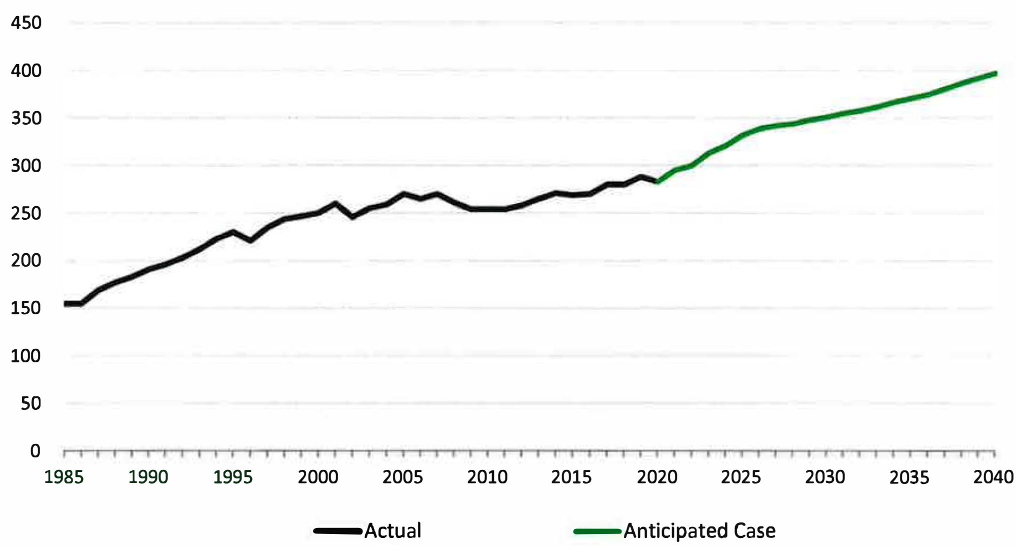

Figure 15. **Forecast industrial load (aMW)**

As discussed previously, the load growth variability is impacted by both economic, non-weather factors, and the impacts of DSM. In developing the forecast, customer-specific DSM implementation is isolated as DSM varies significantly by customer, and the actual energy use is adjusted to remove the impacts of DSM to optimize the causal influence of non-DSM causal variables. The history and forecast of DSM are provided by the DSM specialists within Idaho Power. The economic and other independent variables for the regression models are provided by third-party data providers and internally derived time-series for Idaho Power's service area.

Figure 16 illustrates the 2020 share of each of the categories within the Rate 19 customers. By far, the largest share of electricity was consumed by the food manufacturing sector (38%), followed by dairy (18%) and construction-related (7%). The categorization scheme includes a range of service-providing industrial building types (assembly, lodging, mercantile, warehouse, office, education, and health care). These provide the basis for capturing, modeling, and forecasting the shifting economic landscape that influences industrial category electricity sales.

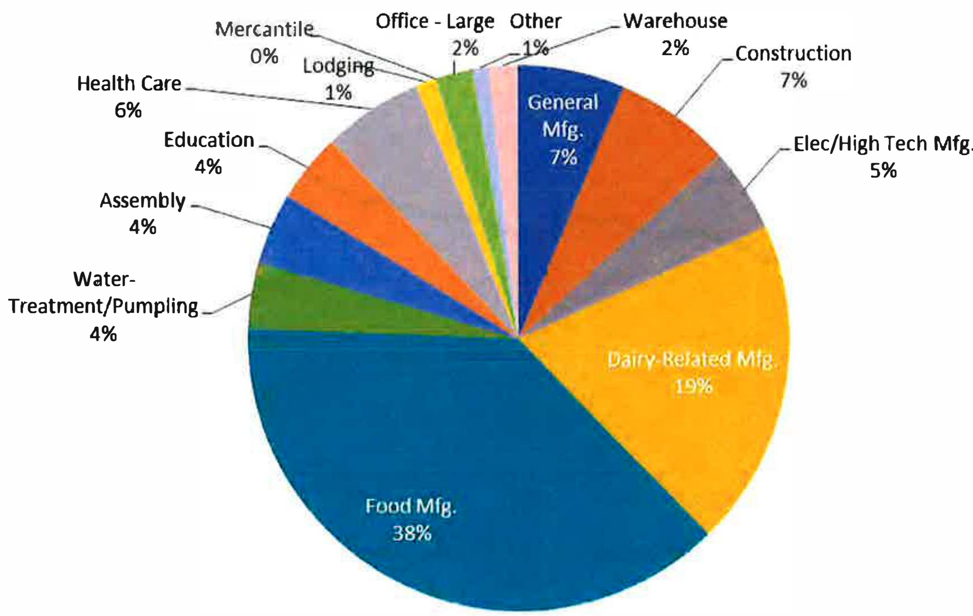

Figure 16. **Industrial electricity consumption by industry group (based on 2020 sales)**

The regression models and associated explanatory variables resulting from the categorization establish the relationship between historical electricity sales and variables such as, corporate earnings, economics, price, technological, demographic, and other influences in the form of estimated coefficients from the industry group regression models applied to the appropriate forecasts of independent time series of energy use. From this output, the history and forecast of previously excluded DSM is subtracted. Figure 17 shows the general forecasting methodology used for both the commercial and industrial sectors.

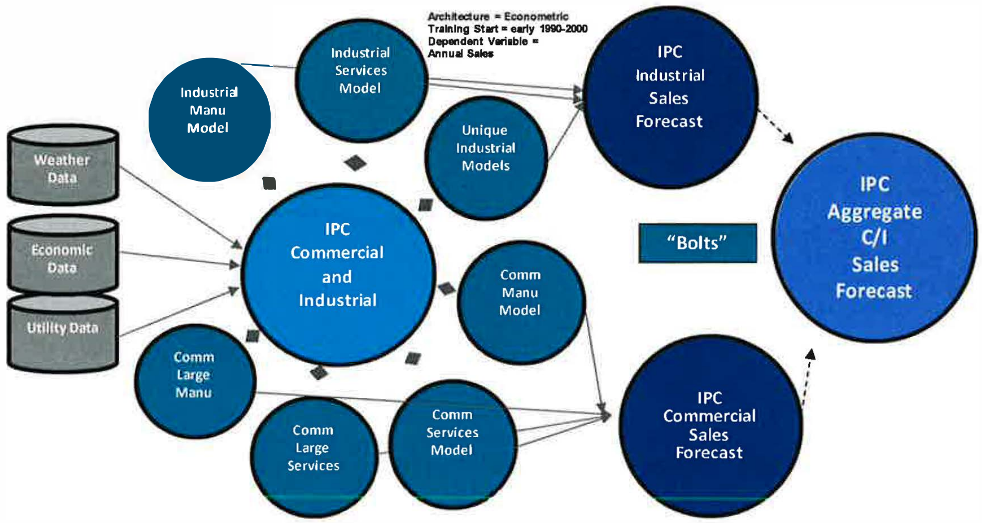

Figure 17. **Commercial and industrial general sales forecast methodology**

Irrigation

The irrigation category is comprised of agricultural irrigation service customers. Service under this schedule is applicable to power and energy supplied to agricultural-use customers at one point-of-delivery for operating water pumping or water-delivery systems to irrigate agricultural crops or pasturage.

The anticipated irrigation load is forecast to increase slowly from 225 aMW in 2021 to 250 aMW in 2040, an average annual compound growth rate of 0.6%. In the 70th-percentile scenario, irrigation load is projected to be 241 aMW in 2021 and 266 aMW in 2040. The anticipated, 70th-percentile, and 90th-percentile scenarios forecast slower growth than the system in irrigation load from 2021 to 2040. The individual irrigation load forecasts are summarized in Table 10 and illustrated in Figure 18.

Table 10. **Irrigation load growth (aMW)**

Growth	2021	2025	2030	2040	Annual Growth Rate 2021–2040
90th Percentile	261	265	270	286	0.5%
70th Percentile	241	244	250	266	0.5%
Anticipated Case	225	229	234	250	0.6%

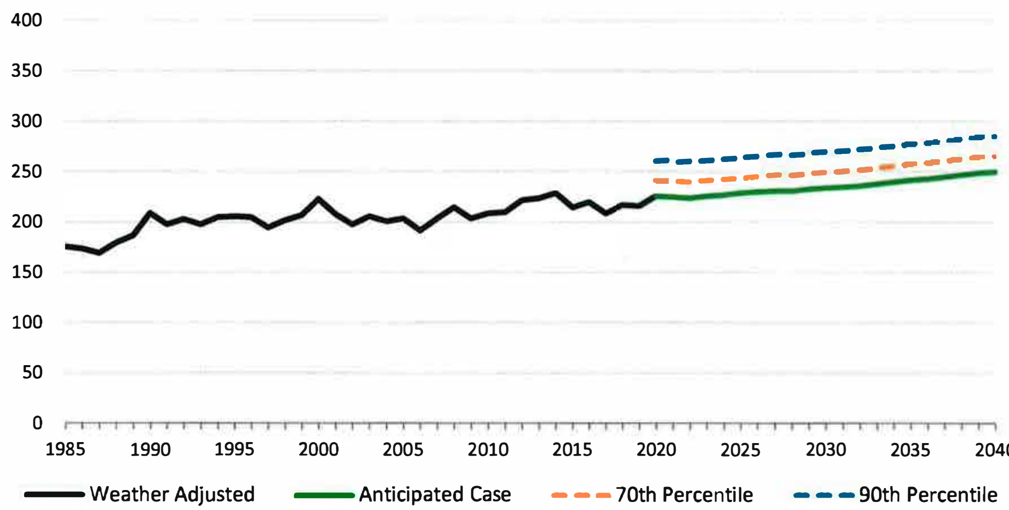

Figure 18. **Forecast irrigation load (aMW)**

The annual average loads in Table 10 and Figure 18 are calculated using the 8,760 hours in a typical year. In the highly seasonal irrigation sector, over 97% of the annual energy is billed during the six months from May through October, and nearly half of the annual energy is billed in just two months, July and August. During the summer, hourly irrigation loads can constitute nearly 900 MW. In a normal July, irrigation pumping accounts for roughly 25% of the energy consumed during the hour of the annual system peak and nearly 30% of the energy consumed during July for general business sales. The forecasted increase of sales is due to the increased customer count from the conversion of flood/furrow irrigation to sprinkler irrigation, primarily related to farmers trying to reduce labor costs. Additionally, the trend toward more water intensive crops—primarily alfalfa and corn—due to growth in the dairy industry, explains most of the increased energy consumption in recent years.

The 2021 IRP irrigation sales forecast model considers several factors affecting electricity sales to the irrigation class, including temperature; precipitation; Palmer Z Index (calculated by the National Ocean and Atmospheric Administration [NOAA] from a combination of precipitation, temperature, and soil moisture data); Moody's Producer Price Index: Prices Received by Farmers, All Farm Products; and annual maximum irrigation customer counts.

Actual irrigation electricity sales have grown from the 1970 level of 816,000 MWh to a peak amount of 2,097,000 MWh in 2013. In 1977, irrigation sales reached a maximum proportion of 20% of Idaho Power system sales. In 2020, the irrigation proportion of system sales was 13% due to the much higher relative growth in other customer classes.

Regarding customer growth, in 1980, Idaho Power had about 10,850 active irrigation accounts. By 2020, the number of active irrigation accounts had increased to 20,800 and is projected to be nearly 25,800 at the end of the planning period in 2040.

As with other sectors, average use per customer is an important consideration. Since 1988, Idaho Power has experienced growth in the number of irrigation customers but slow growth in total electricity sales (weather-adjusted) to this sector. The number of customers has increased because customers are converting previously furrow-irrigated land to sprinkler irrigated land. The conversion rate is slow and the kWh use per customer is substantially lower than the average existing Idaho Power irrigation customer. This is because water for sprinkler conversions is drawn from canals and not pumped from deep groundwater wells. In future forecasts, factors related to the conjunctive management of ground and surface water and the possible litigation associated with the resolution will require consideration. Depending on the resolution of these issues, irrigation sales may be impacted.

Additional Firm Load

The additional firm load category consists of Idaho Power's largest customers. Idaho Power's tariff requires the company serve requests for electric service greater than 20 MW under a special-contract schedule negotiated between Idaho Power and each large-power customer. The contract and tariff schedule are approved by the appropriate regulatory body. A special contract allows customer-specific, cost-of-service analysis and unique operating characteristics to be accounted for in the agreement.

Individual energy and peak-demand forecasts are developed with for special-contract customers, including Micron Technology, Inc.; Simplot Fertilizer Company (Simplot Fertilizer); the Idaho National Laboratory (INL); and any anticipated special contract customer(s) at the time. These special-contract customers comprise the forecast category labeled additional firm load.

In the anticipated forecast, additional firm load is expected to increase from 108 aMW in 2021 to 345 aMW in 2040, an average growth rate of 6.3% per year over the planning period (Table 11). The additional firm load energy and demand forecasts in the 70th- and 90th-percentile scenarios are identical to the anticipated-load growth scenario. The scenario of projected additional firm load is illustrated in Figure 19.

Table 11. **Additional firm load growth (aMW)**

Growth	2021	2025	2030	2040	Annual Growth Rate 2021–2040
Anticipated Case	108	195	345	345	6.3%

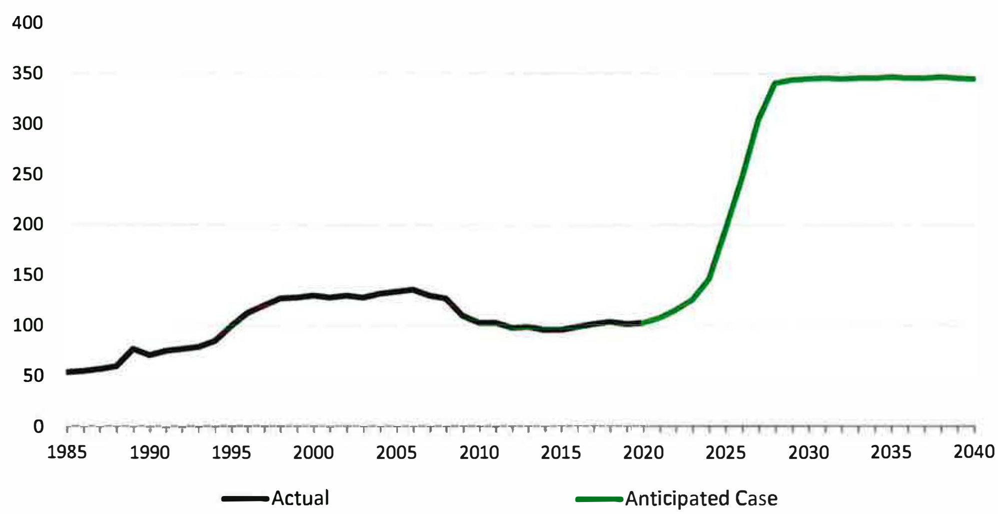

Figure 19. **Forecast additional firm load (aMW)**

Micron Technology

Micron Technology represents Idaho Power's largest electric load for an individual customer and employs approximately 5,000–6,000 workers in the Boise MSA. The company operates its research and development fabrication facility in Boise and performs a variety of other activities, including product design and support, quality assurance, systems integration and related manufacturing, and corporate and general services. Micron Technology's electricity use is a function of the market demand for their products.

Simplot Fertilizer

This facility named the Don Plant is located just outside Pocatello, Idaho. The Don Plant is one of four fertilizer manufacturing plants in the J.R. Simplot Company's Agribusiness Group. Vital to fertilizer production at the Don Plant is phosphate ore mined at Simplot's Smoky Canyon mine on the Idaho/Wyoming border. According to industry standards, the Don Plant is rated as one of the most cost-efficient fertilizer producers in North America. In total, J.R. Simplot Company employs 2,000–3,000 workers throughout its Idaho locations.

Idaho National Laboratory

Idaho National Laboratory (INL) is one of the United States Department of Energy's (DOE) national laboratories and is the nation's lead laboratory for nuclear energy research, development, and demonstration. The DOE, in partnership with its contractors, is focused on performing research and development in energy programs and national defense. Much of the work to achieve this mission at INL is performed in government-owned and leased buildings on the Research and Education Campus (REC) in Idaho Falls, Idaho, and on the INL site, located approximately 50 miles west of Idaho Falls. INL is recognized as a critical economic driver and important asset to the state of Idaho and is the fifth largest employer in the state of Idaho with employees estimated at 4,225 workers.

Anticipated Large-Load Growth

Idaho Power's anticipated load forecast includes new large-load growth. This growth reflects industrial customers that have made a sufficient and significant binding investment and/or interest indicating a commitment of the highest probability of locating in Idaho Power's service area.

ADDITIONAL CONSIDERATIONS

Several influential components and their associated impacts to the sales forecast are treated differently in the forecasting and planning process. The following discussion touches on several of those important topics.

Energy Efficiency

Energy efficiency (EE) influences on past and future load consist of utility programs, statutory codes, and manufacturing standards for appliances, equipment, and building materials that reduce energy consumption. As the influence of statutory codes and manufacturing standards on customers has increased in importance relative to utility programs, Idaho Power continues to modify its forecasting models to fully capture the impact. Idaho Power works closely with its internal DSM program managers and utilizes the updated potential study, most recently developed by Applied Energy Group (AEG). DSM guidance and the achievable potential from AEG are used as a benchmark metric for validating forecast model output.

For residential models, the physical unit flow of energy-efficient products is captured through integrating regional energy efficient product-shipments data into the retail and wholesale distribution channels. The source for the shipments data is the Department of Energy (DOE) and is consistent with DOE's National Energy Model (NEM). This data is first refined by Itron for utility-specific applications. This data captures energy-efficient installations regardless of the source (e.g., programs, standards, and codes).

The DOE/Itron data is recognized in the industry as well-specified for the homogeneous residential sector, however, although DOE data is available for the commercial sector, Idaho Power's test-modeling of the data indicates that the regional data does not provide sufficient segmentation to recognize the heterogeneous differences between the Idaho regional micro-economic composition and the mountain region economy. As discussed in the previous section on forecast methodology within the commercial class, Idaho Power segments the commercial customers by economic and energy profiles and incorporates historical energy efficiency adoption into billed sales. Thus, the energy efficiency is directly modeled into the forecast model energy variable and the forecast is adjusted in conformance with the DSM and AEG potential study forecast to recognize energy efficiency. DOE data is not available for the industrial sector.

The weather and agricultural volatility of the billed sales for the irrigation sector is not well-suited for modeling energy efficiency impacts. Idaho Power monitors energy efficiency implementation in history and forecasts from internal and external sources (DSM staff and presently AEG). The trend of historical implementation (imbedded in the historical usage data) provides a guideline for evaluating the model forecast output relative to expected DSM and codes and standards.

As discussed above, Idaho Power continuously evaluates the models for adequately capturing the impacts of energy efficiency and implements improvements when indicated. With input from DSM program managers and AEG's knowledge base, Idaho Power retains a high confidence in the representation of the impacts of energy efficiency in the forecast.

A more detailed description of DSM can be found in the main IRP document under the Energy Efficiency Section. Additionally, the company publishes a dedicated DSM annual report submitted to the regulatory agencies.

On-Site Generation

In recent years, the number of customers transitioning from standard to net-metering service (Schedules 6, 8, and 84) has risen dramatically, especially for residential customers. While the current population of on-site generation customers is over 1% of the population of retail customers, recent adoption of solar is relatively strong for our service area.

The installation of generating and storage equipment at customer sites will cause the demand for electricity delivered by Idaho Power to be reshaped throughout the year. It is important to measure the overall and future impact on the sales forecast. Therefore, this year's long-term sales forecast was adjusted downward to reflect the impact of the increase in the number customers with on-site generation, specifically solar, connecting to our system.

Schedules 6, 8, and 84 (net-metering) customer billing histories were compared to billing histories prior to said customer becoming a net-metering customer. The resulting average monthly impact per customer (in kWh) was then multiplied by forecasts of the Schedule 6, 8, and 84 residential, commercial, and irrigation customer counts to estimate the future energy impact on the sales forecast. The forecast of net metering customers serves as a function of historical trends and current policy considerations.

The resulting forecast of net-metering customers multiplied by the estimated use-per-customer sales impact per customer results in a monthly downward adjustment to the sales forecast for each class. At the end of the forecast period, 2040, the annual residential sales forecast reduction was about 65 aMW, the commercial reduction was 3 aMW, and the irrigation reduction was 6 aMW.

Electric Vehicles

The load forecast includes an update of the impact of plug-in electric vehicles (PEV) on system load to reflect the future impact of this relatively new and evolving source of energy use. While electric vehicle (EV) consumer adoption rates in Idaho Power's service area remain relatively low, with continued technological advancement, limiting attributes of vehicle range and refueling time continue to improve the competitiveness of these vehicles to non-electric models.

As the market grows, historical adoption data builds to provide a foundation for forecasting adoption rates and for the models to evolve. Idaho Power receives detailed registration data from Idaho Transportation Department (ITD). The data provides county-level registration which provides a basis for determining Idaho Power service-territory vehicle inventory. However, at present, this data is only available for battery-only vehicles and data for hybrid engine-battery vehicles was not available for this forecast update. Other data sources for monitoring the outlook for PEV adoption includes the United States Department of Energy, R.L. Polk, and Moody's Analytics.

Recent registration data shows a strong correlation between vehicles transferred into the service territory and growth of residential in-migration from states with higher PEV share (e.g., California and Washington). Idaho Power subsequently developed a regression model to test the relationship utilizing migration, population, and Moody's car registration forecasts. The model results confirm the correlation, and the forecast outlook conforms well with the generalized model utilizing DOE data.

The evolution of the PEV market shows that high adoption continues to be evident in warmer climates, high-density and affluent population centers. The Idaho Power forecast for PEVs shows that the service territory will continue to fall into the lower adoption ranges. Idaho Power continues to monitor battery technology advancement, vehicle prices, charging rates, and charging station availability which will serve to build the adoption rate in the service territory.

Demand Response

Beginning with the 2009 IRP, the reduction in load associated with demand response programs has been effectively treated as a supply side resource and accounted for in the load and resource balance. Demand response program data, including operational targets for demand reduction, program expenses, and cost-effective summaries are detailed *in Appendix C—Technical Appendix*.

As supply-side resources, demand response program impacts are not incorporated into the sales and load forecast. In the load and resource balance, the forecast of existing demand response programs is subtracted from the peak-hour load forecast prior to accounting for existing supply side resources. Likewise, the performance of new demand response programs is accounted for prior to determining the need for additional supply-side resources. However, because energy efficiency programs have an impact on peak demand reduction, a component of peak hour load reduction is integrated into the sales and load forecast models. This provides a consistent treatment of both types of programs, as energy efficiency programs are considered in the sales and load forecast, while all demand response programs are included in the load and resource balance.

A thorough description of each of the energy efficiency and demand response programs is included in *Appendix B—Demand-Side Management 2020 Annual Report*.

Fuel Prices

Fuel prices, in combination with service-area demographic and economic drivers, impact long term trends in electricity sales. Changes in relative fuel prices can also impact the future demand for electricity. Class-level and economic-sector-level regression models were used to identify the relationships between real historical electricity prices and their impact on historical electricity sales. The estimated coefficients from these models were used as drivers in the individual sales forecast models.

Short-term and long-term nominal electricity price increases are generated internally from Idaho Power financial models. The nominal price estimates are adjusted for projected inflation by applying the appropriate economic deflators to arrive at real fuel prices. The projected average annual growth rates of fuel prices in nominal and real terms (adjusted for inflation) are presented in Table 12. The growth rates shown are for residential fuel prices and can be used as a proxy for fuel-price growth rates in the commercial, industrial, and irrigation sectors.

Table 12. Residential fuel-price escalation (2021–2040) (average annual percent change)

	Nominal	Real*
Electricity—2021 IRP	1.0%	-1.3%
Electricity—2019 IRP	1.1%	-1.1%
Natural Gas	2.2%	0.0%

* Adjusted for inflation

Figure 20 illustrates the average electricity price paid by Idaho Power's residential customers over the historical period 1985 to 2020 and over the forecast period 2021 to 2040.
Both nominal and real prices are shown. In the 2021 IRP, nominal electricity prices are expected to climb to about 12.5 cents per kWh by the end of the forecast period in 2040. Real electricity prices (inflation adjusted) are expected to decline over the forecast period at an average rate of 1.3% annually. In the 2019 IRP, nominal electricity prices were assumed to climb to about 14 cents per kWh by 2040, and real electricity prices (inflation adjusted) were expected to decline over the forecast period at an average rate of 1.1% annually.

The electricity price forecast used to prepare the sales and load forecast in the 2021 IRP reflected the additional plant investment and variable costs of integrating the resources identified in the 2019 IRP preferred portfolio. When compared to the electricity price forecast used to prepare the 2019 IRP sales and load forecast, the 2021 IRP price forecast yields lower future prices. The retail prices are mostly lower throughout the planning period which can impact the sales forecast, a consequence of the inverse relationship between electricity prices and electricity demand.

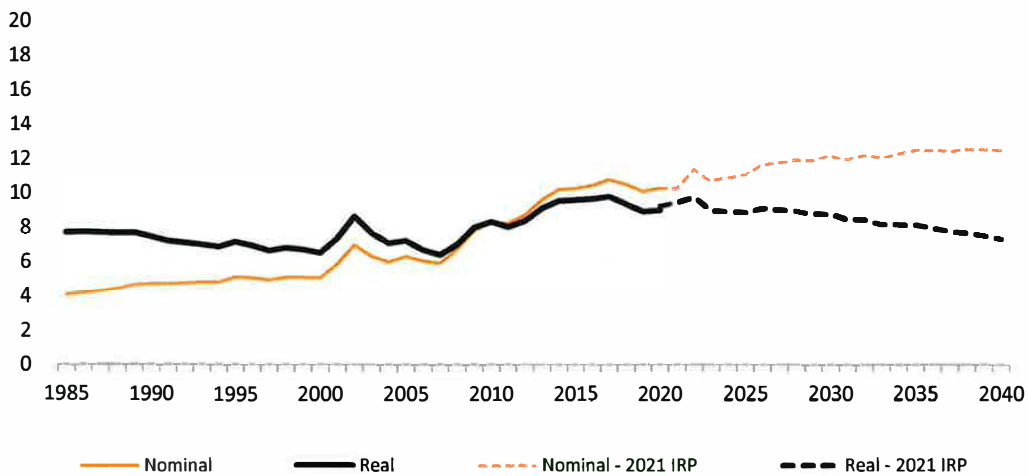

Figure 20. **Forecast residential electricity prices (cents per kWh)**

Electricity prices for Idaho Power customers increased significantly in 2001 and 2002, a direct result of the western United States energy crisis of 2000 and 2001. Prior to 2001, Idaho Power's electricity prices were historically quite stable. From 1990 to 2000, nominal electricity prices rose only 8% overall, an annual average compound growth rate of 0.8% annually. In contrast, from 2000 to 2010, nominal electricity prices rose 63% overall, an annual average compound growth rate of 4.2% annually. More recently, over the period 2010 to 2020, nominal electricity prices rose 23% overall, an annual average compound growth rate of 1.8% annually.

Figure 21 illustrates the average natural gas price paid by Intermountain Gas Company's residential customers over the historical period 1985 to 2020 and forecast prices from 2020 to 2040. Natural gas prices remained stable and flat throughout the 1990s before moving sharply higher in 2001. After spiking in 2001, natural gas prices moved downward for a couple of years before moving sharply upward in 2004 through 2006. Since 2006, natural gas prices have declined by 47%, compared to 2020. Nominal natural gas prices are initially expected to remain relatively flat through 2022, drop in 2023, and then rise at a steady pace throughout the remainder of the forecast period, increasing 70% by 2040, growing at an average rate of 2.2% per year. Real natural gas prices (adjusted for inflation) are expected to increase over the same period at an average rate of 0% annually.

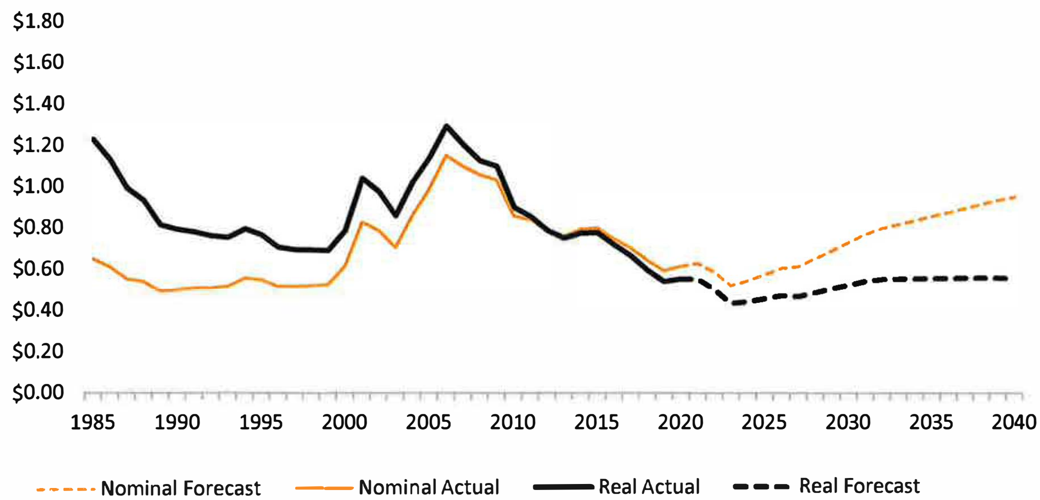

Figure 21. **Forecast residential natural gas prices (dollars per therm)**

One consideration in determining the operating costs of space heating and water heating is fuel cost, if future natural gas price increases outpace electricity price increases, heating with electricity would become more advantageous when compared to that of natural gas. S&P Global Platts provides the forecasts of long-term changes in nominal natural gas prices. In the 2021 IRP price forecast, the long-term direction in real electricity prices (adjusted for inflation) is downward and the long-term projection in real natural gas prices is downward in the near term through 2023, with prices slowly rising throughout the forecast period after that.

Other Considerations

Since the residential, commercial, irrigation, and industrial sales forecasts provide a forecast of sales as billed, it is necessary to adjust these billed sales to the proper time frame to reflect the required generation needed in each calendar month. To determine calendar-month sales from billed sales, the billed sales must first be converted from billed periods to calendar months to synchronize them with the period in which load is generated. The calendar-month sales are then converted to calendar-month average load by adding losses and dividing by the number of hours in each month.

Loss factors are determined by Idaho Power's Transmission Planning department. The annual average energy loss coefficients are multiplied by the calendar-month load, yielding the system load, including losses. A system loss study of 2012 was completed in May 2014. The results of the study concluded that on average, the revised loss coefficients were lower than those applied to generation forecasts developed prior to the 2015 IRP and were used in the development of the 2021 IRP sales and load forecast. This resulted in a one-time permanent reduction of nearly 20 aMW to the load forecast annually.

Hourly Load Forecast

As a result of stakeholder feedback and comments filed in the 2017 and 2019 IRPs, Idaho Power has leveraged several years of advanced metering infrastructure (AMI) data to adopt a new hourly load forecasting methodology to be used in the 2021 IRP. The use of AMI data expanded its footprints at Idaho Power and is utilized to inform an hourly load forecast that conforms with forecast methods mentioned throughout this document.

Historical IRP Methodology

Historically, Idaho Power has utilized metered system generation reads and weather data to build a typical system load factor or hourly system shape based on a previous year, which was then applied to the monthly load forecast for the IRP planning horizon. This methodology produced a consistent system shape throughout the load forecast, but it lacked the significant statistical footing of using individual hourly regressions rooted in AMI.

2021 IRP Methodology

In the time between IRP filings, Idaho Power began exploring potential methodology changes regarding hourly load forecasting relative to what the company currently had in place. While evaluating potential changes, the company believes it is prudent to maintain the integrity of the historic long-term forecasting methodologies previously employed by Load Forecasting.

Based on the research, the company concluded that a new methodology could be developed using a neural network. A neural network utilizes the stability of monthly sales data to calibrate and ground the hourly data via monthly peak regressions. Further, the methodology employs control and flexibility on the neural network while still leaning on its more robust statistical underpinnings.

Enhancements to Hourly Load Forecasting

To begin the process, the company engaged in consultation with Itron Forecasting. Together, Idaho Power and Itron designed the framework to introduce concepts of a neural network model that utilized two non-linear nodes and was hinged on currently accepted load forecasting processes. The result of this methodology brought statistical confidence of hourly load modeling to the company while still conforming to the stability of the legacy methodology of monthly sales forecasting.

An industry approach to weather responsiveness would be to utilize a linear model based on a heating degree day or cooling degree day level of 65 degrees Fahrenheit (°F) (actual point may differ by local utility weather characteristics). Utilities will also often use splines in regression equations to define the weather function to reflect the change of slope as the average daily temperature moves away from the 65°F mark and there is less weather responsiveness. This methodology works very well by minimizing the potential impact of overfitting. Building on this framework, Idaho Power uses a non-linear approach, wherein the derivative or local slope of a curve is calculated at each instance along the weather responsiveness curve. This responsiveness is captured in the neural network.

The neural network design adopted by Idaho Power outputs a single series of hourly energy with only one hidden layer that contains two nodes (H1 and H2) representing the heating and cooling effects along the sales curve. Each of the H1 and H2 nodes uses a logistic activation function with a linear function applied to the output layer, where impacts of the calendar (weekend, weekday, holidays, etc.) are captured.

A distinct model is developed for each hour of the year to capture the full spectrum of temperature responsiveness. For each non-linear hourly model, an instantaneous derivative value is calculated along the curve to obtain the relationship of energy sales to temperature. A key initiative for Idaho Power when using a neural network framework is controllability of calculations and reducing risk of overfitting of the tails of the distribution. This is achieved by capturing the derivative value and using it in the hourly forecast using 5-degree gradation bins. Further, by releasing the slopes in this fashion, it creates unique weighting schemes by hour and facilitates the construction of lagged weather impact, weekends, and holidays. The result of these hourly models is a transparent set of weather response functions.

At this point, a typical meteorological year is developed using a rolling 30 years of weather history within the Idaho Power service territory. The company then uses an algorithm to rank and average the daily temperature within a month from hottest to coldest, averaging the daily temperature for each rank across years. The result is an appropriate representation of severe, moderate, and mild daily temperatures for each month. The company then uses that ranked and averaged typical weather by month and employs a transformation algorithm to reorder days based on a typical weather pattern. Finally, a rotation algorithm is used to ensure that the values over the forecast periods occur on the same day of the week throughout the forecast period, removing the year-to-year variation in the hourly load shape based on where it lands on the calendar of the given forecast year.

Hourly System Load Forecast Design

The output from the neural network is then joined with the abovementioned typical meteorological year (TMY) to develop a near final hourly forecast. An important aspect of the design was for the company to preserve the monthly sales and monthly peak forecast that has been used historically. The newly developed methodology leverages a more statistically confident approach for allocated sales by hour within the month. To maintain conformance with the historical methodology, the company applies a calibration algorithm to the hourly forecast to both the monthly peak and energy sales within a month as produced by the legacy linear forms the company operates. The output of hourly sales and subsequent monthly peaks, as defined from the above-mentioned models, are adjusted such that the duration curve receives minimal adjustment during or around the peak hour, and any required adjustment grows larger as it moves out along the duration curve. This minimizes potential impacts of creating large hour-to-hour swings.

The above process can be repeated for each major customer class to produce estimated contributions to system peak by customer class as can be seen in Figure 22.

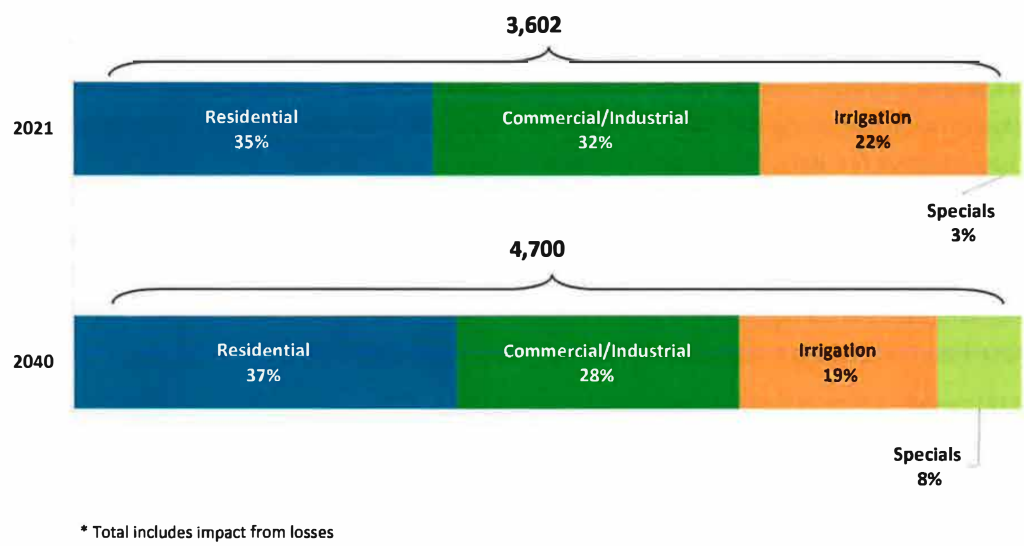

Figure 22. **Class Contribution to System Peak**

CONTRACT OFF-SYSTEM LOAD

The contract off-system category represents long-term contracts to supply firm energy to off-system customers. Long-term contracts are contracts effective during the forecast period lasting for more than one year. Currently, there are no long-term contracts.

The historical consumption for the contract off-system load category was considerable in the early 1990s; however, after 1995, off-system loads declined through 2005. As intended, the off-system contracts and their corresponding energy requirements expired as Idaho Power's surplus energy diminished due to retail load growth. In the future, Idaho Power may enter additional long-term contracts to supply firm energy to off-system customers if surplus energy is available.

Appendix A1. Historical and Projected Sales and Load

Company System Load (excluding Astaris)

Historical Company System Sales and Load, 1980–2020 (weather adjusted)

Year	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
1980	7,866		974
1981	8,181	4.0%	1,014
1982	7,822	-4.4%	973
1983	8,034	2.7%	998
1984	8,120	1.1%	1,006
1985	8,262	1.7%	1,026
1986	8,346	1.0%	1,037
1987	8,489	1.7%	1,055
1988	8,832	4.0%	1,094
1989	9,203	4.2%	1,143
1990	9,575	4.0%	1,189
1991	9,749	1.8%	1,210
1992	9,973	2.3%	1,235
1993	10,268	3.0%	1,276
1994	10,676	4.0%	1,326
1995	11,140	4.4%	1,381
1996	11,479	3.0%	1,421
1997	11,770	2.5%	1,460
1998	12,261	4.2%	1,519
1999	12,558	2.4%	1,557
2000	12,951	3.1%	1,604
2001	13,089	1.1%	1,618
2002	12,791	-2.3%	1,587
2003	13,131	2.7%	1,627
2004	13,362	1.8%	1,655
2005	13,721	2.7%	1,705
2006	13,994	2.0%	1,735
2007	14,386	2.8%	1,785
2008	14,490	0.7%	1,789
2009	14,010	-3.3%	1,738
2010	13,876	-1.0%	1,720
2011	13,908	0.2%	1,724
2012	14,093	1.3%	1,742

Year	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
2013	14,101	0.1%	1,756
2014	14,283	1.3%	1,768
2015	14,131	-1.1%	1,753
2016	14,300	1.2%	1,773
2017	14,422	0.8%	1,788
2018	14,605	1.3%	1,813
2019	14,762	1.1%	1,834
2020	14,928	1.1%	1,856

Company System Load

Projected Company System Sales and Load, 2021–2040

Year	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
2021	15,283	2.4%	1,895
2022	15,528	1.6%	1,926
2023	15,845	2.0%	1,965
2024	16,175	2.1%	2,008
2025	16,338	1.0%	2,082
2026	16,587	1.5%	2,154
2027	16,761	1.1%	2,223
2028	16,889	0.8%	2,269
2029	16,996	0.6%	2,289
2030	17,117	0.7%	2,304
2031	17,199	0.5%	2,314
2032	17,314	0.7%	2,322
2033	17,396	0.5%	2,338
2034	17,535	0.8%	2,356
2035	17,686	0.9%	2,375
2036	17,848	0.9%	2,389
2037	18,030	1.0%	2,418
2038	18,231	1.1%	2,442
2039	18,404	0.9%	2,464
2040	18,604	1.1%	2,482

Residential Load

Historical Residential Sales and Load, 1980–2020 (weather adjusted)

Year	Average Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
1980	209,629		14,771	3,096		353
1981	213,579	1.9%	14,748	3,150	1.7%	355
1982	216,696	1.5%	13,562	2,939	-6.7%	337
1983	219,849	1.5%	14,321	3,149	7.1%	358
1984	222,695	1.3%	14,031	3,125	-0.8%	355
1985	225,185	1.1%	13,867	3,123	-0.1%	356
1986	227,081	0.8%	14,028	3,186	2.0%	365
1987	228,868	0.8%	13,970	3,197	0.4%	366
1988	230,771	0.8%	14,232	3,284	2.7%	375
1989	233,370	1.1%	14,217	3,318	1.0%	380
1990	238,117	2.0%	14,261	3,396	2.3%	388
1991	243,207	2.1%	14,373	3,496	2.9%	401
1992	249,767	2.7%	14,104	3,523	0.8%	401
1993	258,271	3.4%	14,088	3,638	3.3%	417
1994	267,854	3.7%	14,008	3,752	3.1%	429
1995	277,131	3.5%	14,024	3,887	3.6%	444
1996	286,227	3.3%	13,794	3,948	1.6%	451
1997	294,674	3.0%	13,728	4,045	2.5%	462
1998	303,300	2.9%	13,791	4,183	3.4%	478
1999	312,901	3.2%	13,654	4,272	2.1%	488
2000	322,402	3.0%	13,442	4,334	1.4%	494
2001	331,009	2.7%	13,210	4,373	0.9%	498
2002	339,764	2.6%	12,708	4,318	-1.3%	495
2003	349,219	2.8%	12,817	4,476	3.7%	511
2004	360,462	3.2%	12,755	4,598	2.7%	525
2005	373,602	3.6%	12,752	4,764	3.6%	547
2006	387,707	3.8%	12,992	5,037	5.7%	576
2007	397,286	2.5%	13,024	5,174	2.7%	591
2008	402,520	1.3%	12,942	5,209	0.7%	593
2009	405,144	0.7%	12,786	5,180	-0.6%	590
2010	407,551	0.6%	12,524	5,104	-1.5%	583
2011	409,786	0.5%	12,485	5,116	0.2%	583
2012	413,610	0.9%	12,403	5,130	0.3%	583
2013	418,892	1.3%	12,069	5,055	-1.5%	581
2014	425,036	1.5%	11,996	5,099	0.9%	579

Year	Average Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
2015	432,275	1.7%	11,691	5,054	-0.9%	577
2016	440,362	1.9%	11,642	5,127	1.4%	585
2017	448,800	1.9%	11,552	5,184	1.1%	592
2018	459,128	2.3%	11,385	5,227	0.8%	596
2019	471,298	2.7%	11,287	5,320	1.8%	609
2020	484,433	2.8%	11,450	5,547	4.3%	637

Projected Residential Sales and Load, 2021–2040

Year	Average Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
2021	499,559	3.1%	11,281	5,636	1.6%	644
2022	513,957	2.9%	11,110	5,710	1.3%	652
2023	527,572	2.6%	10,941	5,772	1.1%	660
2024	540,764	2.5%	10,789	5,834	1.1%	665
2025	553,746	2.4%	10,591	5,865	0.5%	670
2026	566,899	2.4%	10,405	5,898	0.6%	674
2027	579,731	2.3%	10,231	5,931	0.6%	678
2028	591,914	2.1%	10,082	5,968	0.6%	680
2029	603,243	1.9%	9,945	5,999	0.5%	685
2030	613,993	1.8%	9,803	6,019	0.3%	687
2031	624,544	1.7%	9,669	6,039	0.3%	690
2032	634,909	1.7%	9,534	6,053	0.2%	689
2033	645,083	1.6%	9,396	6,062	0.1%	692
2034	655,094	1.6%	9,319	6,105	0.7%	697
2035	665,028	1.5%	9,274	6,168	1.0%	705
2036	674,971	1.5%	9,237	6,235	1.1%	710
2037	684,927	1.5%	9,209	6,308	1.2%	721
2038	694,856	1.4%	9,180	6,379	1.1%	729
2039	704,784	1.4%	9,154	6,451	1.1%	737
2040	714,731	1.4%	9,129	6,524	1.1%	743

Commercial Load

Historical Commercial Sales and Load, 1980–2020 (weather adjusted)

Year	Average Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
1980	28,797		54,184	1,560		178
1981	29,567	2.7%	54,326	1,606	2.9%	184
1982	30,167	2.0%	54,147	1,633	1.7%	186
1983	30,776	2.0%	52,643	1,620	-0.8%	185
1984	31,554	2.5%	53,824	1,698	4.8%	194
1985	32,418	2.7%	54,495	1,767	4.0%	202
1986	33,208	2.4%	54,027	1,794	1.6%	205
1987	33,975	2.3%	53,710	1,825	1.7%	209
1988	34,723	2.2%	54,567	1,895	3.8%	216
1989	35,638	2.6%	55,654	1,983	4.7%	227
1990	36,785	3.2%	56,088	2,063	4.0%	236
1991	37,922	3.1%	56,385	2,138	3.6%	245
1992	39,022	2.9%	56,761	2,215	3.6%	253
1993	40,047	2.6%	58,693	2,350	6.1%	269
1994	41,629	4.0%	58,612	2,440	3.8%	280
1995	43,165	3.7%	59,035	2,548	4.4%	292
1996	44,995	4.2%	62,399	2,808	10.2%	321
1997	46,819	4.1%	62,490	2,926	4.2%	334
1998	48,404	3.4%	62,989	3,049	4.2%	349
1999	49,430	2.1%	64,468	3,187	4.5%	364
2000	50,117	1.4%	66,281	3,322	4.2%	380
2001	51,501	2.8%	67,783	3,491	5.1%	398
2002	52,915	2.7%	65,108	3,445	-1.3%	394
2003	54,194	2.4%	64,529	3,497	1.5%	399
2004	55,577	2.6%	64,280	3,573	2.2%	408
2005	57,145	2.8%	63,785	3,645	2.0%	417
2006	59,050	3.3%	63,731	3,763	3.2%	430
2007	61,640	4.4%	63,533	3,916	4.1%	448
2008	63,492	3.0%	62,458	3,966	1.3%	450
2009	64,151	1.0%	59,998	3,849	-2.9%	440
2010	64,421	0.4%	59,098	3,807	-1.1%	434
2011	64,921	0.8%	58,806	3,818	0.3%	436
2012	65,599	1.0%	59,128	3,879	1.6%	441
2013	66,357	1.2%	58,834	3,904	0.7%	448
2014	67,113	1.1%	59,173	3,971	1.7%	452

Year	Average Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
2015	68,000	1.3%	58,772	3,996	0.6%	457
2016	68,883	1.3%	58,226	4,011	0.4%	457
2017	69,850	1.4%	58,031	4,053	1.1%	462
2018	71,104	1.8%	57,942	4,120	1.6%	471
2019	72,332	1.7%	57,126	4,132	0.3%	472
2020	73,703	1.9%	54,687	4,031	-2.5%	460

Projected Commercial Sales and Load, 2021–2040

Year	Average Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
2021	75,289	2.2%	55,179	4,154	3.1%	475
2022	76,982	2.2%	54,790	4,218	1.5%	482
2023	78,717	2.3%	54,161	4,263	1.1%	487
2024	80,420	2.2%	53,893	4,334	1.7%	494
2025	82,123	2.1%	53,161	4,366	0.7%	499
2026	83,847	2.1%	52,530	4,404	0.9%	503
2027	85,591	2.1%	51,550	4,412	0.2%	504
2028	87,323	2.0%	50,905	4,445	0.7%	506
2029	89,008	1.9%	50,313	4,478	0.7%	512
2030	90,638	1.8%	49,915	4,524	1.0%	517
2031	92,235	1.8%	49,301	4,547	0.5%	519
2032	93,818	1.7%	49,004	4,597	1.1%	524
2033	95,394	1.7%	48,471	4,624	0.6%	528
2034	96,961	1.6%	48,127	4,666	0.9%	533
2035	98,524	1.6%	47,622	4,692	0.5%	536
2036	100,086	1.6%	47,267	4,731	0.8%	539
2037	101,652	1.6%	47,034	4,781	1.1%	546
2038	103,220	1.5%	46,896	4,841	1.2%	553
2039	104,791	1.5%	46,674	4,891	1.0%	559
2040	106,365	1.5%	46,508	4,947	1.1%	564

Irrigation Load

Historical Irrigation Sales and Load, 1980–2020 (weather adjusted)

Year	Maximum Active Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
1980	10,854		160,699	1,744		199
1981	11,248	3.6%	168,950	1,900	9.0%	217
1982	11,312	0.6%	152,063	1,720	-9.5%	197
1983	11,133	-1.6%	147,885	1,646	-4.3%	188
1984	11,375	2.2%	136,181	1,549	-5.9%	176
1985	11,576	1.8%	133,372	1,544	-0.3%	176
1986	11,308	-2.3%	135,042	1,527	-1.1%	174
1987	11,254	-0.5%	132,422	1,490	-2.4%	170
1988	11,378	1.1%	138,605	1,577	5.8%	180
1989	11,957	5.1%	136,898	1,637	3.8%	187
1990	12,340	3.2%	148,190	1,829	11.7%	209
1991	12,484	1.2%	139,041	1,736	-5.1%	198
1992	12,809	2.6%	139,340	1,785	2.8%	203
1993	13,078	2.1%	132,733	1,736	-2.7%	198
1994	13,559	3.7%	132,365	1,795	3.4%	205
1995	13,679	0.9%	132,064	1,807	0.7%	206
1996	14,074	2.9%	127,939	1,801	-0.3%	205
1997	14,383	2.2%	118,804	1,709	-5.1%	195
1998	14,695	2.2%	120,611	1,772	3.7%	202
1999	14,912	1.5%	121,861	1,817	2.5%	207
2000	15,253	2.3%	128,582	1,961	7.9%	223
2001	15,522	1.8%	117,166	1,819	-7.3%	208
2002	15,840	2.0%	109,361	1,732	-4.7%	198
2003	16,020	1.1%	112,556	1,803	4.1%	206
2004	16,297	1.7%	108,438	1,767	-2.0%	201
2005	16,936	3.9%	105,450	1,786	1.1%	204
2006	17,062	0.7%	98,468	1,680	-5.9%	192
2007	17,001	-0.4%	105,169	1,788	6.4%	204
2008	17,428	2.5%	108,589	1,892	5.8%	215
2009	17,708	1.6%	101,150	1,791	-5.4%	204
2010	17,846	0.8%	102,345	1,826	2.0%	209

Year	Maximum Active Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
2011	18,292	2.5%	100,456	1,838	0.6%	210
2012	18,675	2.1%	104,483	1,951	6.2%	222
2013	19,017	1.8%	103,133	1,961	0.5%	224
2014	19,328	1.6%	103,920	2,009	2.4%	229
2015	19,756	2.2%	95,126	1,879	-6.4%	215
2016	20,042	1.4%	96,382	1,932	2.8%	220
2017	20,246	1.0%	90,552	1,833	-5.1%	209
2018	20,459	1.1%	92,940	1,901	3.7%	217
2019	20,566	0.5%	92,107	1,894	-0.4%	216
2020	20,804	1.2%	95,385	1,984	4.8%	226

Projected Irrigation Sales and Load, 2021–2040

Year	Maximum Active Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
2021	21,063	1.2%	93,540	1,970	-0.7%	225
2022	21,290	1.1%	92,318	1,965	-0.2%	224
2023	21,538	1.2%	92,090	1,983	0.9%	226
2024	21,786	1.2%	91,540	1,994	0.5%	227
2025	22,035	1.1%	90,887	2,003	0.4%	229
2026	22,283	1.1%	90,320	2,013	0.5%	230
2027	22,531	1.1%	89,780	2,023	0.5%	231
2028	22,782	1.1%	89,216	2,033	0.5%	231
2029	23,028	1.1%	88,648	2,041	0.4%	233
2030	23,278	1.1%	88,097	2,051	0.5%	234
2031	23,527	1.1%	87,552	2,060	0.4%	235
2032	23,774	1.0%	87,170	2,072	0.6%	236
2033	24,024	1.1%	86,879	2,087	0.7%	238
2034	24,274	1.0%	86,599	2,102	0.7%	240
2035	24,522	1.0%	86,333	2,117	0.7%	242
2036	24,770	1.0%	86,082	2,132	0.7%	243
2037	25,020	1.0%	85,852	2,148	0.7%	245
2038	25,267	1.0%	85,634	2,164	0.7%	247
2039	25,515	1.0%	85,457	2,180	0.8%	249
2040	25,763	1.0%	85,311	2,198	0.8%	250

Industrial Load

Historical Industrial Sales and Load, 1980–2020 (not weather adjusted)

Year	Average Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
1980	112		9,894,706	1,106		125
1981	118	5.7%	9,718,723	1,148	3.9%	132
1982	122	3.5%	9,504,283	1,162	1.2%	133
1983	122	-0.3%	9,797,522	1,194	2.7%	138
1984	124	1.5%	10,369,789	1,282	7.4%	147
1985	125	1.2%	10,844,888	1,357	5.9%	155
1986	129	2.7%	10,550,145	1,357	-0.1%	155

Year	Average Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
1987	134	4.1%	11,006,455	1,474	8.7%	169
1988	133	-1.0%	11,660,183	1,546	4.9%	177
1989	132	-0.6%	12,091,482	1,594	3.1%	183
1990	132	0.2%	12,584,200	1,662	4.3%	191
1991	135	2.5%	12,699,665	1,719	3.4%	196
1992	140	3.4%	12,650,945	1,770	3.0%	203
1993	141	0.5%	13,179,585	1,854	4.7%	212
1994	143	1.7%	13,616,608	1,948	5.1%	223
1995	120	-15.9%	16,793,437	2,021	3.7%	230
1996	103	-14.4%	18,774,093	1,934	-4.3%	221
1997	106	2.7%	19,309,504	2,042	5.6%	235
1998	111	4.6%	19,378,734	2,145	5.0%	244
1999	108	-2.3%	19,985,029	2,160	0.7%	247
2000	107	-0.8%	20,433,299	2,191	1.5%	250
2001	111	3.5%	20,618,361	2,289	4.4%	260
2002	111	-0.1%	19,441,876	2,156	-5.8%	246
2003	112	1.0%	19,950,866	2,234	3.6%	255
2004	117	4.3%	19,417,310	2,269	1.5%	259
2005	126	7.9%	18,645,220	2,351	3.6%	270
2006	127	1.0%	18,255,385	2,325	-1.1%	265
2007	123	-3.6%	19,275,551	2,366	1.8%	270
2008	119	-3.1%	19,412,391	2,308	-2.4%	261
2009	124	4.0%	17,987,570	2,224	-3.6%	254
2010	121	-2.0%	18,404,875	2,232	0.3%	254
2011	120	-1.1%	18,597,050	2,230	-0.1%	254
2012	115	-4.2%	19,757,921	2,271	1.8%	258
2013	114	-0.7%	20,281,837	2,314	1.9%	265
2014	113	-0.7%	20,863,653	2,363	2.1%	271
2015	116	2.8%	20,271,082	2,360	-0.1%	269
2016	118	1.4%	19,993,955	2,361	0.0%	270
2017	117	-1.1%	20,996,425	2,453	3.9%	280
2018	115	-1.6%	21,274,929	2,447	-0.3%	280
2019	124	8.0%	20,288,866	2,521	3.0%	288

Year	Average Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
2020	124	-0.3%	19,912,671	2,466	-2.2%	283

Projected Industrial Sales and Load, 2021–2040

Year	Average Customers	Percent Change	kWh per Customer	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
2021	124	-0.2%	20,879,623	2,580	4.6%	295
2022	123	-0.5%	21,326,834	2,623	1.7%	300
2023	123	0.0%	22,198,824	2,730	4.1%	313
2024	125	1.6%	22,532,633	2,817	3.2%	321
2025	126	0.8%	22,993,784	2,897	2.9%	332
2026	126	0.0%	23,539,107	2,966	2.4%	339
2027	126	0.0%	23,746,821	2,992	0.9%	342
2028	129	2.4%	23,388,087	3,017	0.8%	344
2029	130	0.8%	23,420,860	3,045	0.9%	348
2030	130	0.0%	23,653,746	3,075	1.0%	351
2031	130	0.0%	23,868,001	3,103	0.9%	355
2032	132	1.5%	23,787,633	3,140	1.2%	358
2033	133	0.8%	23,849,695	3,172	1.0%	362
2034	133	0.0%	24,135,122	3,210	1.2%	367
2035	133	0.0%	24,409,273	3,246	1.1%	371
2036	135	1.5%	24,355,460	3,288	1.3%	375
2037	135	0.0%	24,705,719	3,335	1.4%	381
2038	135	0.0%	25,098,479	3,388	1.6%	387
2039	135	0.0%	25,405,447	3,430	1.2%	392
2040	137	1.5%	25,425,088	3,483	1.6%	397

Additional Firm Sales and Load

Historical Additional Firm Sales and Load, 1980–2020

Year	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
1980	360		41
1981	376	4.6%	43
1982	367	-2.4%	42
1983	425	15.7%	49
1984	466	9.7%	53
1985	471	1.1%	54
1986	482	2.4%	55
1987	502	4.2%	57
1988	530	5.6%	60
1989	671	26.5%	77
1990	625	-6.9%	71
1991	661	5.8%	75
1992	680	2.9%	77
1993	689	1.3%	79
1994	740	7.5%	85
1995	878	18.6%	100
1996	989	12.6%	113
1997	1,048	6.0%	120
1998	1,113	6.2%	127
1999	1,121	0.8%	128
2000	1,143	1.9%	130
2001	1,118	-2.1%	128
2002	1,139	1.9%	130
2003	1,120	-1.7%	128
2004	1,156	3.3%	132
2005	1,175	1.6%	134
2006	1,189	1.2%	136
2007	1,141	-4.0%	130
2008	1,114	-2.4%	127
2009	965	-13.4%	110
2010	907	-6.0%	103
2011	906	0.0%	103
2012	862	-4.8%	98
2013	867	0.5%	99
2014	841	-2.9%	96

Year	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
2015	842	0.1%	96
2016	870	3.3%	99
2017	897	3.1%	102
2018	910	1.4%	104
2019	895	-1.7%	102
2020	900	0.6%	103

*Includes Micron Technology, Simplot Fertilizer, INL, Hoku Materials, City of Weiser, and Raft River Rural Electric Cooperative, Inc.

Projected Additional Firm Sales and Load, 2021–2040

Year	Billed Sales (thousands of MWh)	Percent Change	Average Load (aMW)
2021	943	4.7%	108
2022	1,019	8.1%	116
2023	1,104	8.4%	126
2024	1,288	16.7%	147
2025	1,706	32.4%	195
2026	2,163	26.8%	247
2027	2,668	23.3%	305
2028	2,996	12.3%	341
2029	3,010	0.4%	344
2030	3,025	0.5%	345
2031	3,027	0.1%	346
2032	3,032	0.2%	345
2033	3,028	-0.1%	346
2034	3,029	0.0%	346
2035	3,040	0.4%	347
2036	3,043	0.1%	346
2037	3,035	-0.3%	346
2038	3,036	0.0%	347
2039	3,028	-0.3%	346
2040	3,032	0.1%	345

*Includes Micron Technology, Simplot Fertilizer, the INL, and any anticipated special contract customers

BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON

Docket PCN 5

In the Matter of

IDAHO POWER COMPANY'S
PETITION FOR CERTIFICATE OF PUBLIC CONVENIENCE
AND NECESSITY

Attachment 14

Idaho Power's 2021 IRP

September 30, 2022

IDAHO POWER®
An IDACORP Company

DECEMBER • 2021

IRP

INTEGRATED RESOURCE PLAN

A VIEW
FROM ABOVE

SAFE HARBOR STATEMENT

This document may contain forward-looking statements, and it is important to note that the future results could differ materially from those discussed. A full discussion of the factors that could cause future results to differ materially can be found in Idaho Power's filings with the Securities and Exchange Commission.

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GLOSSARY OF ACRONYMS

A/C—Air Conditioning

AC—Alternating Current

AEG—Applied Energy Group

AFUDC—Allowance for Funds Used During Construction

AgI—Silver Iodide

akW—Average Kilowatt

aMW—Average Megawatt

ATC—Available Transfer Capacity

B2H—Boardman to Hemingway

BLM—Bureau of Land Management

BPA—Bonneville Power Administration

CADSWES—Center for Advanced Decision Support for Water and Environmental Systems

CAISO—California Independent System Operator

CBM—Capacity Benefit Margin

CCCT—Combined-Cycle Combustion Turbine

cfs—Cubic Feet per Second

CHP—Combined Heat and Power

CO_2—Carbon Dioxide

CPCN—Certificate of Public Convenience and Necessity

CSPP—Cogeneration and Small-Power Producers

CWA—*Clean Water Act of 1972*

DC—Direct Current

DEQ—Department of Environmental Quality

DER—Distributed Energy Resources

DOE—Department of Energy

DPO—Draft Proposed Order

DSM—Demand-Side Management

DSP—Distribution System Planning

E3—Energy and Environmental Economics, Inc.

EE—Energy Efficiency

EFOR— Effective Forced Outage Rate

EFSC—Energy Facility Siting Council

EIA—Energy Information Administration

EIM—Energy Imbalance Market

EIS—Environmental Impact Statement

ELCC—Effective Load Carrying Capability

EPA—Environmental Protection Agency

ESA—*Endangered Species Act of 1973*

ESPA—Eastern Snake River Plain Aquifer

ESPAM—Enhanced Snake Plain Aquifer Model

FCRPS—Federal Columbia River Power System

FERC—Federal Energy Regulatory Commission

FPI—Fire Potential Index

FPA—*Federal Power Act of 1920*

GBT—Great Basin Transmission

GHG—Greenhouse Gas

GWMA—Ground Water Management Area

HB—House Bill

HCC—Hells Canyon Complex

HGHC—High Gas High Carbon

HRSG—Heat Recovery Steam Generator

IDWR—Idaho Department of Water Resources

IEPR—Integrated Energy Policy Report

IGCC—Integrated Gasification Combined Cycle

INL—Idaho National Laboratory

IPUC—Idaho Public Utilities Commission

IRP—Integrated Resource Plan

IRPAC—IRP Advisory Council

ISEA—Idaho Strategic Energy Alliance

IWRB—Idaho Water Resource Board

kV—Kilovolt

kW—Kilowatt

kWh—Kilowatt-Hour

LCOC—Levelized Cost of Capacity

LCOE—Levelized Cost of Energy

Li-ion—Lithium Ion

LiDAR—Light Detection and Ranging

LOLE—Loss of Load Expectation

LOLP—Loss of Load Probability

LTCE—Long-Term Capacity Expansion

m^2—Square Meters

MMBtu—Million British Thermal Units

MSA—Metropolitan Statistical Area

MW—Megawatt

MWh—Megawatt-Hour

NEPA—*National Environmental Policy Act of 1969*

NERC—North American Electric Reliability Corporation

NOx—Nitrogen Oxide

NPV—Net Present Value

NRC—Nuclear Regulatory Commission

NREL—National Renewable Energy Laboratory

NWPCC—Northwest Power and Conservation Council

NYMEX—New York Mercantile Exchange

O&M—Operation and Maintenance

OATT—Open-Access Transmission Tariff

ODOE—Oregon Department of Energy

OPUC—Oregon Public Utility Commission

pASC—Preliminary Application for Site Certificate

PAC—PacifiCorp

PCA—Power Cost Adjustment

PGE—Portland General Electric

PM&E—Protection, Mitigation, and Enhancement

PPA—Power Purchase Agreement

PTC—Production Tax Credit

PURPA—*Public Utility Regulatory Policies Act of 1978*

PV—Photovoltaic

QF—Qualifying Facility

REC—Renewable Energy Certificate

RFP—Request for Proposal

RICE—Reciprocating Internal Combustion Engine

ROD—Record of Decision

ROR—Run-of-River

RPS—Renewable Portfolio Standard

RTF—Regional Technical Forum

SB—Senate Bill

SCCT—Simple-Cycle Combustion Turbine

SCR—Selective Catalytic Reduction

SMR—Small Modular Reactor

SO_2—Sulfur Dioxide

SRBA—Snake River Basin Adjudication

SWIP—South West Intertie Project

T&D—Transmission and Distribution

TRC—Total Resource Cost

UCT—Utility Cost Test

USBR—United States Bureau of Reclamation

USFS—United States Forest Service

VER—Variable Energy Resources

WECC—Western Electricity Coordinating Council

IRP REPORT:

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Introduction

The 2021 Integrated Resource Plan (IRP) is Idaho Power's 15th resource plan prepared in accordance with regulatory requirements and guidelines established by the Idaho Public Utilities Commission (IPUC) and the Oregon Public Utility Commission (OPUC).

The 2021 IRP evaluates the 20-year planning period from 2021 through 2040. During this period, Idaho Power's load is forecasted to grow by 1.4% per year for both average energy demand and peak-hour demand. Total average annual customers are expected to increase from just over 600,000 in 2021 to 847,000 by 2040. To meet this growing demand, the 20-year plan includes the addition of 3,790 megawatts (MW) of new non-carbon emitting resources consisting of wind, solar, and storage technologies, the addition of the Boardman to Hemingway (B2H) transmission line, and a variety of demand-side management resource additions totaling 540 MW.

IRP Methodology Improvements

The primary goal of the long-term resource planning process is to ensure Idaho Power's system has sufficient resources to reliably serve customer demand and flexible capacity needs. In each IRP, the company models resource needs over a 20-year planning period with the primary objective of minimizing costs and risks to customers.

As in prior planning cycles, Idaho Power used Energy Exemplar's AURORA model for the 2021 IRP. Under AURORA's Long-Term Capacity Expansion (LTCE) modeling approach, resources are selected from a variety of supply- and demand-side resource options to develop portfolios that are least-cost for the given alternative future scenarios with the objective of meeting a 15.5% planning margin and regulating reserve requirements associated with balancing load, wind, and solar-plant output. The model can also select to exit existing coal generation units, as well as build resources based on economics absent a defined capacity need. The LTCE modeling process is discussed in further detail in Chapter 9.

The 2021 IRP reflects significant modeling improvements over past resource planning processes. Idaho Power used AURORA's LTCE platform with varied success in the 2019 IRP. In the 2019 IRP, the LTCE was able to optimize for the entire western interconnection; however, it was incapable of simultaneously optimizing for Idaho Power's service area and the western interconnection. The company therefore went through a manual optimization process to determine an Idaho Power Preferred Portfolio. Between the 2019 and 2021 IRPs, the company worked with Energy Exemplar to add functionality that allows for co-optimization between the western interconnection and Idaho Power specifically. This ability to co-optimize allowed for a more streamlined modeling process. As a result, the resource portfolios developed in the 2021 IRP were optimized entirely within the LTCE platform, without manual adjustments, specific to Idaho Power's balancing area.

To ensure the AURORA-produced portfolios provide customers affordable energy, Idaho Power employed verification tests to validate the most economic portfolio under numerous variations of resources and timing.

To verify the AURORA-produced portfolios could meet Idaho Power's reliability requirements, Idaho Power leveraged a new method of measuring each portfolio's reliability through the calculation of a portfolio Loss of Load Expectation (LOLE). For those portfolios that did not achieve the minimum reliability threshold, an additional reliability resource requirement was added to the portfolio cost.

Details about the validation and verification process can be found in Chapter 9, and a discussion of the results can be found in Chapter 10. An in-depth discussion of the LOLE calculation process can be found in the Loss of Load Expectation section of *Appendix C—Technical Report*.

For the AURORA-developed portfolios, Idaho Power conducted a financial analysis of costs and benefits. The financial costs and benefits include:

- Construction costs
- Fuel costs
- Operations and Maintenance (O&M) costs
- Transmission upgrade costs associated with interconnecting new resource options
- Natural gas pipeline reservation or new natural gas pipeline infrastructure costs
- Projected wholesale market purchases and sales
- Anticipated environmental controls
- Market value of Renewable Energy Certificates (REC) for REC-eligible resources

As part of the 2021 IRP analysis, the company conducted economic sensitivity analyses on several resources, including the B2H transmission line project, which has been included in IRPs since 2009.

Further discussion of the treatment of B2H in the 2021 IRP capacity expansion modeling is provided in chapters 7, 9, and 10.

Additionally, to enhance the risk evaluation within the 2021 IRP, the company worked with the IRP Advisory Council (IRPAC) to develop four unique future scenarios to test. The company ultimately used these scenarios to determine whether the decisions being made within the

Action Plan window (2021–2027) are robust and reliable across different futures. The four future scenarios are:

- Rapid Electrification
- Climate Change
- 100% Clean by 2035
- 100% Clean by 2045

Portfolio Analysis Overview

For the 2021 IRP, Idaho Power identified several key features on which to build out resource portfolios. These features were preset in AURORA and then the LTCE model was used to optimize portfolios based on these set features. These key features are as follows:

- With and without the B2H project
- With and without portions of the Gateway West project
- Allowing the model to choose from specified Bridger Coal Plant exit date and natural gas conversion date assumptions to determine Idaho Power's system economics
- Aligning with PacifiCorp's (PAC) Bridger Coal Plant exit date and natural gas conversion date assumptions

These portfolios were compared against each other using various natural gas price forecasts (referred to as "planning" and "high") and carbon adder price forecasts ("zero," "planning," and "high"). The planning case for natural gas and carbon adder price forecasts represent Idaho Power's assessment of the most likely future.

To validate the resource selection and robustness of the Preferred Portfolio, the company performed additional scenario and sensitivity analyses, including the following:

- The resources selected in the Action Plan window of the Preferred Portfolio were compared to optimal resources selected for four future scenarios to determine the changes that would need to be made in each of those scenarios: Rapid Electrification, Climate Change, 100% Clean by 2035, and 100% Clean by 2045.
- Both low and high Cogeneration and Small Power Producers (CSPP) wind renewal assumptions were tested to determine the impact on the resources selected within the Action Plan window.
- A sensitivity was evaluated to test the cost-effectiveness of the Southwest Intertie Project (SWIP) North transmission project—a potential future partnership opportunity.

- Validation and verification studies were performed to test coal exit dates, Bridger unit natural gas conversions, and both supply-side and demand-side resources.
- Various tests and sensitivities were performed on the B2H project capacity, cost, and timing assumptions.

Table 1.1 shows the resource additions and coal exits that characterize Idaho Power's 2021 IRP Preferred Portfolio over the 20-year planning period.

Table 1.1 Preferred Portfolio additions and coal exits (MW)

	Base B2H (MW)								
Year	Gas	Wind	Solar	Storage	Trans.	DR	Coal Exits	EE Forecast	EE Bundles
2021	0	0	0	0	0	0	0	23	0
2022	0	0	0	0	0	300	0	24	0
2023	0	0	120	115	0	20	-357	24	0
2024	357	700	0	5	0	0	0	25	0
2025	0	0	300	105	0	20	-308	27	0
2026	0	0	215	0	500	0	0	28	0
2027	0	0	250	5	0	0	0	27	0
2028	0	0	120	55	0	0	-175	27	0
2029	0	0	100	255	0	0	0	26	0
2030	0	0	0	55	0	0	0	24	0
2031	0	0	0	55	0	0	0	24	0
2032	0	0	0	55	0	0	0	23	0
2033	0	0	0	100	0	0	0	22	0
2034	-357	0	100	150	0	0	0	21	0
2035	0	0	100	305	0	0	0	20	0
2036	0	0	0	55	0	0	0	16	0
2037	0	0	0	105	0	0	0	14	0
2038	0	0	100	155	0	20	0	12	0
2039	0	0	0	55	0	20	0	11	3
2040	0	0	0	55	0	20	0	10	9
Subtotal	0	700	1,405	1,685	500	400	-841	428	12
Total	**4,289**								

Preferred Portfolio Changes from the 2019 IRP

Compared to the 2019 IRP, the Preferred Portfolio of the 2021 IRP incorporates positive changes towards clean, low-cost resources, as well as an increased focus on system reliability. Table 1.2 highlights these changes.

Table 1.2 2021 IRP comparison to the 2019 IRP

2019 IRP Preferred Portfolio	2021 IRP Preferred Portfolio
The last coal generation unit exit was planned in 2030.	The last coal generation unit exit is planned in 2028 (two years earlier).
The B2H transmission line was identified as a least-cost resource.	B2H continues to be a least-cost resource.
411 MW of new natural-gas generation was identified in the plan.	The plan includes a conversion of Bridger coal units 1 and 2 to natural gas operation with a 2034 exit date.
400 MW of solar was included.	700 MW of wind plus 1,405 MW of solar are included.
80 MW of battery storage was identified.	1,685 MW of battery storage is included.
45 MW of additional Demand Response (DR) was selected.	In addition to updating existing DR programs to be more effective during high-risk hours, an additional 100 MW of DR is included.
No energy efficiency bundles were included beyond the measures determined to be cost-effective in the Potential Assessment.	In addition to the measures identified in the Potential Assessment, 12 MW of additional energy efficiency measures was selected, for a total of 440 MW of planned energy efficiency.

Importantly, the 2021 IRP was assessed on the same principles of minimizing cost and risk (the least-cost, least-risk portfolio) as the 2019 IRP. The outcome, however, is notably different between the two IRPs. The 2021 Preferred Portfolio includes significant amounts of clean resources—700 MW of wind, 1,405 MW of solar, and 1,685 MW of battery storage (some of it paired with solar). In contrast, the 2019 IRP Preferred Portfolio included no wind resources, roughly two-thirds less solar, and only a fraction of the amount of battery storage than was identified in the 2021 IRP.

The 2021 IRP also reflects different amounts and timing of thermal resources, with the company exiting all coal by 2028—two years earlier than the final coal exit date in the 2019 IRP. With respect to natural gas, the only gas additions in the 2021 IRP stem from the conversion of Bridger coal units 1 and 2 to natural gas resources, compared to 411 MW of new gas added in the 2019 IRP.

DR has also grown considerably in the 2021 IRP, with 100 MW included in the Preferred Portfolio compared to 45 MW in the 2019 IRP. Finally, energy efficiency expanded in the 2021 IRP, with 12 MW of additional energy efficiency selected—for a total of 440 MW of energy efficiency planned across the 20-year planning horizon.

Action Plan (2021–2027)

The Action Plan for the 2021 IRP reflects near-term actionable items of the Preferred Portfolio. The Action Plan identifies key milestones to successfully position Idaho Power to provide reliable, economic, and environmentally sound service to our customers into the future. The current regional electric market, regulatory environment, pace of technological change and Idaho Power's goal of 100% clean energy by 2045 make the 2021 Action Plan especially relevant.

The Action Plan associated with the Preferred Portfolio is driven by its core resource actions through 2027. These core resource actions include:

- 120 MW of added solar photovoltaic (PV) capacity in 2022
- Conversion of Bridger units 1 and 2 from coal to natural gas by summer 2024 with a 2034 exit date
- Seek to acquire significant capacity and energy resources to meet demand growth needs in 2023 through 2027
- Exit from both Bridger Unit 3 and Valmy Unit 2 by year-end 2025
- B2H online by summer 2026

The Action Plan is the result of the above resource actions and portfolio attributes, which are discussed in the following sections. Further discussion of the core resource actions and attributes of the Preferred Portfolio is included in Chapter 11. A chronological listing of the near-term actions follows in Table 1.3.

Table 1.3 Action Plan (2021–2027)

Year	Action
2022	Conduct ongoing B2H permitting activities. Negotiate and execute B2H partner construction agreements. Once the agreements are in place, file for a certificate of public convenience and necessity with state commissions.
2022	Discuss partnership opportunities related to SWIP-North with the project developer for more detailed evaluation in future IRPs.
2022–2023	Jackpot Solar is contracted to provide 120 MW starting December 2022. Work with the developer to determine, if necessary, mitigating measures if the project cannot meet the negotiated timeline.
2022–2024	Plan and coordinate with PacifiCorp and regulators for conversion to natural gas operation with a 2034 exit date for Bridger units 1 and 2. The conversion is targeted before the summer peak of 2024.
2022–2025	Issue a Request for Proposal (RFP) to procure resources to meet identified deficits in 2024 and 2025.
2022–2025	Plan and coordinate with PacifiCorp and regulators for the exit/closure of Bridger Unit 3 by year-end 2025 with Bridger Unit 4 following the Action Plan window in 2028.
2022–2025	Redesign existing DR programs then determine the amount of additional DR necessary to meet the identified need.
2022–2026	Conduct preliminary construction activities, acquire long-lead materials, and construct the B2H project.
2022–2027	Implement cost-effective energy efficiency measures each year as identified in the energy efficiency potential assessment.
2022–2027	Work with large-load customers to support their energy needs with solar resources.
2022–2027	Finalize candidate locations for distributed storage projects and implement where possible to defer T&D investments as identified in the Action Plan.
2025	Exit Valmy Unit 2 by December 31, 2025.
2025–2026	Subject to coordination with PacifiCorp, and B2H in-service prior to summer 2026, exit Bridger Unit 3 by December 31, 2025.

Given the complexities and ongoing developments related to Bridger units and B2H, an update on each is provided below.

Bridger Unit Conversions and Exits

Idaho Power owns one-third of Bridger units 1–4, and PacifiCorp owns the remaining two-thirds and is the plant operator. In its 2021 IRP, PacifiCorp concluded it would be cost-effective to convert Bridger units 1 and 2 to natural gas beginning in 2024 while continuing to operate units 3 and 4 as coal units through 2037. Idaho Power and PacifiCorp have not developed contractual terms that would be necessary to allow for the potential earlier exit or conversion to a non-coal fuel source by one party or both parties. Any new contractual terms may impact costs and assumptions, and therefore the specific timing of exits identified in the 2021 IRP.

For the 2021 IRP, Idaho Power used AURORA’s LTCE model to determine the best Bridger operating option specific to Idaho Power’s system subject to the following constraints:

- Unit 1—Allowed to exit year-end 2023 or convert to natural gas. If converted to natural gas, the unit will operate through 2034.

- Unit 2—Allowed to exit between year-end 2023 and year-end 2026 or convert to natural gas as early as year-end 2023. If converted to natural gas, the unit will operate through 2034.
- Unit 3—Can exit no earlier than year-end 2025 and no later than year-end 2034.
- Unit 4—Can exit no earlier than year-end 2027 and no later than year-end 2034.

The results of the LTCE model indicate that the conversion of units 1 and 2 to natural gas in 2023 is economical. The Preferred Portfolio identifies exits for units 3 and 4 year-end 2025 and 2028, respectively. To ensure the robustness of these modeling outcomes, the company performed a significant number of validation and verification studies around the Bridger conversions and coal exit dates. These validation and verification studies are detailed in Chapter 9.

Boardman to Hemingway

Idaho Power in the 2021 IRP requests acknowledgement of B2H based on the company owning 45% of the project. This ownership share, which represents a change from Idaho Power's 21% share in the 2019 IRP, is the result of negotiations among Idaho Power, PacifiCorp, and Bonneville Power Administration (BPA). Under such a structure, Idaho Power would absorb BPA's previously assumed ownership share in exchange for BPA entering into a transmission service agreement with Idaho Power. This arrangement, along with many other aspects of B2H, will be detailed in *Appendix D*, which will be filed during the first quarter of 2022.

The Preferred Portfolio, which includes B2H, is significantly more cost-effective than the best alternative portfolio that did not include B2H.

- Base with B2H Portfolio NPV (Preferred Portfolio)—$7,942.4 million
- Base without B2H PAC Bridger Alignment Portfolio NPV—$8,207.9million
- B2H NPV Cost Effectiveness Differential—$265.5 million

Under planning conditions, the Base with B2H (Preferred Portfolio) is approximately $266 million more cost effective than the best portfolio that did not include the B2H project. Detailed portfolio costs can be found in Chapter 10.

IDAHO POWER
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IRP REPORT:
BACKGROUND

1. BACKGROUND

Integrated Resource Plan

Idaho Power's resource planning process has four primary goals:

1. Identify sufficient resources to reliably serve the growing demand for energy and flexible capacity within Idaho Power's service area throughout the 20-year planning period.
2. Ensure the selected resource portfolio balances cost and risk while also considering environmental factors.
3. Give equal and balanced treatment to supply-side resources, demand-side measures, and transmission resources.
4. Involve the public in the planning process in a meaningful way.

The IRP evaluates a 20-year planning period in which demand is forecasted and additional resource requirements are identified.

Idaho Power relies on current resources including hydroelectric projects, solar PV projects, wind farms, geothermal plants, natural gas-plants, coal-facilities, and energy markets via transmission interconnections. The company's existing supply-side resources are detailed in Chapter 4, while possible future supply-side resources, including storage, are explored in Chapter 5.

Other resources relied on for planning include DSM and transmission resources, which are further explored in Chapters 6 and 7, respectively. The goal of DSM programs is to achieve cost-effective energy efficiency savings and provide an optimal amount of peak reduction from DR programs. Idaho Power also strives to provide customers with tools and information to help them manage their own energy use. The company achieves these objectives by implementing and carefully managing incentive programs as well as through outreach and education.

Idaho Power's resource planning process evaluates additional stand-alone transmission capacity as a resource alternative to serve retail customers. Transmission projects are often regional resources, and Idaho Power coordinates transmission planning as a member of NorthernGrid. Idaho Power is obligated under Federal Energy Regulatory Commission (FERC) regulations to plan and expand its local transmission system to provide requested firm transmission service to third parties and to construct and place in service sufficient transmission capacity to reliably deliver energy and capacity to network customers and Idaho Power retail customers. The delivery of energy, both within Idaho Power's system and through regional transmission interconnections, is of increasing importance for several reasons. First, adequate transmission is essential for robust participation in the Energy

Imbalance Market (EIM). Second, it is necessary to unlock geographic resource diversity benefits for Variable Energy Resources (VER). The timing of new transmission projects is subject to complex permitting, siting, and regulatory requirements and coordination with co-participants.

Public Advisory Process

Idaho Power has involved representatives of the public in the resource planning process since the early 1990s. The IRPAC meets regularly during the development of the resource plan, and the meetings are open to the public. Members of the council include staff from the IPUC and OPUC; political, environmental, and customer representatives; and representatives of other public-interest groups. Many members of the public also participate in the IRPAC meetings. Some individuals have participated in Idaho Power's resource planning process for over 20 years. A list of the 2021 IRPAC members can be found in *Appendix C—Technical Report*.

For the 2021 IRP, Idaho Power facilitated nine IRPAC meetings and three additional workshops. All 2021 IRPAC meetings were conducted virtually, which resulted in increased and more diverse participation of members and the general public. The company received positive feedback from IRPAC members that the virtual forum was logistically easier and aided in the presentation and review of materials.

To further enhance engagement, Idaho Power also maintained an online webpage for stakeholders to submit requests for information and for Idaho Power to provide responses. The webpage allowed stakeholders to develop their understanding of the IRP process, particularly its key inputs, consequently enabling more meaningful stakeholder involvement. The company made presentation slides and other materials used at the IRPAC meetings, in addition to the question-submission portal and other IRP documents, available to the public on its website at idahopower.com/IRP.

IRP Methodology

The primary goal of the IRP is to ensure Idaho Power's system has sufficient resources to reliably serve customer demand and flexible capacity needs over the 20-year planning period while also minimizing costs and risks to customers. This process is completed, and a new plan is produced every two years. To ensure Idaho Power's growing need for energy is sufficiently met, the capability of the existing system is included and then resources are added (or removed). Multiple portfolios consisting of varying resource additions are produced. Resource additions include supply-side resources like solar plus storage generation facilities; demand-side resources like energy efficiency measures; and transmission projects that increase access to energy markets. The portfolios are then compared, and the portfolio that best minimizes cost and risk is selected in the plan.

Cost

Costs for each portfolio include the capital costs of designing and constructing each resource, including transmission builds and expansions, through the 20-year timeframe of the plan. Operational costs—such as fuel costs, maintenance costs, environmental controls, and the price to purchase and sell energy on the electrical market—are forecasted and included to compare the cost effectiveness of each portfolio.

Risk

Typical of long-term planning, uncertainty grows the further into the future one attempts to evaluate. Acknowledging this uncertainty and the risk this creates, the 2021 IRP includes a robust risk analysis and approaches the subject in three different ways.

The first risk analysis method evaluates different future scenarios to test the decisions being made, especially in the near term. Future scenarios typically include multiple assumptions that fit together to define the scenario. To enhance the risk evaluation within the 2021 IRP, the company worked with the IRPAC to develop four unique future scenarios. The company ultimately used these scenarios to test whether the decisions being made within the Action Plan window (2021–2027) are robust across multiple futures. The four future scenarios are as follows:

1. Rapid Electrification
2. Climate Change
3. 100% Clean by 2035
4. 100% Clean by 2045

In addition to the scenarios above, the 2021 IRP also evaluated key inputs (e.g., natural gas and carbon price forecasts) and derived bookend assumptions (e.g., wind contract renewal assumptions) to test portfolio risk, and these are discussed in detail in Chapter 9.

The second method employed by the 2021 IRP is an analysis of stochastic risk. Stochastic analyses help quantify the sensitivity and risk associated with variables over which Idaho Power has little or no control. For more information, see Chapter 10.

Finally, the third method of risk analysis is qualitative which is used to identify risks that are not easily quantified. A detailed discussion of qualitative risk can be found in Chapter 10.

Modeling

Due to the complexity involved in an analysis that includes a 20-year forecast for energy demand, fuel prices, resource costs and more, Idaho Power uses modeling software to generate and optimize resources selected in portfolios. For the 2021 IRP, the company utilized the

AURORA LTCE platform to generate resource portfolios. The software evaluates how to cost-effectively meet future needs by selecting resources that are optimized within modeling constraints.

LTCE tools have evolved over time, making them more effective with each iteration of the IRP process. As an example, for the 2019 IRP, the capacity expansion software was able to optimize for the entire western interconnection; however, it was incapable of simultaneously optimizing for Idaho Power's service area and the western interconnection. Between the 2019 and 2021 IRPs, the company worked with the software provider to add functionality allowing for co-optimization between the Idaho Power and the western interconnection. As a result, the resource portfolios developed in the 2021 IRP were optimized entirely within the Aurora LTCE platform, without manual adjustments, specific to Idaho Power's balancing area.

Validation and Verification

In the 2021 IRP, to ensure the AURORA LTCE model produced an optimized portfolio, the company employed additional verification tests to ensure the model produced an optimized solution within its modeling tolerance. Verification tests were performed to validate the most economic portfolio under numerous variations of resources and timing.

To verify the AURORA-produced portfolios meet Idaho Power's reliability requirements, Idaho Power measured each portfolio's reliability by calculating a portfolio LOLE. For those portfolios that did not achieve the minimum reliability threshold, an additional reliability cost was added to the portfolio cost. This additional cost was derived from the fixed cost of a gas resource and places portfolios on a comparable reliability basis. With the additional resource adjustment, all portfolios meet the reliability threshold.

Details about the validation and verification process can be found in Chapter 9, and a discussion of the results can be found in Chapter 10. An in-depth discussion of the LOLE calculation process can be found in the Loss of Load Expectation section of *Appendix C—Technical Report*.

Energy Risk Management Policy

While the 2021 IRP addresses Idaho Power's long-term resource needs, near-term energy needs are evaluated in accordance with the company's *Energy Risk Management Policy* and *Energy Risk Management Standards*. The risk management standards were collaboratively developed in 2002 among Idaho Power, IPUC staff, and interested customers (IPUC Case No. IPC-E-01-16). The risk management standards provide guidelines for Idaho Power's physical and financial hedging and are designed to systematically identify, quantify, and manage the exposure of the company and its customers to uncertainties related to the energy markets in which Idaho Power is an active participant. The risk management standards specify an

18-month load and resource review period, and Idaho Power's Risk Management Committee assesses the resulting operations plan monthly.

IDAHO POWER
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IRP REPORT:

POLITICAL, REGULATORY, AND OPERATIONAL CONSIDERATIONS

2. POLITICAL, REGULATORY, AND OPERATIONAL CONSIDERATIONS

Idaho Strategic Energy Alliance

Under the umbrella of the Idaho Governor's Office of Energy and Mineral Resources, the Idaho Strategic Energy Alliance (ISEA) was established to help develop effective and long-lasting responses to existing and future energy challenges. The purpose of the ISEA is to enable the development of a sound energy portfolio that emphasizes the importance of an affordable, reliable, and secure energy supply.

The ISEA strategy to accomplish this purpose rests on three foundational elements: 1) maintaining and enhancing a stable, secure, and affordable energy system; 2) determining how to maximize the economic value of Idaho's energy systems and in-state capabilities, including attracting jobs and energy-related industries and creating new businesses with the potential to serve local, regional, and global markets; and 3) educating Idahoans to increase their knowledge about energy and energy issues.

Idaho Power representatives serve on the ISEA Board of Directors and several volunteer task forces on the following topics:

- Energy efficiency and conservation
- Wind
- Geothermal
- Hydropower
- Baseload resources
- Biogas
- Biofuel
- Solar
- Transmission
- Communication and outreach
- Energy storage
- Transportation

Idaho Energy Landscape

In 2021, the ISEA prepared the *2021 Idaho Energy Landscape Report* to help Idahoans better understand the contemporary energy landscape in the state and to make informed decisions about Idaho's energy future.[1]

The *2021 Idaho Energy Landscape Report* concludes, "The strength of Idaho's economy and the quality of life in Idaho depend upon access to affordable and reliable energy resources."[1] The report provides information about energy resources, production, distribution, and use in the state. The report also discusses the need for reliable, affordable, and sustainable energy for individuals, families, and businesses while protecting the environment to achieve sustainable economic growth and maintain Idaho's quality of life.

The 2021 report finds a weakening correlation between economic growth and energy consumption due to technological changes and the increased use of energy efficiency. Idaho's gross domestic product grew 4.8% annually from 1998 to 2018, yet Idaho's energy consumption (transportation, heat, light, and power) grew just 0.5% annually from 1998 to 2018.[1]

Despite the modest growth in energy consumption, Idaho continues to be a net importer of energy, which requires a robust and well-maintained infrastructure of highways, railroads, pipelines, and transmission lines. Approximately 23% of Idaho's electricity was composed of market purchases and energy imports from out-of-state generating resources owned by Idaho utilities.[1]

The report states that low average rates for electricity and natural gas are the most important feature of Idaho's energy outlook. Large hydroelectric facilities on the Snake River and other tributaries of the Columbia River provide energy and flexibility required to meet the demands of this growing region. Based on 2018 data, hydroelectricity is the largest source of Idaho's electricity, comprising 63%. Natural gas makes up 15%, and non-hydro renewables, principally wind power, solar, geothermal, and biomass, account for approximately 21%.[1] Idaho's electricity rates were the third lowest among the 50 states and the District of Columbia in 2019.[1]

[1] https://oemr.idaho.gov/wp-content/uploads/Idaho-Energy-Landscape-2021.pdf. Accessed September 2021.

State of Oregon 2020 Biennial Energy Report

In 2017, the Oregon Department of Energy (ODOE) introduced House Bill (HB) 2343, which charges the ODOE to develop a new biennial report to inform local, state, regional, and federal energy policy development and energy planning and investments. The *2020 Biennial Energy Report*[2] provides foundational energy data about Oregon and examines the existing policy landscape while identifying options for continued progress toward meeting the state's goals in the areas of climate change, renewable energy, transportation, energy resilience, energy efficiency, and consumer protection.

The biennial report shows an evolving energy supply in Oregon. While Oregon's energy consumption consists primarily of hydroelectric power, coal, and natural gas, renewable energy continues to make up an increasing share of the energy mix each year. With the increase in renewable energy sources, other resources in the electricity mix have changed as well. The amount of coal included in Oregon's resource mix has dropped since 2005. Natural gas, a resource that can help to integrate the hourly variation of renewable resources and help smooth out seasonal hydro variation, has steadily increased its share of Oregon's resource mix since 1990.

The main theme of the 2020 biennial report was Oregon's transition to a low-carbon economy. According to the report, achieving Oregon's energy and climate goals, while protecting consumers, will take collaboration among state agencies, policy makers, state and local governments, and private-sector business and industry leaders.[3]

FERC Relicensing

Like other utilities that operate non-federal hydroelectric projects on qualified waterways, Idaho Power obtains licenses from FERC for its hydroelectric projects. The licenses last for 30 to 50 years, depending on the size, complexity, and cost of the project.

Hells Canyon Dam

Idaho Power's remaining and most significant ongoing relicensing effort is for the Hells Canyon Complex (HCC). The HCC provides approximately 70% of

[2] https://energyinfo.oregon.gov/ber. Accessed September 2021.

[3] Oregon Department of Energy, *2020 Biennial Energy Report*.

Idaho Power's hydroelectric generating capacity and 30% of the company's total generating capacity. The original license for the HCC expired in July 2005. Until the new, multi-year license is issued, Idaho Power continues to operate the project under annual licenses issued by FERC. The HCC provides clean energy to Idaho Power's system, supporting Idaho Power's long-term clean energy goals. The HCC also provides flexible capacity critical to the successful integration of VERs, further enabling the achievement of Idaho Power's clean energy goals.

Idaho Power's HCC license application was filed in July 2003 and accepted by FERC for filing in December 2003. FERC has been processing the application consistent with the requirements of the *Federal Power Act of 1920*, as amended (FPA); the *National Environmental Policy Act of 1969*, as amended (NEPA); the *Endangered Species Act of 1973* (ESA); the *Clean Water Act of 1972* (CWA); and other applicable federal laws. Since issuance of the final environmental impact statement (EIS) (NEPA document) in 2007, FERC has been waiting for Idaho and Oregon to issue a final Section 401 certification under the CWA. The states issued the final CWA 401 certification on May 24, 2019. In July 2019, three third parties filed lawsuits against the Oregon Department of Environmental Quality in Oregon state court challenging the Oregon CWA 401 certification. Two of the lawsuits were consolidated, and Idaho Power intervened in that lawsuit. The parties reached a settlement in September 2021. The court dismissed the third challenge with prejudice. No parties challenged the Idaho CWA 401 certification. FERC will now be able to continue with the relicensing process, which includes consultation under the ESA, among other actions.

Efforts to obtain a new multi-year license for the HCC are expected to continue until a new license is issued, which Idaho Power believes is likely in 2024 or thereafter.

After a new multi-year license is issued, further costs will be incurred to comply with the terms of the new license. Because the new license for the HCC has not been issued, and discussions on protection, mitigation, and enhancement (PM&E) packages are still being conducted, Idaho Power cannot determine the ultimate terms of, and costs associated with, any resulting long-term license.

In addition to the relicensing of the HCC, Idaho Power is also relicensing its American Falls hydroelectric project. Its FERC license expires in 2025.

Relicensing activities include the following:

- Coordinating the relicensing process
- Consulting with regulatory agencies, tribes, and interested parties on resource and legal matters

- Preparing and conducting studies on fish, wildlife, recreation, archaeological resources, historical flow patterns, reservoir operations and load shaping, forebay and river sedimentation, and reservoir contours and volumes
- Analyzing data and reporting study results
- Preparing all necessary reports, exhibits, and filings to support ongoing regulatory processes related to the relicensing effort

Failure to relicense any of the existing hydroelectric projects at a reasonable cost will create upward pressure on the electric rates of Idaho Power customers. The relicensing process also has the potential to decrease available capacity and increase the cost of a project's generation through additional operating constraints and requirements for environmental PM&E measures imposed as a condition of relicensing. Idaho Power's goal throughout the relicensing process is to maintain the low cost of generation at the hydroelectric facilities while implementing non-power measures designed to protect and enhance the river environment. As noted earlier, Idaho Power views the relicensing of the HCC as critical to its clean energy goals.

No reduction of the available capacity or operational flexibility of the hydroelectric plants to be relicensed has been assumed in the 2021 IRP.

Idaho Water Issues

Power generation at Idaho Power's hydroelectric projects on the Snake River and its tributaries is dependent on the state water rights held by the company for these projects. The long-term sustainability of the Snake River Basin streamflows, including tributary spring flows and the regional aquifer system, is crucial for Idaho Power to maintain generation from these projects. Idaho Power is dedicated to the vigorous defense of its water rights. Idaho Power's ongoing participation in water-right issues and studies is intended to guarantee sufficient water is available for use at the company's hydroelectric projects on the Snake River.

Idaho Power, along with other Snake River Basin water-right holders, was engaged in the Snake River Basin Adjudication (SRBA), a general streamflow adjudication process started in 1987 to define the nature and extent of water rights in the Snake River Basin. Idaho Power filed claims for all its hydroelectric water rights in the SRBA. Because of the SRBA, Idaho Power's water rights were adjudicated, resulting in the issuance of partial water-right decrees. The Final Unified Decree for the SRBA was signed on August 25, 2014.

The initiation of the SRBA resulted from the Swan Falls Agreement entered into by Idaho Power and the governor and attorney general of the State of Idaho in October 1984. The Swan Falls Agreement resolved a struggle over the company's water rights at the Swan Falls Hydroelectric Project (Swan Falls Project). The agreement stated Idaho Power's water rights at its hydroelectric facilities between Milner Dam and Swan Falls entitled Idaho Power to a minimum flow at Swan Falls of 3,900 cubic feet per second (cfs) during the irrigation season and 5,600 cfs during the non-irrigation season.

The Swan Falls Agreement placed the portion of the company's water rights beyond the minimum flows in a trust established by the Idaho Legislature for the benefit of Idaho Power and Idahoans. Legislation establishing the trust granted the state authority to allocate trust water to future beneficial uses in accordance with state law. Idaho Power retained the right to use water in excess of the minimum flows at its facilities for hydroelectric generation until it was reallocated to other uses.

Idaho Power filed suit in the SRBA in 2007 because of disputes about the meaning and application of the Swan Falls Agreement. The company asked the court to resolve issues associated with Idaho Power's water rights and the application and effect of the trust provisions of the Swan Falls Agreement. In addition, Idaho Power asked the court to determine whether the agreement subordinated Idaho Power's hydroelectric water rights to aquifer recharge.

A settlement signed in 2009 reaffirmed the Swan Falls Agreement and resolved the litigation by clarifying the water rights held in trust by the State of Idaho are subject to subordination to future upstream beneficial uses, including aquifer recharge. The settlement also committed the State of Idaho and Idaho Power to further discussions on important water-management issues concerning the Swan Falls Agreement and the management of water in the Snake River Basin. Idaho Power and the State of Idaho are actively involved in those discussions. The settlement recognizes water-management measures that enhance aquifer levels, springs, and river flows—such as managed aquifer-recharge projects—to benefit agricultural development and hydroelectric generation.

Idaho Power initiated and pursued a successful weather modification (cloud seeding) program in the Snake River Basin. The company then partnered with an existing program in the Upper Snake River Basin and has cooperatively expanded the existing weather-modification program, along with forecasting and meteorological data support. In 2014, Idaho Power expanded its cloud-seeding program to the Boise and Wood River basins, in collaboration with basin water users and the Idaho Water Resource Board (IWRB). Wood River cloud seeding, along with the Upper Snake River activities, will benefit the Eastern Snake River Plain Aquifer (ESPA) Comprehensive Aquifer Management Plan implementation through additional water supply.

Water-management activities for the ESPA are currently being driven by the recent agreement between the Surface Water Coalition and the Idaho Ground Water Appropriators. This agreement settled a call by the Surface Water Coalition against groundwater appropriators for the delivery of water to its members at the Minidoka and Milner dams. The agreement provides a plan for the management of groundwater resources on the ESPA, with the goal of improving aquifer levels and spring discharge upstream of Milner Dam. The plan provides short- and long-term aquifer level goals that must be met to ensure a sufficient water supply for the Surface Water Coalition. The plan also references ongoing management activities, such as aquifer recharge. The plan provides the framework for modeling future management activities on the ESPA. These management activities are included in the modeling of hydropower production through the IRP planning horizon.

On November 4, 2016, Idaho Department of Water Resources (IDWR) Director Gary Spackman signed an order creating a Ground Water Management Area (GWMA) for the ESPA. Spackman told the Idaho Water Users Association at their November 2016 Water Law Seminar:

> By designating a groundwater management area in the Eastern Snake Plain Aquifer region, we bring all of the water users into the fold—cities, water districts and others—who may be affecting aquifer levels through their consumptive use. […] As we've continued to collect and analyze water data through the years, we don't see recovery happening in the ESPA. We're losing 200,000 acre-feet of water per year.

Spackman said creating a GWMA will embrace the terms of a historic water settlement between the Surface Water Coalition and groundwater users, but the GWMA for the ESPA will also seek to bring other water users under management who have not joined a groundwater district, including some cities.

Variable Energy Resource Integration

Since the mid-2000s, Idaho Power has completed multiple studies investigating the impacts and costs associated with integrating VERs, such as wind and solar, without compromising reliability. Idaho Power's most recent VER Integration study was completed in 2020.

For the 2020 VER Integration study, Idaho Power worked in conjunction with a technical review committee and retained Energy and Environmental Economics, Inc. (E3) to perform the study. Through the analysis, E3 determined updated VER integration costs and regulation reserve requirements for various VER addition scenarios for a 2023 model year.

Improving on the 2018 VER study to model Idaho Power's new participation in the EIM, E3's analysis utilized Energy Exemplar's PLEXOS software to allow for modeling the system in four stages: day ahead, hour ahead, 15-minute, and 5-minute markets. Idaho Power joined the EIM in the second quarter of 2018. The addition of the EIM market allows for balancing of forecast errors in real time.

In compliance with Order 21-198 in Oregon Docket UM 1730, Idaho Power filed the 2020 VER study, which described the methods followed by Idaho Power to estimate the amounts of regulating reserves necessary to integrate VER without compromising system reliability.

The methods followed in the 2020 VER study yielded estimated regulating reserve requirements necessary to balance the netted system of load, wind, and solar (net load).

For the 2021 IRP analysis, the 2020 VER study defined the hourly reserves needed to reliably operate the system based on current and future quantities of solar and wind generation and load forecasted by season and time of day. The reserves are defined separately, incorporating their combined diversity benefits dynamically in the modeling. The reserve rules applied in the 2021 IRP include defining hourly reserve requirements for "Load Up," "Load Down," "Solar Up," "Solar Down," "Wind Up," and "Wind Down."

Oregon Community Solar Program

In 2016, the Oregon Legislature enacted Senate Bill (SB) 1547, which requires the OPUC to establish a program for the procurement of electricity from community solar projects. Community solar projects provide electric company customers the opportunity to share in the costs and benefits associated with the electricity generated by solar photovoltaic systems, as owners of or subscribers to a portion of the solar project.

Since 2016, the OPUC has conducted an inclusive implementation process to carefully design and execute a program that will operate successfully, expand opportunities, and have a fair and positive impact across electric company ratepayers. After an inclusive stakeholder process, the OPUC adopted formal rules for the Community Solar Pilot program on June 29, 2017, through Order No. 17-232, which adopted Division 88 of Chapter 860 of the Oregon Administrative Rules. The rules also define the program size, community solar project requirements, program participant requirements, and details surrounding the opportunity for low-income participants, as well as information regarding on-bill crediting.

Under the Oregon Community Solar Program rules, Idaho Power's initial capacity tier is 3.3 MW. As of the date of this IRP filing, Idaho Power has executed all the necessary agreements with Verde Light, a 2.95-MW project that intends to participate in the community solar program, with a planned in-service date of July 2022. The company believes the project is well positioned to obtain the necessary certifications to participate in the program. The proposed 2.95-MW project will use all but 305 kilowatts (kW) of Idaho Power's initial capacity allocation.

Additionally, Order No. 17-232 requires Idaho Power to: 1) include all energized community solar projects participating in the community solar program in its generation mix included in its IRP and 2) include forecasts of market potential for community solar projects when assessing the load-resource balance in the IRP. Because the potential project is not planning to be operational until mid-2022, the resource has not been included in this IRP. Once operational, the project will be included as part of the generation mix in future IRP cycles.

Renewable Energy Certificates

A REC, also known as a green tag, represents the green or renewable attributes of energy produced by a certified renewable resource. Specifically, a REC represents the renewable attributes associated with the production of 1 MWh of electricity generated by a qualified renewable energy resource, such as a wind turbine, geothermal plant, or solar facility. The purchase of a REC buys the renewable attributes, or "greenness," of that energy.

A renewable or green energy provider (e.g., a wind farm) is credited with one REC for every 1 MWh of electricity produced. RECs produced by a certified renewable resource can either be sold together with the energy (bundled), sold separately (unbundled), or be retired to comply with a state- or federal-level renewable portfolio standard (RPS). An RPS is a policy requiring a minimum amount (usually a percentage) of the electricity each utility delivers to customers to come from renewable energy resources. See Idaho Power's RPS Obligations in the Renewable Portfolio Standard section. The entity that retires a REC can also claim the renewable energy attributes of the corresponding amount of energy delivered to customers.

A certification system gives each REC a unique identification number to facilitate tracking purchases, sales, and retirements. The electricity produced by the renewable resource is fed into the electrical grid, and the associated REC can then be used (retired), held (banked), or traded (sold).

REC prices depend on many factors, including the following:

- The location of the facility producing the RECs
- REC supply/demand
- Whether the REC is certified for RPS compliance
- The generation type associated with the REC (e.g., wind, solar, geothermal)
- Whether the RECs are bundled with energy or unbundled

When Idaho Power sells RECs, the proceeds are returned to Idaho Power customers through each state's power cost adjustment (PCA) mechanisms as directed by the IPUC in Order No. 32002 and by the OPUC in Order No. 11-086. Idaho Power cannot claim the renewable attributes associated with RECs that are sold. The new REC owner has purchased the rights to claim the renewable attributes of that energy.

Clean Energy Your Way

On Thursday, December 2, 2021, the company filed an application with the IPUC to expand optional customer clean energy offerings through the Clean Energy Your Way Program. Idaho Power has long supported customers' individual goals and initiatives to achieve clean energy through various program offerings, as well as becoming one of the first investor-owned utilities to proactively establish a 100% clean energy goal by 2045. This request will allow the company to better meet the needs of the growing number of customers and communities pursuing or exploring sustainability targets, such as powering their operations on 100% renewable energy by the end of the decade—if not sooner.

More specifically, the company requested authority to 1) rename the existing Idaho Schedule 62 Green Power Purchase Program Rider to Clean Energy Your Way—Flexible, 2) establish a regulatory framework for a future voluntary subscription green power service offering named Clean Energy Your Way—Subscription, and 3) offer a tailored renewable option to the company's largest customers (Special Contract and Schedule 19, Large Power Service) named Clean Energy Your Way—Construction.

While the Flexible option (Schedule 62—Green Power Program) is currently available to customers in both Idaho and Oregon; the Subscription and Construction options will initially be offered to the company's Idaho customers.

This proposed program provides three options for customers to purchase renewable energy:

Clean Energy Your Way—Flexible

The Flexible offering is a renaming of the existing Green Power Program. Business and residential customers would continue to purchase renewable energy in blocks of 100 kilowatt-hours (kWh) or covering 100% of their usage.

This option is available today in both Idaho and Oregon as Schedule 62—Green Power Program. Once the Clean Energy Your Way proposal is approved, the option will remain, but under the new name.

Clean Energy Your Way—Subscription

The Subscription offering will provide opportunities for business and residential customers in Idaho to receive an amount of renewable energy equal to either 50% or 100% of their historic average annual energy use by subscribing to a new renewable resource. This resource would be built upon approval of the IPUC—the type and timing of the resource would be determined through a subsequent phase of the implementation process, with size dependent upon customer interest. Subscription terms are intended to provide customers the ability to "opt-in and opt-out" based on their individual preferences. Terms for residential customers could be as short as monthly, and terms for business customers would range from 5 to 20 years.

This offering will require a two-phase approval process by the IPUC. Upon IPUC approval to offer a voluntary subscription option, the next step will be to identify a new renewable resource to serve the program, then return to the IPUC for approval to develop that resource and establish customer pricing for the program. In the interim, Idaho Power has provided an opportunity for customers to express interest in the Subscription offering so the company can provide updates as the program progresses.

Clean Energy Your Way—Construction

The Construction offering will enable industrial customers (Special Contract and Schedule 19 customers) to partner with Idaho Power to develop new renewable resources through a long-term arrangement. Customers would have the ability to work with Idaho Power and provide input on the size, location, and type of renewable project (i.e., wind or solar) to meet their individual requirements. The new renewables must connect to Idaho Power's system, but customers would claim the renewable attributes as their own.

This offering will require detailed, negotiated contracts between an Idaho customer and Idaho Power that will require individual approval by the IPUC.

Renewable Portfolio Standard

As part of the *Oregon Renewable Energy Act of 2007* (Senate Bill 838), the State of Oregon established a Renewable Portfolio Standard (RPS) for electric utilities and retail electricity suppliers. Under the Oregon RPS, Idaho Power is classified as a smaller utility because the company's Oregon customers represent less than 3% of Oregon's total retail electric sales. In 2020 per United States Energy Information Administration (EIA) data, Idaho Power's Oregon customers represented 1.4% of Oregon's total retail electric sales. As a smaller utility in Oregon, Idaho Power will likely have to meet a 5% RPS requirement beginning in 2025.

In 2016, the Oregon RPS was updated by Senate Bill 1547 to raise the target from 25% by 2025 to 50% renewable energy by 2040; however, Idaho Power's obligation as a smaller utility does not change. Additionally, the Oregon Legislature in 2021 passed House Bill 2021, which sets greenhouse gas emissions reduction requirements associated with electricity sold to utility customers. Idaho Power is exempt from the conditions of this bill, as the company has fewer than 25,000 retail customers in Oregon.

The State of Idaho does not currently have an RPS.

Carbon Adder/Clean Power Plan

In June 2014, the United States Environmental Protection Agency (EPA) released, under Section 111(d) of the *Clean Air Act of 1970*, a proposed rule for addressing greenhouse gas (GHG) from existing fossil fuel electric generating units. The proposed rule was intended to achieve a 30% reduction in carbon dioxide (CO_2) emissions from the power sector by 2030. In August 2015, the EPA released the final rule under Section 111(d) of the Clean Air Act, referred to as the Clean Power Plan, which required states to adopt plans to collectively reduce 2005 levels of power sector CO_2 emissions by 32% by 2030.

In June 2019, the EPA released the Affordable Clean Energy rule to replace the Clean Power Plan under Section 111(d) of the Clean Air Act for existing electric utility generating units. In August 2019, 22 states sued the EPA in federal appeals court to challenge the Affordable Clean Energy rule. In January 2021, the United States Court of Appeals for the District of Columbia Circuit vacated the Affordable Clean Energy rule in its entirety and directed the EPA to create a new regulatory approach. On February 12, 2021, the EPA issued a memorandum notifying states that it will not require states to submit plans to the EPA under Section 111(d) of the Clean Air Act because the Court vacated the Affordable Clean Energy rule without reinstating the Clean Power Plan.

In January 2021, the new presidential administration issued several executive orders to establish new federal environmental mandates, revoke several existing executive orders, and require agencies to review regulations related to environmental matters issued by the previous presidential administration. One executive order rejoined the United States to the Paris Agreement on climate change, which requires commitments to reduce GHG emissions, among other things. A more recent executive order, signed by President Biden on December 8, 2021, seeks to leverage government actions and procurement to further the clean energy transition. Among several directives in the order are requirement to achieve net-zero emissions from federal procurement and from overall federal operations by 2050.[4]

On March 2, 2021, the House Energy and Commerce Committee released a discussion draft of the Climate Leadership and Environmental Action for Our Nation’s Future Act (CLEAN Future Act), which is intended to achieve the committee’s goal of reaching economy-wide net-zero GHG emissions by 2050. Title II of the CLEAN Future Act includes a suite of measures focused on the United States electric power sector. As proposed, Subtitle A includes a nationwide clean electricity standard, which would require all retail electricity suppliers to obtain 100% of their electricity from clean energy sources by 2035. With the CLEAN Future Act still in draft form, it is unclear what will be required, if anything, as a clean energy standard for electricity suppliers.

[4] https://www.whitehouse.gov/briefing-room/statements-releases/2021/12/08/fact-sheet-president-biden-signs-executive-order-catalyzing-americas-clean-energy-economy-through-federal-sustainability/

IDAHO POWER
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IRP REPORT:

CLIMATE CHANGE

3. CLIMATE CHANGE

Idaho Power recognizes the need to assess the impacts of climate change on our industry, customers, and on long-term planning. The company undertakes a variety of analysis exercises and impact evaluations to understand and prepare for climate change. This new chapter of the IRP focuses on identifying climate-related risks, discussing the company's approach to monitoring and mitigating identified risks, and examining climate-related risk considerations in the IRP.

In a climate change assessment, it is important to underscore the distinction between mitigation and adaptation. Climate change mitigation refers to efforts associated with reducing the severity of climate change, most commonly through the reduction of GHG emissions, primarily CO_2. In contrast, climate change adaptation involves understanding the scope of potential physical and meteorological changes that could result from climate change and identifying ways to adapt to such changes. Idaho Power's climate change risk assessment examines both mitigation and adaptation in the sections below.

Climate Change Mitigation

Our Clean Energy Goal—Clean Today. Cleaner Tomorrow.®

In March 2019, Idaho Power announced a goal to provide 100% clean energy by 2045. This goal furthers Idaho Power's legacy as a leader in clean energy. The key to achieving this goal of 100% clean energy is the company's existing backbone of hydropower—our largest energy source—as well as the plan contained in the Preferred Portfolio to continue reducing carbon emissions by ending reliance on coal plants by year-end 2028.

The Preferred Portfolio identified in this 2021 IRP reflects a clean mix of generation and transmission resources that ensures reliable, affordable energy using technologies available today. Achieving our 100% clean energy goal, however, will require technological advances and reductions in cost, as well as a continued focus on energy efficiency and demand-response programs. As it has over the past decade, the IRPAC will continue to play a fundamental role in updating the IRP every two years, including analyzing new and evolving technologies to help the company on its path toward a cleaner tomorrow while providing low-cost, reliable energy to our customers.

Idaho Power Carbon Emissions

Limiting the impact of climate change requires reducing GHG emissions, primarily CO_2. Idaho Power's CO_2 emission levels have historically been well below the national average for the 100 largest electric utilities in the United States, both in terms of emissions intensity (pounds per megawatt-hour [MWh] generation) and total CO_2 emissions (tons). The overall declining trend of carbon demonstrates Idaho Power's commitment to reducing emissions.

This is shown in the graph 3.1 and 3.2 with the dashed black line indicating the long-term trend and the green line indicating the actual annual amounts.

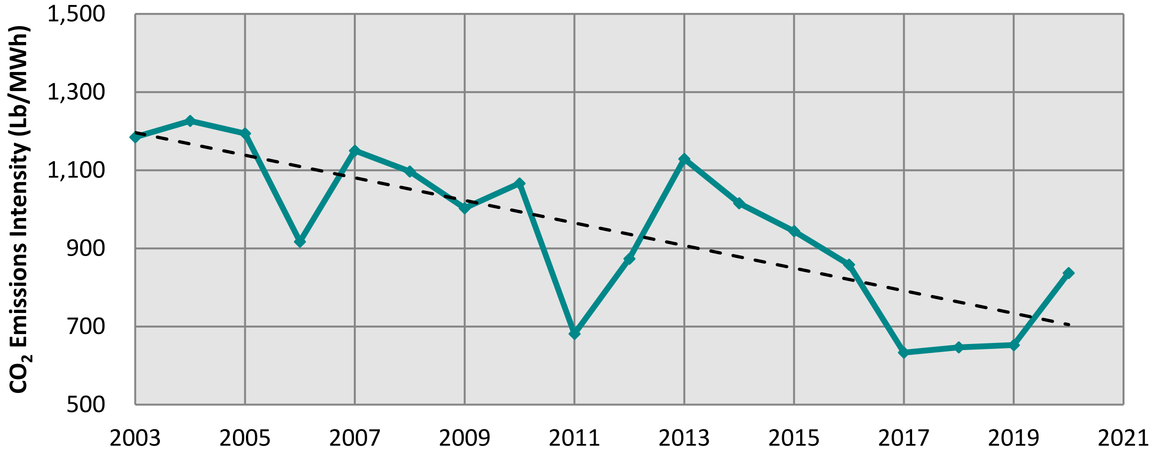

Figure 3.1 Estimated Idaho Power CO_2 emissions intensity

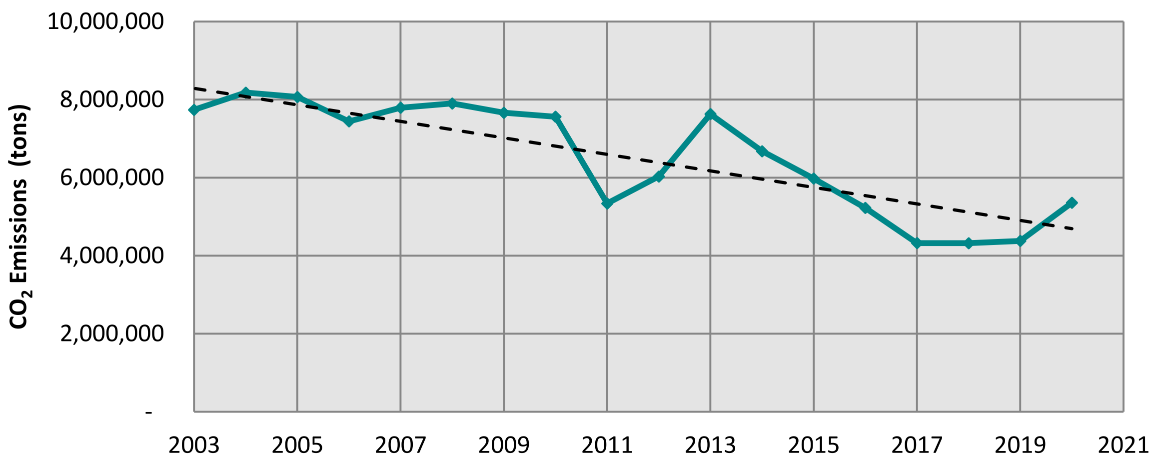

Figure 3.2 Estimated Idaho Power CO_2 emissions

Idaho Power is committed to reducing the amount of CO_2 emitted from energy-generating sources. Since 2009, the company has met various voluntary goals to realize its commitment to CO_2 reduction. From 2010 to 2020, Idaho Power reduced carbon emissions by an average of 29% compared to 2005. The general trend continues to be downward as Idaho Power exits coal generation facilities and adds clean resources. The uptick in 2020 correlates with low water supply, increased demand for electricity, and market conditions.

Generation and emissions from company-owned resources are included in the CO_2 emissions intensity calculation. Idaho Power's progress toward achieving this intensity reduction goal and additional information on Idaho Power's CO_2 emissions are reported on the company's website. Information is also available through the Carbon Disclosure Project at cdp.net.

The portfolio analysis performed for the 2021 IRP assumes carbon emissions are subject to a per-ton cost of carbon. The carbon cost forecasts are provided in Chapter 9, while the projected CO_2 emissions for each analyzed resource portfolio are provided in Chapter 10.

Energy Mix

Combined with the energy purchased from power purchase agreements (PPA) and *Public Utility Regulatory Policies Act of 1978* (PURPA) projects, Idaho Power's resource mix was approximately 60% clean in 2020 (see below).[5] The company's generation mix is primarily driven by hydropower, which is considered a clean energy source for producing virtually no carbon emissions.

Notably, included in the company's 2020 energy mix was over 1,200 megawatts (MW) of power purchase contracts for renewable energy (primarily PURPA projects). The various contracts included 728 MW of wind, 316 MW of solar, 147 MW of small hydropower and 35 MW of geothermal.

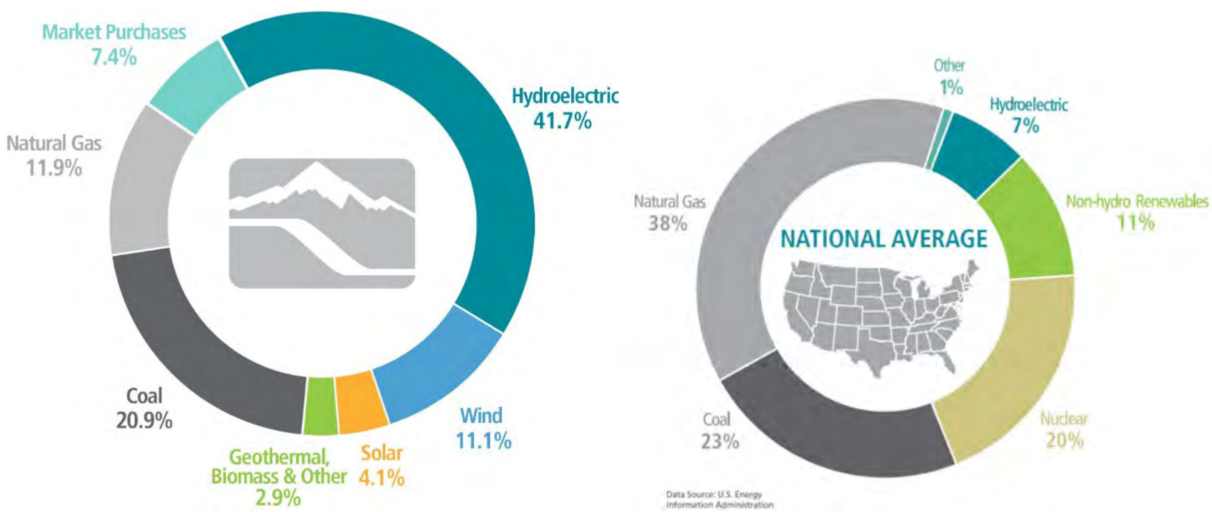

Figure 3.3 Idaho Power's 2020 energy mix compared to the national average

The company's path away from coal resources is evident in the 2021 Preferred Portfolio and notably in the near-term Action Plan. The addition of renewable resources over the 20-year study period combined with the completion of the Boardman to Hemingway (B2H) transmission

[5] The company sells the RECs associated with renewable energy, meaning that the overall mix does not represent the energy delivered to customers.

line in 2026, will drastically change the company's energy mix in the future to include primarily clean resources.

Climate Change Adaptation

As noted earlier, climate change adaptation relates to steps or measures that may need to be taken to adapt to a changing climate. To understand what these steps might be first requires understanding the potential regional impacts of climate change that Idaho Power may experience. To this end, Idaho Power stays current on climate change research and analysis both generally and specific to the Pacific Northwest. The sixth assessment report from the United Nations' Intergovernmental Panel on Climate Change (IPCC) states "Human-induced climate change is already affecting many weather and climate extremes in every region across the globe. Evidence of observed changes in extremes such as heatwaves, heavy precipitation, droughts, and tropical cyclones… has strengthened."[6]

More regionally focused studies have assessed the potential impact of climate change on the Pacific Northwest. The Fourth National Climate Assessment[7] and the River Management Joint Operating Committee (RMJOC) [8] addressed water availability in the region under multiple climate change and response scenarios. Both reports highlight the uncertainty related to future climate projections. However, many of the model projections show warming temperatures and increased precipitation into the future.

In the 2021 IRP, Idaho Power approached climate change risk in two ways: through adjusted modeling inputs and scenarios and then with specific scenarios to understand portfolio impacts as a result of potential future climate change policies. Both approaches are summarized below and detailed in later chapters of this report.

Risk Identification and Management

Identification of and response to specific risks are managed via Idaho Power's annual Enterprise Risk and Compliance Assessment, which includes a robust review of current and emerging regulations and external factors impacting the company's internal operations in the areas of technology, legal, market, weather, reputation, and safety, among other risks. Management of each risk is identified and can include internal risk oversight by an internal department, committee, internal or external auditor process review, and Board of Directors oversight.

Climate change-specific risks are an evolving category that includes, but may not be limited to, changes in customer usage and hydro generation due to changing weather conditions and

[6] P. 8, https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf

[7] https://nca2018.globalchange.gov/

[8] https://www.bpa.gov/p/Generation/Hydro/Pages/Climate-Change-FCRPS-Hydro.aspx

severe weather events. Wildfire is another category of risk that is influenced, although not solely driven by, climate change. In Idaho Power's service area, climate-related risks are evaluated in light of potential for storm severity, lightning, droughts, heat waves, fires, floods, and snow loading. Policy-oriented risk with respect to climate change can be understood as climate-oriented laws, rules, and regulations that could impact Idaho Power operations and planned capital expenditure. These specific climate-oriented risks are examined in the following sections.

Weather Risk

Changing and severe weather conditions as a result of climate change can adversely affect Idaho Power's operating results and cause them to fluctuate seasonally. Climate change could also have significant physical effects in Idaho Power's service area, such as increased frequency and severity of storms, lightning, droughts, heat waves, fires, floods, snow loading, and other extreme weather events. These events and their associated impacts could damage transmission, distribution, and generation facilities, causing service interruptions and extended outages, increasing costs and other operating and maintenance expenses—including emergency response planning and preparedness expenses—and limiting Idaho Power's ability to meet customer energy demand.

Idaho Power's Atmospheric Science group—in collaboration with Boise State University, the Idaho National Laboratory and the Idaho Water Resources Board—worked together in 2020 to advance high-performance computing within Idaho. This public–private partnership benefits Idaho Power customers by providing a cost-effective, high-performance computing system to run complex weather models and conduct research to refine forecasting capabilities. The company expects this system to help improve the integration of renewable energy sources into the electrical grid and help Idaho Power manage hydroelectric system and cloud-seeding operations. Such advances improve Idaho Power's ability to provide affordable, clean energy to meet the region's growing needs.

Wildfire Risk

In recent years, the Western United States has experienced an increase in the frequency and intensity of wildland fires (wildfires). A variety of factors have contributed in varying degrees to this trend including climate change, increased human encroachment in wildland areas, historical land management practices, and changes in wildland and forest health, among other factors.

The risk of more extensive or worsening wildfires is linked to weather-related climate risk. To manage wildfire-related risk, Idaho Power has developed a Fire Potential Index (FPI) tool based on original work completed by San Diego Gas and Electric, the United States Forest

Service, and the National Interagency Fire Center and modified for Idaho Power's Idaho and Oregon service area.

This tool is designed to support operational decision-making to reduce fire threats and risks. This tool converts environmental, statistical, and scientific data into an easily understood forecast of the short-term fire threat that could exist for different geographical areas in the Idaho Power service area. The FPI is issued for a seven-day period to provide for planning of upcoming events by Idaho Power personnel.

The FPI reflects key variables, such as the state of native vegetation across the service area, fuels (ratio of dead fuel moisture component to live fuel moisture component), and weather (sustained wind speed and dew point depression). Each of these variables is assigned a numeric value, and those individual numeric values are summed to generate a Fire Potential value from zero to 16. That final value indicates the degree of fire threat expected for each of the seven days included in the forecast. Green, Yellow, or Red FPI scores reflect low, medium, and high levels of weather-related risk. The FPI is discussed in greater detail, along with the company's full list of wildfire mitigation measures, in Idaho Power's Wildfire Mitigation Plan (WMP). The WMP will be reviewed annually in advance of each fire season.[9]

Wildfires can cause a wide range of direct and indirect harms, from community damage to air quality and wildlife degradation, reduced recreation access, and power outages—along with the associated harms associated with power outages. Idaho Power's attention to safety and reliability starts with the quality of its equipment, such as power lines, poles, substations and transformers. The company designs and builds its equipment to meet or exceed industry standards, monitors the ongoing equipment condition, and works hard to maintain the company's infrastructure.

With these goals in mind, Idaho Power operates a robust vegetation management program to keep trees and other plants away from its lines. The company's vegetation management efforts are applied across its service area and its transmission corridors. This work includes pruning and, if necessary, removing trees, with a higher level of attention in identified zones where wildfire risk is highest. Additionally, in Idaho, a sterilant is applied around select power poles to keep plants from growing nearby. These actions have proved successful in saving poles and lines during wildfire events.

[9] https://docs.idahopower.com/pdfs/Safety/2021WildfireMitigationPlan.pdf

Water and Hydropower Generation Risk

Factors contributing to lower hydropower generation can increase costs and negatively impact Idaho Power's financial condition and results of operations, as the company derives a significant portion of its power supply from its hydropower facilities.

Specific programs the company has implemented to responsibly manage water use include working with government agencies to monitor key water supply indicators (e.g., snow, water equivalent, precipitation, temperature); conducting cloud seeding; monitoring surface and groundwater flows; and producing short- and long-range streamflow forecasts.

Water supply within the Snake River Basin is primarily snowpack driven. To increase the amount of snow that falls in drainages that feed the Snake River—subsequently benefiting hydropower generation, irrigation, recreation, water quality and other uses—Idaho Power collaboratively conducts a successful cloud-seeding program in the Snake River Basin. In addition, Idaho Power provides forecasting and meteorological data support.

Idaho Power stays current on the rapidly developing climate change research in the Pacific Northwest. The recently completed River Management Joint Operating Committee Second Edition Long-Term Planning Study (RMJOC-II) climate change study shows the natural hydrograph could see lower summer base flows, an earlier shift of the peak runoff, higher winter baseflows, and an overall increase in annual natural flow volume. For Idaho Power's hydro system, the findings support that upstream reservoir regulation significantly dampens the effects of this shift in natural flow to Idaho Power's system. Furthermore, the studies indicate Idaho Power could see July–December regulated streamflow relatively unaffected and January–June regulated streamflow increasing over the 20-year planning period.

Policy Risk

Changes in legislation, regulation, and government policy may have a material adverse effect on Idaho Power's business in the future. Specific legislative and regulatory proposals and recently enacted legislation that could have a material impact on Idaho Power include, but are not limited to, tax reform, utility regulation, carbon-reduction initiatives, infrastructure renewal programs, environmental regulation, and modifications to accounting and public company reporting requirements.

Policy-related risk is addressed in a number of ways in Idaho Power's long-term planning. For each IRP, the company models existing policies, including known expiration or sunset dates. Idaho Power does not model specific policies to which it is not subject. For example, the Oregon Legislature's House Bill 2021 sets emission reduction standards for electric utilities, but Idaho Power is exempt because it has fewer than 25,000 retail customers in its

Oregon service area. As a result, the company did not model HB 2021 requirements for Idaho Power's portfolio.

At the time of the 2021 IRP, state-level climate policies did not exist in Idaho and did not apply to Idaho Power in Oregon. Similarly, federal climate legislation has not been passed by Congress. However, the company believes that climate- and emissions-related policies will emerge in future years. To account for this expected future, the company models multiple scenarios with varying prices on carbon. These scenarios are detailed in Chapter 9 of this report.

Modeling Climate Risks in the IRP

While the above referenced climate-related risks are all addressed and accounted for in different operational ways by Idaho Power, the company also extended climate-related risk assessment to the 2021 IRP. Specifically, the company conducted additional scenarios to explore the impact these events would have on Idaho Power's system. These scenarios are summarized below and detailed in Chapter 9.

The company conducted a Rapid Electrification scenario at the request of IRPAC members. This scenario was developed to determine what kind of adjustments would need to be made to accommodate a very rapid transition toward electrification. This rapid transition includes increasing the electric vehicle forecast and the penetration of electric heat pumps for building heating and cooling each by a factor of 10. This aggressive forecast assumes over half a million electric vehicles as well as adoption of an 80% penetration of heat pump technology at residences within the company's service area by 2040.

The Climate Change scenario includes an increased demand forecast associated with extreme temperature events and a variable supply of water from year to year.

To model risk associated with carbon regulation, Idaho Power has assessed the risk in two ways. First, the company created "100% Clean by 2035" and "100% Clean by 2045" scenarios that remove carbon price adder forecasts and assume a legislative mandate to move toward 100% clean energy by the years 2035 and 2045, respectively. Second, the company estimated the portfolio cost of six core portfolios under three different carbon price forecasts (see Chapter 9 for more information on the six portfolios: Base with B2H, Base with B2H without Gateway West, Base with B2H PAC Bridger Alignment, Base without B2H, Base without B2H without Gateway West, and Base without B2H PAC Bridger Alignment).

By considering the above scenarios and varying assumptions, the 2021 IRP has a robust method for assessing possible risk associated with both mitigation and adaptation to climate change.

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IRP REPORT:
IDAHO POWER TODAY

4. IDAHO POWER TODAY

Customer Load and Growth


Residential construction growth in southern Idaho.

In 1996, Idaho Power served approximately 351,000 customers. In 2021, Idaho Power served more than 600,000 customers in Idaho and Oregon. Firm peak-hour load has increased from 2,437 MW in 1996 to 3,751 MW in 2021—a new system peak hour record reached on June 30, 2021.

Average firm load increased from 1,438 average MW (aMW) in 1996 to 1,809 aMW in 2020 (load calculations exclude the load from the former special contract customer Astaris, or FMC). Additional details of Idaho Power's historical load and customer data are shown in Figure 4.1 and Table 4.1. The data in Table 4.1 suggests each new customer adds over 5.0 kW to the peak-hour load and over 3 average kW (akW) to the average load.

Since 1996, Idaho Power's total nameplate generation has increased from 2,703 MW to 3,389 MW. Table 4.1 shows Idaho Power's changes in reported nameplate capacity since 1996.

Idaho Power anticipates adding approximately 13,300 customers each year throughout the 20-year planning period. The anticipated load forecast for the entire system predicts summer peak-hour load requirements will grow nearly 55 MW per year, and the average-energy requirement is forecast to grow about 30 aMW per year. More detailed customer and load forecast information is presented in Chapter 7 and in *Appendix A—Sales and Load Forecast*.

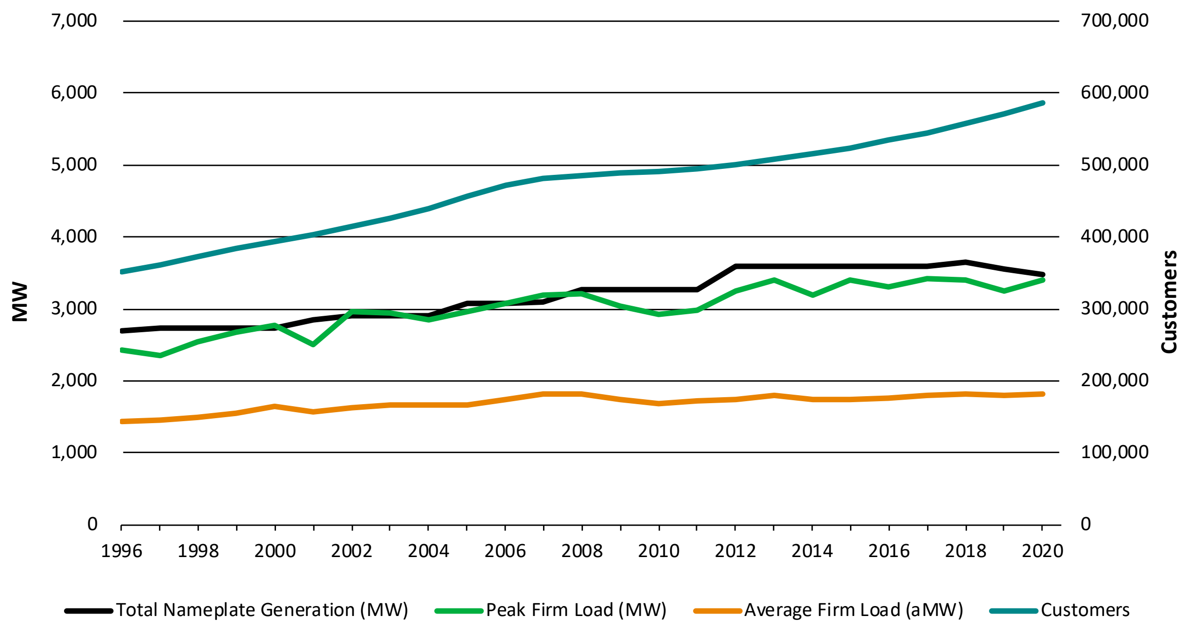

Figure 4.1 Historical capacity, load, and customer data

Table 4.1 Historical capacity, load, and customer data

Year	Total Nameplate Generation (MW)	Peak Firm Load (MW)	Average Firm Load (aMW)	Customers[1]
1996	2,703	2,437	1,438	351,261
1997	2,728	2,352	1,457	361,838
1998	2,738	2,535	1,491	372,464
1999	2,738	2,675	1,552	383,354
2000	2,738	2,765	1,654	393,095
2001	2,851	2,500	1,576	403,061
2002	2,912	2,963	1,623	414,062
2003	2,912	2,944	1,658	425,599
2004	2,912	2,843	1,671	438,912
2005	3,085	2,961	1,661	456,104
2006	3,085	3,084	1,747	470,950
2007	3,093	3,193	1,810	480,523
2008	3,276	3,214	1,816	486,048
2009	3,276	3,031	1,744	488,813
2010	3,276	2,930	1,680	491,368
2011	3,276	2,973	1,712	495,122
2012	3,594	3,245	1,746	500,731
2013	3,594	3,407	1,801	508,051
2014	3,594	3,184	1,739	515,262
2015	3,594	3,402	1,748	524,325
2016	3,594	3,299	1,750	533,935

Year	Total Nameplate Generation (MW)	Peak Firm Load (MW)	Average Firm Load (aMW)	Customers[1]
2017	3,594	3,422	1,807	544,378
2018	3,659	3,392	1,810	556,926
2019	3,547	3,242	1,790	570,953
2020	3,389[2]	3,392	1,809	586,565
YTD 2021	n/a	3,751	1,885	601,616

1 Year-end residential, commercial, and industrial customers, plus the maximum number of active irrigation customers.

2 Reported nameplate capacity aggregation methodology changed for 2020.

3 2021 year to date values are as of Nov 30, 2021.

2020 Energy Sources

Idaho Power's energy sources for 2020 are shown in Figure 3.3. Idaho Power-owned generating capacity was the source for about 75% of the energy delivered to customers. Hydroelectric production from company-owned projects was the largest single source of energy at about 42% of the total. Coal contributed about 21%, and natural gas and diesel generation contributed about 12%. Purchased power accounted for the remainder of the total energy delivered to customers. Much of the purchased power was from long-term energy contracts (PURPA and PPA projects), primarily from wind, solar, hydro, geothermal, and biomass projects (in order of decreasing percentage). While Idaho Power receives production from PURPA and PPA projects, the company sells the RECs it receives associated with the production and does not represent the energy from these projects as renewable energy delivered to customers.

Existing Supply-Side Resources

Table 4.2 shows all of Idaho Power's existing company-owned resources, nameplate capacities, and general locations.

Table 4.2 Existing resources

Resource	Type	Nameplate Capacity (MW)	Location
American Falls	Hydroelectric	92.3	Upper Snake
Bliss	Hydroelectric	75.0	Mid-Snake
Brownlee	Hydroelectric	675.0	Hells Canyon
C. J. Strike	Hydroelectric	82.8	Mid-Snake
Cascade	Hydroelectric	12.4	North Fork Payette
Clear Lake	Hydroelectric	2.5	South Central Idaho
Hells Canyon	Hydroelectric	391.5	Hells Canyon
Lower Malad	Hydroelectric	13.5	South Central Idaho
Lower Salmon	Hydroelectric	60.0	Mid-Snake
Milner	Hydroelectric	59.4	Upper Snake
Oxbow	Hydroelectric	190.0	Hells Canyon
Shoshone Falls	Hydroelectric	14.7	Upper Snake
Swan Falls	Hydroelectric	27.2	Mid-Snake

Resource	Type	Nameplate Capacity (MW)	Location
Thousand Springs	Hydroelectric	6.8	South Central Idaho
Twin Falls	Hydroelectric	52.9	Mid-Snake
Upper Malad	Hydroelectric	8.3	South Central Idaho
Upper Salmon A	Hydroelectric	18.0	Mid-Snake
Upper Salmon B	Hydroelectric	16.5	Mid-Snake
Jim Bridger[10]	Coal	707.0	Southwest Wyoming
North Valmy[11]	Coal	134.0	North Central Nevada
Langley Gulch	Natural Gas—CCCT	318.5	Southwest Idaho
Bennett Mountain	Natural Gas—SCCT	164.2	Southwest Idaho
Danskin	Natural Gas—SCCT	261.4	Southwest Idaho
Salmon Diesel	Diesel	5.0	Eastern Idaho
Total existing nameplate capacity		**3,388.9**	

The following sections describe Idaho Power's existing supply-side resources and long-term power purchase contracts.

Hydroelectric Facilities

Idaho Power operates 17 hydroelectric projects on the Snake River and its tributaries. Together, these hydroelectric facilities provide a total nameplate capacity of 1,773 MW and median annual generation equal to approximately 820 aMW, or 7.2 million MWh (1991–2020).

Hells Canyon Complex

The backbone of Idaho Power's hydroelectric system is the HCC in the Hells Canyon reach of the Snake River. The HCC consists of Brownlee, Oxbow, and Hells Canyon dams and the associated generation facilities. In a normal water year, the three plants provide approximately 70% of Idaho Power's annual hydroelectric generation and enough energy to meet over 30% of the energy demand of retail customers. Water storage in Brownlee Reservoir also enables the HCC projects to provide the major portion of Idaho Power's peaking and load following capability.

Idaho Power operates the HCC to comply with the existing annual FERC license, as well as voluntary arrangements to accommodate other interests, such as recreational use and environmental resources. Among the arrangements is the Fall Chinook Program, voluntarily adopted by Idaho Power in 1991 to protect the spawning and incubation of fall Chinook salmon below Hells Canyon Dam. The fall Chinook salmon is currently listed as threatened under the ESA.

[10] Idaho Power owns one-third of the plant. Idaho Power's share of the plant's capacity is 707 MW.

[11] Idaho Power owns 50% of the plant. Idaho Power's share of the remaining Unit 2 is 134 MW.

Brownlee Reservoir is the main HCC reservoir and Idaho Power's only reservoir with significant active storage. Brownlee Reservoir has 101 vertical feet of active storage capacity, which equals approximately 1 million acre-feet of water. Both Oxbow and Hells Canyon reservoirs have significantly smaller active storage capacities—approximately 0.5% and 1% of Brownlee Reservoir's volume, respectively.

Brownlee Reservoir is a year-round, multiple-use resource for Idaho Power and the Pacific Northwest. Although its primary purpose is to provide a stable power source, Brownlee Reservoir is also used for system flood risk management, recreation, and the benefit of fish and wildlife resources.

Brownlee Dam is one of several Pacific Northwest dams coordinated to provide springtime flood risk management on the lower Columbia River. Idaho Power operates the reservoir in accordance with flood risk management guidance from the United States Army Corps of Engineers as required in Article 42 of the existing FERC license.

After flood risk management requirements have been met in late spring, Idaho Power attempts to refill the reservoir to meet peak summer electricity demands and provide suitable habitat for spawning bass and crappie. The full reservoir also offers optimal recreational opportunities through the Fourth of July holiday.

The United States Bureau of Reclamation (USBR) releases water from USBR storage reservoirs in the Snake River Basin above Brownlee Reservoir to augment flows in the lower Snake River to help anadromous fish migrate past the Federal Columbia River Power System (FCRPS) projects. The releases are part of the flow augmentation implemented by the 2008 FCRPS biological opinion. Much of the flow augmentation water travels through Idaho Power's middle Snake River (mid-Snake) projects, with all the flow augmentation eventually passing through the HCC before reaching the FCRPS projects. Idaho Power works with federal and state partners and other stakeholders to pass these federal flow augmentation releases without delay through the HCC.

As part of a 2005 interim HCC relicensing agreement, Idaho Power agreed to provide up to 237,000 acre-feet of water from Brownlee Reservoir for flow augmentation, in addition to the federal flow augmentation releases. Idaho Power uses its best efforts to hold Brownlee Reservoir at or near full elevation (approximately 2,077 feet above mean sea level) through June 20. Thereafter, Brownlee Reservoir is drafted to elevation 2,059 (releasing up to 237,000 acre-feet) by August 7. Although the portion of the 2005 interim agreement relating to flow augmentation releases has expired, Idaho Power has continued to provide these flow augmentation releases annually through 2021.

Brownlee Reservoir's releases are managed to maintain operationally stable flows below Hells Canyon Dam in the fall because of the Fall Chinook Program. The stable flow is set at a level to protect fall Chinook spawning nests, or redds. During fall Chinook operations, Idaho Power attempts to refill Brownlee Reservoir by the first week of December to meet wintertime peak-hour loads. The Fall Chinook Program spawning flows establish the minimum flow below Hells Canyon Dam throughout the winter until the fall Chinook fry emerge in the spring.

Upper Snake and Mid-Snake Projects

Idaho Power's hydroelectric facilities upstream from the HCC include the Cascade, Swan Falls, C.J. Strike, Bliss, Lower Salmon, Upper Salmon, Upper and Lower Malad, Thousand Springs, Clear Lake, Shoshone Falls, Twin Falls, Milner, and American Falls projects. Although the upstream projects typically follow run-of-river (ROR) operations, a small amount of peaking and load-following capability exists at the Lower Salmon, Bliss, C.J. Strike, and Swan Falls projects.

Water-Lease Agreements

Idaho Power views the rental of water for delivery through its hydroelectric system as a potentially cost-effective power-supply alternative. Water leases that allow the company to request delivery when the hydroelectric production is needed are especially beneficial. Acquiring water through the Idaho Department of Water Resources' Water Supply Bank[12] also helps the company improve water-quality and temperature conditions in the Snake River as part of ongoing relicensing efforts associated with the HCC. The company does not currently have any standing water lease agreements. However, single-year leases from the Upper Snake Basin are occasionally available, and the company plans to continue to evaluate potential water lease opportunities in the future.

[12] https://idwr.idaho.gov/iwrb/programs/water-supply-bank/

Cloud Seeding

In 2003, Idaho Power implemented a cloud-seeding program to increase snowpack in the south and middle forks of the Payette River watershed. In 2008, Idaho Power began expanding its program by enhancing an existing program operated by a coalition of counties and other stakeholders in the Upper Snake River Basin above Milner Dam. Idaho Power has continued to collaborate with the IWRB and water users in the Upper Snake, Boise, and Wood River basins to expand the target area to include those watersheds.

Cloud seeding ground generator

Idaho Power seeds clouds by introducing silver iodide (AgI) into winter storms. Cloud seeding increases precipitation from passing winter storm systems. If a storm has abundant supercooled liquid water vapor and appropriate temperatures and winds, conditions are optimal for cloud seeding to increase precipitation. Idaho Power uses two methods to seed clouds:

1. Remotely operated ground generators releasing AgI at high elevations
2. Modified aircraft burning flares containing AgI

Benefits of either method vary by storm, and the combination of both methods provides the most flexibility to successfully introduce AgI into passing storms. Minute water particles within the clouds freeze on contact with the AgI particles and eventually grow and fall to the ground as snow downwind.

AgI particles are very efficient ice nuclei, allowing minute quantities to have an appreciable increase in precipitation. It has been used as a seeding agent in numerous western states for decades without any known harmful effects.[13] Analyses conducted by Idaho Power since 2003 indicate the annual snowpack in the Payette River Basin increased between 1% and 22% annually, with an annual average of 11.3%. Idaho Power estimates cloud seeding, on average, provides an additional 415,000 acre-feet in the Upper Snake River, 105,000 acre-feet in the Wood River Basin, 264,000 acre-feet in the Boise Basin, and 221,000 acre-feet from the Payette River Basin, for a total average annual benefit of 1,006,000 acre-feet. At program build-out (including additional aircraft and remote ground generators), Idaho Power estimates additional runoff, on average, from the Payette, Boise, Wood, and Upper Snake projects will total

[13] weathermod.org/wp-content/uploads/2018/03/EnvironmentalImpact.pdf

approximately 1,280,000 acre-feet. The additional water from cloud seeding helps fuel the hydropower system along the Snake River.

Seeded and Natural Orographic Wintertime Clouds: the Idaho Experiment (SNOWIE) was a joint project between the National Science Foundation and Idaho Power. Researchers from the universities of Wyoming, Colorado, and Illinois used Idaho Power's operational cloud seeding project, meteorological tools, and equipment to identify changes within wintertime precipitation after cloud seeding had taken place. Groundbreaking discoveries continue to be evaluated from this dataset collected in winter 2017. Multiple scientific papers have already been published,[14] with more planned for submission about the effects and benefits of cloud seeding.

Idaho Power continues to collaborate with the State of Idaho and water users to augment water supplies with cloud seeding. The program includes 32 remote-controlled, ground-based generators and two aircraft for Idaho Power-operated cloud seeding in the central mountains of Idaho (Payette, Boise, and Wood River basins). The Upper Snake River Basin program includes 25 remote-controlled, ground-based generators and one aircraft operated by Idaho Power targeting the Upper Snake, as well as 25 manual, ground-based generators operated by a coalition of stakeholders in the Upper Snake.

During the 2021 legislative session, House Bill 266, related to cloud seeding activities throughout the state, was passed. The legislation states that cloud seeding is in the public interest and that augmenting water supplies have significant benefits in the areas of drought mitigation, water rights protection, municipal and business development, water quality, recreation, and fish and wildlife. The legislation instructs the IWRB to authorize cloud-seeding in basins throughout the state that experience depleted or insufficient water supplies. In addition, the legislation allows the IWRB to use state funds to support cloud seeding programs within the state where water supply is not sufficient. Following the enactment of the new legislation, all cloud-seeding programs in which Idaho Power is involved were granted authorization by the Idaho Water Resources Board.

[14] French, J. R., and Coauthors, 2018: Precipitation formation from orographic cloud seeding. Proc. Natl. Acad. Sci. USA, 115, 1168–1173, doi.org/10.1073/pnas.1716995115.

Tessendorf, S.A., and Coauthors, 2019: Transformational approach to winter orographic weather modification research: The SNOWIE Project. Bull. Amer. Meteor. Soc., 100, 71–92, journals.ametsoc.org/doi/full/10.1175/BAMS-D-17-0152.1.

Coal Facilities

Jim Bridger

Idaho Power owns one-third, or 707 MW, of the Jim Bridger coal power plant located near Rock Springs, Wyoming. The Jim Bridger plant consists of four generating units. PacifiCorp has two-thirds ownership and is the operator of the Jim Bridger facility. PacifiCorp's 2021 IRP preferred portfolio includes a coal-to-gas conversion of units 1 and 2.[15] For additional details on the Jim Bridger plant, refer to Chapter 8, Planning Period Forecast. For the 2021 IRP, Idaho Power used the AURORA model's capacity expansion capability to evaluate a range of exit dates and gas conversion possibilities for the company's participation in the Jim Bridger units.

North Valmy

Idaho Power's participation in the operations of North Valmy Unit 1 ceased at year-end 2019. Idaho Power currently participates 50%, or 134 MW, in the second generating unit at the North Valmy coal power plant located near Winnemucca, Nevada. NV Energy is the other 50% participant and is the operator of the North Valmy facility. For the AURORA-based capacity expansion modeling performed for the 2021 IRP analysis, Idaho Power required an exit from Unit 2 participation no later than year-end 2025 and no earlier than year-end 2023.

Natural Gas Facilities and Diesel Units

Bennett Mountain

Idaho Power owns and operates the Bennett Mountain plant, which consists of a 164 MW Siemens–Westinghouse 501F natural gas simple-cycle combustion turbine (SCCT) located east of the Danskin plant in Mountain Home, Idaho. The Bennett Mountain plant is dispatched as needed to support system load.

Danskin

The Danskin facility is located northwest of Mountain Home, Idaho. Idaho Power owns and operates one 171 MW Siemens 501F and two 45 MW Siemens–Westinghouse W251B12A SCCTs at the facility. The two smaller turbines were installed in 2001, and the larger turbine was installed in 2008. The Danskin units are dispatched when needed to support system load.

Langley Gulch

Idaho Power owns and operates the Langley Gulch plant, which uses a nominal 318-MW natural gas combined-cycle combustion turbine (CCCT). The plant consists of one 187 MW Siemens

[15] Docketed as LC 77 in Oregon and PAC-E-21-19 in Idaho, PacifiCorp's 2021 IRP discusses coal-to-gas conversion of Jim Bridger units 1 and 2 at pp. 298-299, 322.

STG-5000F4 combustion turbine and one 131.5 MW Siemens SST-700/SST-900 reheat steam turbine. The Langley Gulch plant, located south of New Plymouth in Payette County, Idaho, became commercially available in June 2012. In early 2022, the Langley Gulch plant will go through an overhaul to upgrade the gas combustion turbine. The upgrade will allow for the maximum-rated exhaust gas temperature of the units to increase and it will increase both the thermal efficiency and the total capacity of the plant. Once the upgrade is completed, it is expected that the total nameplate of the plant will increase to 365 MW.

Diesel

Idaho Power owns and operates two diesel generation units in Salmon, Idaho. The Salmon units have a combined generator nameplate rating of 5 MW and are operated during emergency conditions, primarily for voltage and load support.

Solar Facilities

Solar End-of-Feeder Project

The Solar End-of-Feeder Pilot Project is a small-scale (18 kW) proof-of-concept PV system evaluated as a non-wires alternative to traditional methods to mitigate low-voltage near the end of a distribution feeder. The purpose of the pilot was to evaluate its operational performance and its cost-effectiveness compared to traditional low-voltage mitigation methods. Traditional methods for mitigating low voltage include the addition of capacitor banks, voltage regulators, or reconductoring. Capacitor banks and voltage regulators are relatively inexpensive solutions compared to reconductoring, but these solutions were not viable options for this location due to distribution feeder topology.

Solar installation as part of the Solar End-of-Feeder Pilot Project.

The Solar End-of-Feeder Pilot Project was installed and has been in operation since October 2016. The project has operated as expected by effectively mitigating low voltage.

Customer Generation Service

Idaho Power’s on-site generation and net metering services allow customers to generate power on their property and connect to Idaho Power’s system. For participating customers, the energy generated is first consumed on the property itself, while excess energy flows on to the company’s grid. Most customer generators use solar PV systems. As of March 31, 2021, there were 7,354 solar PV systems interconnected through the company's customer generation tariffs with a total capacity of 65.163 MW. At that time, the company had received completed applications for an additional 720 solar PV systems, representing an incremental capacity of 23.431 MW. For further details regarding customer-owned generation resources interconnected through the company's on-site generation and net metering services, see tables 4.3 and 4.4.

Table 4.3 Customer generation service customer count as of March 31, 2021

Resource Type	Active	Pending	Total
Idaho Total	7,327	712	8,039
Solar PV	7,284	711	7,995
Wind	32	1	33
Other/hydroelectric	11	0	11
Oregon Total	**70**	**9**	**79**
Solar PV	70	9	79
Wind	0	0	0
Other/hydroelectric	0	0	0
Idaho Power Total	**7,397**	**721**	**8,118**

Table 4.4 Customer generation service generation capacity (MW) as of March 31, 2021

Resource Type	Active	Pending	Total
Idaho Total	64.098	23.109	87.208
Solar PV	63.761	23.101	86.863
Wind	0.179	0.008	0.187
Other/hydroelectric	0.158	0.000	0.158
Oregon Total	1.402	0.329	1.731
Solar PV	1.402	0.329	1.731
Wind	0.000	0.000	0.000
Other/hydroelectric	0.000	0.000	0.000
Idaho Power Total	**65.500**	**23.439**	**88.939**

Oregon Solar Photovoltaic Pilot Program

In 2009, the Oregon Legislature passed Oregon Revised Statute 757.365 as amended by HB 3690, which mandated the development of pilot programs for electric utilities operating in Oregon to demonstrate the use and effectiveness of volumetric incentive rates for electricity produced by solar PV systems.

As required by the OPUC in Order Nos. 10-200 and 11-089, Idaho Power established the Oregon Solar PV Pilot Program in 2010, offering volumetric incentive rates to customers in Oregon. Under the pilot program, Idaho Power acquired 400 kW of installed capacity from solar PV systems with a nameplate capacity of less than or equal to 10 kW. In July 2010, approximately 200 kW were allocated, and the remaining 200 kW were offered during an enrollment period in October 2011. However, because some PV systems were not completed from the 2011 enrollment, a subsequent offering was held on April 1, 2013, for approximately 80 kW.

In 2013, the Oregon Legislature passed HB 2893, which increased Idaho Power's required capacity amount by 55 kW. An enrollment period was held in April 2014, and all capacity was allocated, bringing Idaho Power's total capacity in the program to 455 kW.

Public Utility Regulatory Policies Act

In 1978, the United States Congress passed PURPA, requiring investor-owned electric utilities to purchase energy from any qualifying facility (QF) that delivers energy to the utility. A QF is defined by FERC as a small renewable-generation project or small cogeneration project. CSPP are often associated with PURPA. Individual states were tasked with establishing PPA terms and conditions, including prices that each state's utilities are required to pay as part of the PURPA agreements. Because Idaho Power operates in Idaho and Oregon, the company must adhere to IPUC rules and regulations for all PURPA facilities located in Idaho, and to OPUC rules and regulations for all PURPA facilities located in Oregon. The rules and regulations are similar but not identical for the two states.

Under PURPA, Idaho Power is required to pay for generation at the utility's avoided cost, which is defined by FERC as the incremental cost to an electric utility of electric energy or capacity that, but for the purchase from the QF, such utility would generate itself or purchase from another source. The process to request an Energy Sales Agreement for Idaho QFs is described in Idaho Power's Tariff Schedule 73, and for Oregon QFs, Schedule 85. QFs also have the option to sell energy "as-available" under Idaho Power's Tariff Schedule 86.

As of July 1, 2021, Idaho Power had 131 PURPA contracts with independent developers for approximately 1,140.40 MW of nameplate capacity. These PURPA contracts are for hydroelectric projects, cogeneration projects, wind projects, solar projects, anaerobic digesters, landfill gas, wood-burning facilities, and various other small, renewable-power generation facilities. Of the 131 contracts, 129 were online as of July 1, 2021, with a cumulative nameplate rating of approximately 1,136.6 MW. Figure 4.2 shows the percentage of the total PURPA nameplate capacity of each resource type under contract.

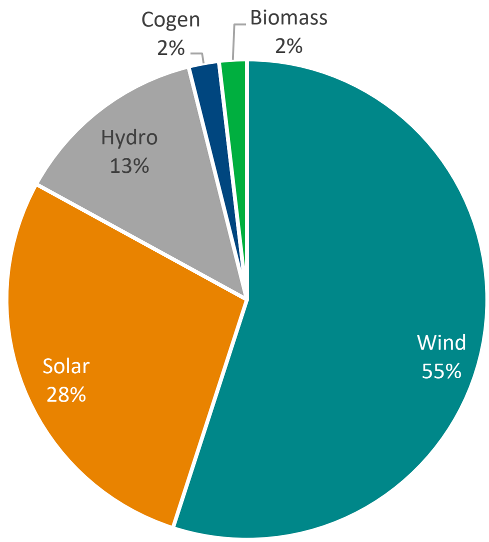

Figure 4.2 PURPA contracts by resource type

Idaho Power cannot predict the level of future PURPA development; therefore, only signed contracts are accounted for in Idaho Power's resource planning process. To account for likely variability in future PURPA resources, the 2021 IRP includes three contract renewal scenarios for existing PURPA resources: a 25% base case renewal rate and 0% and 100% low and high case bookends. Generation from PURPA contracts is forecasted early in the IRP planning process to update the accounting of supply-side resources available to meet load. The PURPA forecast used in the 2021 IRP was completed in December 2020. Details on signed PURPA contracts, including capacity and contractual delivery dates, are included in *Appendix C—Technical Report*.

Non-PURPA Power Purchase Agreements

Elkhorn Wind

In February 2007, the IPUC approved a PPA with Telocaset Wind Power Partners, LLC, for 101 MW of nameplate wind generation from the Elkhorn Wind Project located in northeastern Oregon. The Elkhorn Wind Project was constructed during 2007 and began commercial operations in December 2007. Under the PPA, Idaho Power receives all the RECs from the project. Idaho Power's contract with Telocaset Wind Power Partners expires December 2027.

Raft River Unit 1

In January 2008, the IPUC approved a PPA with Raft River Energy I, LLC, for approximately 13 MW of nameplate generation from the Raft River Geothermal Power Plant Unit 1 located in southern Idaho. The Raft River project began commercial operations in October 2007 under a PURPA contract with Idaho Power that was canceled when the new PPA was approved by the IPUC. Idaho Power is entitled to 51% of all RECs generated by the project for the remaining term of the agreement. Idaho Power's contract with Raft River Energy I expires in April 2033.

Neal Hot Springs

In May 2010, the IPUC approved a PPA with USG Oregon, LLC, for approximately 27 MW of nameplate generation from the Neal Hot Springs Unit 1 geothermal project located in eastern Oregon. The Neal Hot Springs Unit 1 project achieved commercial operation in November 2012. Under the PPA, Idaho Power receives all RECs from the project. Idaho Power's contract with USG Oregon expires in November 2037.

Jackpot Solar

On March 22, 2019, Idaho Power and Jackpot Holdings, LLC, entered a 20-year PPA for the purchase and sale of 120 MW of solar electric generation from the Jackpot Solar facility to be built north of the Idaho–Nevada state line near Rogerson, Idaho. Under the terms of the PPA, Idaho Power will receive all RECs from the project. Jackpot Solar is scheduled to be online in December 2022.

An application was submitted to the IPUC on April 4, 2019, requesting an order approving the PPA, and on December 24, 2019, the IPUC issued Order No. 34515 approving the Jackpot Solar PPA. On the same day as the IPUC application, Idaho Power submitted a notice to the OPUC, in accordance with OAR 860-089-0100(3) and (4), of an exception from Oregon's competitive-bidding requirements for electric utilities, as the PPA with Jackpot Holdings presents a time-limited opportunity to acquire a resource of unique value to Idaho Power customers.

Late in the 2021 IRP development process, the project developer informed Idaho Power they may not be able to meet the in-service date specified in the contract. For IRP purposes, all cases assumed Jackpot Solar was in-service per the terms of the contract; however, if Jackpot Solar is not online in 2023, the company will have an additional 40.8 MW load and resource balance deficit in 2023. Given the near-term nature of this possible deficit, the company's operations teams are evaluating options.

Clatskanie Energy Exchange

In September 2009, Idaho Power and the Clatskanie PUD in Oregon entered into an energy exchange agreement. Under the agreement, Idaho Power receives the energy as it is generated from the 18-MW power plant at Arrowrock Dam on the Boise River; in exchange, Idaho Power provides the Clatskanie PUD energy of an equivalent value delivered seasonally, primarily during months when Idaho Power expects to have surplus energy. An energy bank account is maintained to ensure a balanced exchange between the parties where the energy value will be determined using the Mid-Columbia market price index. The Arrowrock project began generating in January 2010, with the initial exchange agreement with Idaho Power ending in 2015. At the end of the initial term, Idaho Power exercised its right to extend the agreement through 2020. At the end of the 2020 term, Idaho Power once again exercised its right to extend the agreement through 2025. The Arrowrock project is expected to produce approximately 81,000 MWh annually.

Power Market Purchases and Sales

Idaho Power relies on regional power markets to supply a significant portion of energy and capacity needs during certain times of the year. Idaho Power is especially dependent on the regional power market purchases during peak-load periods. The existing transmission system is used to import the power purchases. A reliance on regional power markets has benefited Idaho Power customers during times of low prices through the import of low-cost energy. Customers also benefit from sales revenues associated with surplus energy from economically dispatched resources.

Transmission MW Import Rights

Idaho Power's interconnected transmission system facilitates market purchases to access resources to serve load. Five transmission paths connect Idaho Power to neighboring utilities:

1. Idaho–Northwest (Path 14)
2. Idaho–Nevada (Path 16)
3. Idaho–Montana (Path 18)
4. Idaho–Wyoming (Path 19)
5. Idaho–Utah (Path 20)

Idaho Power's interconnected transmission facilities were all jointly developed with other entities and act to meet the needs of the interconnecting participants. Idaho Power owns various amounts of capacity across each transmission path; the paths and their associated capacity are further described in Chapter 7. Idaho Power reserves portions of its transmission capacity to import energy for load service (network set-aside); this set-aside capacity, along with existing contractual obligations, consumes nearly all of Idaho Power's import capacity on all paths (see Table 7.1 in Chapter 7).

Idaho Power continually evaluates market opportunities to meet near-term needs. Idaho Power currently has one wholesale energy market purchase for peak hours in July and August for 2021 through 2024 for 75 MW. Idaho Power does not currently have any long-term wholesale energy sales contracts.

IDAHO POWER
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IRP REPORT:

FUTURE SUPPLY-SIDE GENERATION AND STORAGE RESOURCES

5. FUTURE SUPPLY-SIDE GENERATION AND STORAGE RESOURCES

Generation Resources

Supply-side generation resources include traditional generation resources, renewable resources, and storage resources. As discussed in Chapter 6, demand-side programs are an essential and valuable component of Idaho Power's resource strategy. The following sections describe the supply-side resources and energy-storage technologies considered when Idaho Power developed and analyzed the resource portfolios for the 2021 IRP. Not all supply-side resources described in this section were included in the modeling, but every resource described was considered.

The primary source of cost information for the 2021 IRP is the 2020 Annual Technology Baseline report released by the National Renewable Energy Laboratory (NREL) in July 2020.[16] Other information sources were relied on or considered on a case-by-case basis depending on the credibility of the source and the recency of the information. For a full list of all the resources considered and cost information, refer to Chapter 8. All cost information presented is in nominal dollars with an online date of 2023 for all levelized cost of energy (LCOE) calculations. The levelized cost figures are based on Idaho Power's cost of capital.

Resource Contribution to Peak

For the 2019 IRP, Idaho Power calculated the contribution to peak of solar using the 8,760-based method developed by NREL; for the 2021 IRP, Idaho Power has since updated and expanded the contribution to peak calculations to analyze solar, wind, demand response, storage, and solar plus storage using the Effective Load Carrying Capability (ELCC) methodology. ELCC is a reliability-based metric used to assess the contribution to peak of any given power plant.

The ELCC of a resource is determined by first calculating the perfect generation required to achieve an LOLE of 0.05 days per year. Then, the resource being evaluated is added to the system, and the perfect generation required is calculated again. The ELCC of a given resource is equal to the difference in the size of the perfect generators (from the two evaluations previously mentioned) divided by the resource's nameplate.

To account for weather variations in the data, four different test years were used; the results from each of the test years were then averaged to produce a singular contribution to peak for each specified variable resource to be used in the AURORA model. ELCC values for future solar,

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[16] atb.nrel.gov/

wind, demand response, storage, and solar plus storage can be found in the corresponding resource sections of chapters 5 and 6.

Idaho Power developed a tool to calculate LOLE and ELCC[17]. For more information regarding the methodologies and calculations used for this analysis, see the Loss of Load Expectation section of *Appendix C—Technical Report* of the 2021 IRP.

Renewable Resources

Renewable energy resources serve as the foundation of Idaho Power's existing portfolio. The company emphasizes a long and successful history of prudent renewable resource development and operation, particularly related to its fleet of hydroelectric generators. In the 2021 IRP, a variety of renewable resources were included in many of the portfolios analyzed. Renewable resources are discussed in general terms in the following sections.

Hydroelectric

Hydroelectric power is the foundation of Idaho Power's electrical generation fleet. The existing generation is low cost and does not emit carbon.

Large hydroelectric pumped storage projects are a potential way to add significant hydropower to the region. Pumped storage projects can often site the main upper reservoir away from the main river, which reduces its impact on the primary water body. Closed loop systems are completely disconnected from the main surface water body and only require additional water to overcome evaporative and seepage losses. Pumped storage can provide significant capacity and energy when it is needed and integrate additional VERs on the electrical system. Such a venture could also be pursued as a collaborative effort with other utilities.

Small-scale hydroelectric projects have been extensively developed in southern Idaho on irrigation canals and other sites, many of which have PPAs with Idaho Power.

Solar

The primary types of solar generation technology are utility-scale PV and distributed PV. Sunlight is composed of photons, or particles of solar energy that contain various amounts of energy corresponding to the different wavelengths of the solar spectrum. Solar cells are made from semiconductor materials that convert sunlight into electricity according to the principle of photovoltaic effect. The photovoltaic effect is the generation of a voltage difference at the junction of two different materials upon exposure to light. The PV modules produce electricity when photons are absorbed into a semiconductor junction. DC energy passes through an inverter, converting it to AC that can then be used on-site or sent to the grid.

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[17] Billinton, R., Allan, R., 'Power system reliability in perspective', *IEE J. Electronics Power*

Solar insolation is a measure of solar radiation reaching the earth's surface and is used to evaluate the solar potential of an area. Typically, insolation is measured in kWh per square meter (m^2) per day (daily insolation average over a year). The higher the insolation number, the better the solar-power potential for an area. NREL insolation charts[18] show the desert southwest has the highest theoretical solar potential in the continental United States.

Modern solar PV technology has existed for many years but has historically been cost prohibitive. Improvements in technology and manufacturing, combined with increased demand, have made PV resources more cost competitive with other renewable and conventional generating technologies.

Rooftop solar was considered in two forms as part of the 2021 IRP: residential rooftop solar and commercial solar.

Advancements in energy storage technologies have focused on coupling storage devices with solar PV resources to mitigate and offset the effects of the resource's variability. This coupling or pairing of resources was modeled and considered in the 2021 IRP. For a more complete description of battery storage, refer to the Storage Resources section of this chapter.

The average ELCC value for future stand-alone solar projects was 10.2%.

The average ELCC value applied to future solar plus storage projects was 97% with 4-hour storage durations.

For Idaho Power's cost estimates, operating parameters, and ELCC calculations for single-axis tracking, utility-scale PV resources, see the Supply-Side Resource and Loss of Load Expectation sections of *Appendix C—Technical Report* of the 2021 IRP.

Targeted Grid Solar and Storage

Idaho Power analyzed transmission and distribution (T&D) deferral benefits associated with targeted solar, storage, and solar with storage. The analysis included the following:

1. **Deferrable Investments**: Potentially deferrable infrastructure investments were identified spanning a 20-year period from 2002 through 2021. The infrastructure investments served as a test bed to identify the attributes of investments required to serve Idaho Power's growing customer base and whether those investments could have been (or could be) deferred with solar and/or storage. Transmission, substation, and distribution projects driven by capacity growth were analyzed. The limiting capacity was identified for each asset, along with the recommended in-service date, projected cost, peak loading, peak time of day, and projected growth rate.

[18] https://www.nrel.gov/gis/solar-resource-maps.html

2. **Solar Contribution**: The capacity demand reduction from varying amounts of solar was analyzed. Irradiance data was assumed to be consistent throughout the service area. The following was assumed for solar projects:
    - Rooftop solar: fixed, south facing
    - Large-scale solar: single-axis tracking
3. **Storage Contribution**: The capacity demand reduction from varying amounts of utility-scale storage was analyzed. The systems were chosen from readily available lithium-ion (Li-ion) battery storage systems. The storage systems were selected in multiples of 1 MW and 4-hour duration size.
4. **Solar with Storage Contribution**: A combination of large-scale solar with utility-scale storage.
5. **Methodology**: If the net forecast (electrical demand minus an assumed storage export contribution) was below the facility limiting capacity, the project could have been (or could be) deferred. The financial savings of deferring the project were then calculated.

Idaho Power selected five infrastructure investments from the data set that could have been deferred with varying amounts of storage. The selections were made to represent different areas, project sizes, and deferral periods, as well as the frequency at which projects are likely to be deferrable on Idaho Power's system. The storage required to achieve each deferral and the value of each deferral varied (Table 5.1).

Table 5.1 Storage capacity required to defer infrastructure investments

Location	Years Deferred	Deferral Savings	Storage Project Size (kW)	Capacity Value ($/kW)
Weiser	10	$379,546	2,000	$189.77
Elmer (Mountain Home)	14	$706,822	4,000	$176.71
Hidden Springs (Boise)	5	$377,350	2,000	$188.68
Cascade	5	$673,840	2,000	$336.92
Filer	10	$1,848,112	2,000	$924.06

The average capacity value of the identified investments was $363.23 per kW. This value was used for the T&D deferral locational value.

It is anticipated that a locational value of T&D deferral may apply to an annual average of 5,000 kW of storage over the 20-year IRP forecast for a total potential of 100 MW of storage. This resource option was added to the AURORA LTCE model.

While solar can sometimes be used to offset T&D investment, the instances are infrequent. Batteries can provide T&D deferral value and are a necessary addition to the system as load continues to increase. Batteries are also more practical to defer T&D investment because the land requirement is lower than it is for solar or solar plus battery installations.

Geothermal

Potential for commercial geothermal generation in the Pacific Northwest includes both flashed steam and binary-cycle technologies. Based on exploration to date in southern Idaho, binary-cycle geothermal development is more likely than flashed steam within Idaho Power's service area. The flashed steam technology requires higher water temperatures. Most optimal locations for potential geothermal development are believed to be in the southeastern part of the state; however, the potential for geothermal generation in southern Idaho remains somewhat uncertain. The time required to discover and prove geothermal resource sites is highly variable and can take years.

The overall cost of a geothermal resource varies with resource temperature, development size, and water availability. Flashed steam plants are applicable for geothermal resources where the fluid temperature is 300 ^{o}Fahrenheit or greater. Binary-cycle technology is used for lower temperature geothermal resources. In a binary-cycle geothermal plant, geothermal water is pumped to the surface and passed through a heat exchanger where the geothermal energy is transferred to a low-boiling-point fluid (the secondary fluid). The secondary fluid is vaporized and used to drive a turbine/generator. After driving the generator, the secondary fluid is condensed and recycled through a heat exchanger. The secondary fluid is in a closed system and is reused continuously in a binary-cycle plant. The primary fluid (the geothermal water) is returned to the geothermal reservoir through injection wells.

For Idaho Power's cost estimates and operating parameters for binary-cycle geothermal generation, see the Supply-Side Resource section of *Appendix C—Technical Report* of the 2021 IRP.

Wind

Modern wind turbines effectively collect and transfer energy from windy areas into electricity. A typical wind development consists of an array of wind turbines, with each turbine ranging in size from 1 to 5 MW. Most potential wind sites in southern Idaho lie between the south-central and the southeastern part of the state. Wind energy sites in areas that receive consistent, sustained winds greater than 15 miles per hour are the best candidates for development.

Upon comparison with other renewable energy alternatives, wind energy resources are well suited for the Intermountain and Pacific Northwest regions, as demonstrated by the large number of existing projects. Wind resources present operational challenges for electric utilities and system operators due to the variable nature of wind-energy generation. To adequately account for the unique characteristics of wind energy, resource planning of new wind resources requires estimates of the expected annual energy and capacity contribution. The 2021 IRP assumed an annual average capacity factor of 35% for projects sited in Idaho and 45% for projects sited in Wyoming.

The average ELCC value applied to future wind projects was 11.2%.

For Idaho Power's cost estimates, operating parameters, and ELCC calculations for wind resources, see the Supply-Side Resource and Loss of Load Expectation sections of *Appendix C—Technical Report* of the 2021 IRP.

Biomass

The 2021 IRP includes anaerobic digesters as a resource alternative. Multiple anaerobic digesters have been built in southern Idaho due to the size and proximity of the dairy industry and the large quantity of fuel available. Of the biomass technologies available, the 2021 IRP considers anaerobic digesters as the best fit for biomass resources within the service area.

For Idaho Power's cost estimates and operating parameters for an anaerobic digester, see the Supply-Side Resource section of *Appendix C—Technical Report* of the 2021 IRP.

Thermal Resources

While renewable resources have garnered significant attention in recent years, conventional thermal generation resources are essential to providing dispatchable capacity, which is critical in maintaining the reliability of a bulk-electrical power system and integrating renewable energy into the grid. Conventional thermal generation technologies include natural gas resources, nuclear, and coal.

Natural Gas Resources

Natural gas resources burn natural gas in a combustion turbine to generate electricity. CCCTs are commonly used for baseload energy, while faster ramping but less-efficient SCCTs are used to generate electricity during peak-load periods, or times of low variable resource output. Additional details related to the characteristics of both types of natural gas resources are presented in the following sections. CCCT and SCCT resources are typically sited near existing natural gas transmission pipelines. All of Idaho Power's existing natural gas generators are located adjacent to a major natural gas pipeline.

Combined-Cycle Combustion Turbines

CCCT plants have been the preferred choice for new commercial, dispatchable power generation in the region. CCCT technology benefits from a relatively low initial capital cost compared to other baseload resources; has high thermal efficiencies; is highly reliable;

provides significant operating flexibility; and when compared to coal, emits fewer emissions and requires fewer pollution controls. Modern CCCT facilities are highly efficient and can achieve efficiencies of approximately 60% (lower heating value) under ideal conditions.

A traditional CCCT plant consists of a natural gas turbine/generator equipped with a heat recovery steam generator (HRSG) to capture waste heat from the turbine exhaust. The HRSG uses waste heat from the combustion turbine to drive a steam turbine generator to produce additional electricity. In a CCCT plant, heat that would otherwise be wasted to the atmosphere is reclaimed and used to produce additional power beyond that typically produced by an SCCT. New CCCT plants can be constructed, or existing SCCT plants can be converted to combined-cycle units by adding an HRSG.

For Idaho Power's cost estimates and operating parameters for a CCCT resource, see the Supply-Side Resource section of *Appendix C—Technical Report* of the 2021 IRP.

Simple-Cycle Combustion Turbines

SCCT natural gas technology involves pressurizing air that is then heated by burning gas in fuel combustors. The hot, pressurized air expands through the blades of the turbine that connects by a shaft to the electric generator. Designs range from larger industrial machines at 80 to 200 MW to smaller machines derived from aircraft technology. SCCTs have a lower thermal efficiency than CCCT resources and are typically less economical on a per-MWh basis. However, SCCTs can respond more quickly to grid fluctuations and can assist in the integration of VERs.

Several natural gas SCCTs have been brought online in the region in the past two decades, primarily in response to the regional energy crisis of 2000 to 2001. High electricity prices combined with persistent drought during 2000 to 2001, as well as continued summertime peak-load growth, created an appetite for generation resources with low capital costs and relatively short construction lead times.

Idaho Power currently owns and operates approximately 430 MW of SCCT capacity. As peak summertime electricity demand continues to grow within Idaho Power's service area, SCCT generating resources remain a viable option to meet peak load during critical high-demand periods when the transmission system is constrained. The SCCT plants may also be dispatched based on economics during times when regional energy prices peak due to weather, fuel supply shortages, or other external grid influences.

For Idaho Power's cost estimates and operating parameters for a SCCT unit, see the Supply-Side Resource section of *Appendix C—Technical Report* of the 2021 IRP.

Reciprocating Internal Combustion Engines

Reciprocating internal combustion engine (RICE) generation sets are typically multi-fuel engines connected to a generator through a flywheel and coupling. They are typically capable of burning natural gas or other liquid petroleum products. They are mounted on a common base frame, resulting in the ability for an entire unit to be assembled, tuned, and tested in the factory prior to delivery to the power plant location. This production efficiency minimizes capital costs. Operationally, reciprocating engines are typically installed in configurations with multiple identical units, allowing each engine to be operated at its highest efficiency level once started. As demand for grid generation increases, additional units can be started sequentially or simultaneously. This configuration also allows for relatively inexpensive future expansion of the plant capacity. Reciprocating engines provide unique benefits to the electrical grid. They are extremely flexible because they can provide ancillary services to the grid in just a few minutes. Engines can go from a cold start to full load in 10 minutes.

For Idaho Power's cost estimates and operating parameters for RICE facilities, see the Supply-Side Resource section of *Appendix C—Technical Report* of the 2021 IRP.

Combined Heat and Power

Combined heat and power (CHP), or cogeneration, typically refers to simultaneous production of both electricity and useful heat from a single plant. CHP plants are typically located at, or near, commercial or industrial facilities capable of using the heat generated in the process. These facilities are sometimes referred to as the steam host. Generation technologies frequently used in CHP projects are gas turbines or engines with a heat-recovery unit.

The main advantage of CHP is the higher overall efficiencies that can be obtained because the steam host can use a large portion of the waste heat that would otherwise be lost in a typical generation process. Because CHP resources are typically located near load centers, investment in additional transmission capacity can also often be avoided.

In the evaluation of CHP resources, it became evident that CHP could be a relatively high-cost addition to Idaho Power's resource portfolio if the steam host's need for steam forced the electrical portion of the project to run at times when electricity market prices were below the dispatch cost of the plant. To find ways to make CHP more economical, Idaho Power is committed to working with individual customers to design operating schemes that allow power to be produced when it is most valuable, while still meeting the needs of the steam host's production process. This would be difficult to model for the IRP because each potential CHP opportunity could be substantially different. While not expressly analyzed in the 2021 IRP, Idaho Power will continue to evaluate CHP projects on an individual basis as they are proposed to the company.

Coal Conversion to Natural Gas

There are two primary methods by which a coal power plant can be converted to natural gas. The less common way is to fully retire the existing coal facility and replace it with a CCCT natural gas facility. The more common method is to convert the existing steam boiler to utilize natural gas instead of coal.[19] In either case, the conversion process can create numerous benefits, including reduced emissions, reduced plant O&M expenses, reduced capital costs, and increased flexibility.

For purposes of the 2021 IRP, Idaho Power has not modeled the first method in which a specific coal facility is replaced by a CCCT.

As a minority owner of the Jim Bridger facility, Idaho Power is aligning its modeling of the Jim Bridger plant with PacifiCorp's 2021 IRP by assuming that units 1 and 2 convert from coal to natural gas in 2024, or they are exited by the company. Idaho Power did not force the model to convert units 1 and 2 but instead allowed the LTCE model to either exit the units or convert them to natural gas.

Hydrogen Retrofit Opportunities

Hydrogen can be used to generate power with existing natural gas burning facilities with a retrofit. The production of hydrogen gas through electrolysis (a process that separates hydrogen from water with oxygen as a byproduct) using excess renewable energy is becoming more popular and costs are decreasing. There are opportunities to retrofit existing facilities to support fueling with a hydrogen blend to reduce greenhouse gas emissions. A full conversion can also be considered once larger quantities of hydrogen are commercially available. Idaho Power is monitoring these developments and will continue to evaluate opportunities associated with hydrogen.

Nuclear Resources

The nuclear power industry has been working to develop and improve reactor technology for many years, and Idaho Power continues to evaluate various technologies in the IRP process. Due to the Idaho National Laboratory (INL) site located in eastern Idaho, the IRP has typically assumed that an advanced-design or small modular reactor (SMR) could be built on the site. In September 2020, the Nuclear Regulatory Commission (NRC) issued its final safety evaluation report of NuScale Power's SMR design, with the full design certification pending. NuScale's current timeline would have their first reference plant online and fully operational by 2030 at INL. Idaho Power continues to monitor the advancement of SMR technology and will evaluate it in the future as the NRC reviews proposed SMR designs.

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[19] https://www.eia.gov/todayinenergy/detail.php?id=44636

For the 2021 IRP, a 77-MW SMR was analyzed. Compared to typical reactor designs, SMRs offer numerous benefits, including smaller physical footprints, reduced capital investment, plant size scalability, and greatly enhanced flexibility. Although current operating parameters are not available, Idaho Power has modeled the operational characteristics of an SMR plant similar to a combined cycle plant. Grid services provided by the SMR include baseload energy, peaking capacity, and flexible capacity.

For Idaho Power's cost estimates and operating parameters for an advanced SMR nuclear resource, see the Supply-Side Resource section of *Appendix C—Technical Report* of the 2021 IRP.

Coal Resources

Conventional coal generation resources have been part of Idaho Power's generation portfolio since the early 1970s. Growing concerns over emissions and climate change coupled with historic-low natural gas prices have made it imprudent to consider building new conventional coal generation resources.

No new coal-based energy resources were modeled as part of the 2021 IRP.

Storage Resources

RPSs have spurred the development of renewable resources in the Pacific Northwest to the point where there is an oversupply of energy during select times of the year. Mid-C wholesale market prices for electricity continue to remain relatively low. The oversupply issue has grown to the point where, at certain times of the year, such as in the spring, low customer demand coupled with large amounts of hydro and wind generation cause real-time and day-ahead wholesale market prices to be negative.

As increasing amounts of VERs continue to be built within the region, the value of an energy storage project increases. There are many energy storage technologies at various stages of development, such as hydrogen storage, compressed air, flywheels, battery storage, pumped hydro storage, and others. The 2021 IRP considered a variety of energy-storage technologies and modeled battery storage and pumped hydro storage.

Energy storage can provide numerous grid services in both short (less than 1 hour) and medium duration (between 1 hour and 8 hours). Short-term services include ancillary services like frequency regulation, spinning reserve, and reactive power support. In the medium duration, storage today can provide peak shaving, arbitrage, transmission and distribution deferral, and shaping for VERs.

Battery Storage

There are many types of battery-storage technologies at various stages of development. The dominant chemistry used in the market today is Li-ion-based, which accounted for more than 90% of large-scale battery storage projects in the United States[20] as of the end of 2019. Li-ion based chemistries provide significant advantages compared to other battery-storage technologies commercially available today. Those advantages include high cycle efficiency, high cycle life, fast response times, and high energy density. Although other chemistries—such as sodium-sulfide, nickel-cadmium, and lead-acid—have been installed and used for a variety of applications on the grid, their use has been limited due to numerous technical and financial reasons. It is for the reasons above that Idaho Power has focused on and modeled Li-ion storage over other technologies in the 2021 IRP. Idaho Power will continue to observe and evaluate the changing storage technology landscape.

Li-ion-based energy storage devices, like nearly any technology, can present potential safety concerns, and there have been several high-profile incidents of dangerous battery malfunctions.[21] [22] [23] That said, the battery storage industry is making strides to reduce the potential dangers posed by lithium-based storage technologies, and it is reasonable to believe technological improvements will increase the safety of these options in the future.

Costs for battery systems have experienced significant cost reductions[24] and provide numerous grid services. Idaho Power will continue to monitor price trends and scalability of this technology in the coming years.

The average ELCC value applied to future storage projects was 87.5% for 4-hour and 97% for 8-hour.

For Idaho Power's cost estimates, operating parameters, and ELCC calculations, see the Supply-Side Resource and Loss of Load Expectation sections of *Appendix C—Technical Report* of the 2021 IRP.

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[20] https://www.eia.gov/analysis/studies/electricity/batterystorage/pdf/battery_storage_2021.pdf

[21] https://www.aps.com/en/About/Our-Company/Newsroom/Articles/Equipment-failure-at-McMicken-Battery-Facility

[22] https://www.faa.gov/airports/airport_safety/certalerts/media/part-139-cert-alert-16-08-samsung-galaxy-note-7-ban.pdf

[23] https://www.cnbc.com/2021/07/23/gm-issues-second-recall-of-chevy-bolt-evs-after-vehicles-catch-fire.html

[24] https://www.eia.gov/todayinenergy/detail.php?id=45596#

Pumped-Hydro Storage

Pumped-hydro storage is a type of hydroelectric power generation that is capable of consuming electricity during times of low value and generating electricity during periods of high value. The technology stores potential energy by pumping water from a lower elevation reservoir to a higher elevation. Lower-cost, off-peak electricity is used to pump water from the lower reservoir to the upper reservoir. During higher-cost periods of high electrical demand, the water stored in the upper reservoir is used to produce electricity.

Typical round-trip cycle efficiencies are between 75% and 82% for pumped-hydro storage. The efficiency of a pumped-hydro storage facility is dependent on system configuration and site-specific characteristics. Pumped-hydro storage projects are often large and become more feasible where large amounts of storage are identified as a system need. Due to the region's increasing VER penetration, and the ancillary services required, Idaho Power will continue to monitor the viability of pumped-hydro storage projects.

For Idaho Power's cost estimates and operating parameters for pumped-hydro storage, see the Supply-Side Resource section of the *Appendix C—Technical Report* of the 2021 IRP.

IRP REPORT:

DEMAND-SIDE RESOURCES

6. DEMAND-SIDE RESOURCES

Demand-Side Management Program Overview

DSM resources offset future energy loads by reducing energy demand through either efficient equipment upgrades (energy efficiency) or peak-system demand reduction (demand response). Energy efficiency has been a leading resource in IRPs since 2004, providing average cumulative system load reductions of over 289 aMW by year-end 2020, while demand response programs in the past have brought significant peaking resources, with 380 MW of available capacity to serve system demand. Historically, energy efficiency potential resources have first been forecasted and screened for cost-effectiveness, then all available energy efficiency potential resources are included in the IRP before considering new supply-side resources. As part of the 2021 IRP, the company convened an energy efficiency working group, which consisted of interested members of the IRPAC and the Energy Efficiency Advisory Group. Based on input from this group, two approaches were used to include energy efficiency potential in the 2021 IRP.

Idaho Power's Irrigation Peak Rewards program helps offset energy use on high-use days.

Energy efficiency is estimated to reduce system peak by 440 MW. Also included in the Preferred Portfolio is 300 MW of nameplate summer capacity reduction from demand response plus an additional 100 MW of demand response by the end of the planning timeframe.

Energy Efficiency Forecasting—Energy Efficiency Potential Assessment

For the 2021 IRP, Idaho Power's third-party contractor, Applied Energy Group (AEG), provided a 20-year forecast of Idaho Power's energy efficiency potential from a utility cost test (UCT) perspective. The contractor also provided additional bundles of energy efficiency and their associated costs beyond the achievable economic potential for analysis in the 2021 IRP.

For the initial study, the contractor developed three levels of energy efficiency potential: technical, economic, and achievable. The three levels of potential are described below.

1. *Technical*—Technical potential is defined as the theoretical upper limit of energy efficiency potential. Technical potential assumes customers adopt all feasible measures

regardless of cost. In new construction, customers and developers are assumed to choose the most efficient equipment available. Technical potential also assumes the adoption of every applicable measure available. The retrofit measures are phased in over several years, which is increased for higher-cost measures.

2. *Economic*—Economic potential represents the adoption of all cost-effective energy efficiency measures. In the energy efficiency potential study, the contractor applied the UCT for cost-effectiveness, which compares lifetime energy and capacity benefits to the cost of the program. Economic potential assumes customers purchase the most cost-effective option at the time of equipment failure and adopt every cost-effective and applicable measure.
3. *Achievable*—Achievable potential considers market adoption, customer preferences for energy-efficient technologies, and expected program participation. Achievable potential estimates a realistic target for the energy efficiency savings a utility can achieve through its programs. It is determined by applying a series of annual market-adoption factors to the cost-effective potential for each energy efficiency measure. These factors represent the ramp rates at which technologies will penetrate the market.

The load forecast entered into AURORA includes the reduction to customer sales of all future achievable economic energy efficiency potential. Treatment of energy efficiency that could contribute beyond the decrement to the load forecast is discussed below.

Energy Efficiency Modeling

In addition to the baseline energy efficiency potential study that assessed technical, economic, and achievable potential in a manner consistent with past IRPs, the company modeled extra bundles of achievable technical energy efficiency and their costs in the AURORA model in the 2021 IRP.

Technically Achievable Supply Curve Bundling

Based on input from the efficiency working group, an approach was established that bundles technically achievable energy efficiency potential beyond the achievable economic potential, to be input into the AURORA model for possible selection. These bundles include measures that did not pass economic screening given current economic parameters but were made available for selection depending on various scenarios determined by the model. Technically achievable potential applies a market adoption factor intended to estimate those customers likely to participate in programs incentivizing more efficient processes and/or equipment, similar to the approach used when forecasting achievable potential.

Four bundles of energy efficiency measures were created that were grouped by summer or winter measures, as well as a high- and low-cost bundle for each season. Whether a measure belonged in the summer or winter bundle depended on the ratio of peak winter to summer kW determined by the measure's load shapes at the hour of seasonal peak need. The bundles are sized to be large enough to be used in AURORA, but small enough to keep the average levelized cost reflective of the costs of the measures associated with it.

After bundle creation, the bundles were loaded into the AURORA software with a 'nameplate' capacity (peak kW) and an 8,760-hour load shape that contained the percentage of peak demand for each hour of the year. A levelized cost was given for each bundle for each year. Because energy efficiency bundles may be necessary at different times, each bundle was modeled as its own resource for every year of the planning period. This gave the model the ability to select energy efficiency at any point in the planning period and keep the energy efficiency program active for as long as necessary. Therefore, the energy efficiency bundles were evaluated for every year in the model and activated or deactivated accordingly. If more than one year of a bundle is selected, the values are additive. For example, if the summer low-cost bundle is selected in 2023 at 3.6 MW and it is selected again in 2024, but is no longer needed in 2025, that bundle contributes 3.6 MW in 2023 and 7.2 MW in 2024 continuing through the remainder of the planning period. Once a bundle is selected, its contribution was held in the model throughout the remainder of the 20-year period. Table 6.1 lists the average annual resource potential and average levelized cost for the bundles.

Table 6.1 Energy efficiency bundles average annual resource potential and average levelized cost

Bundle	20-Year Average Annual Potential (aMW)	20-Year Average Real Cost ($/MWh)
Summer Low Cost	3.6	$103
Summer High Cost	21.7	$596
Winter Low Cost	12.6	$66
Winter High Cost	5.8	$325

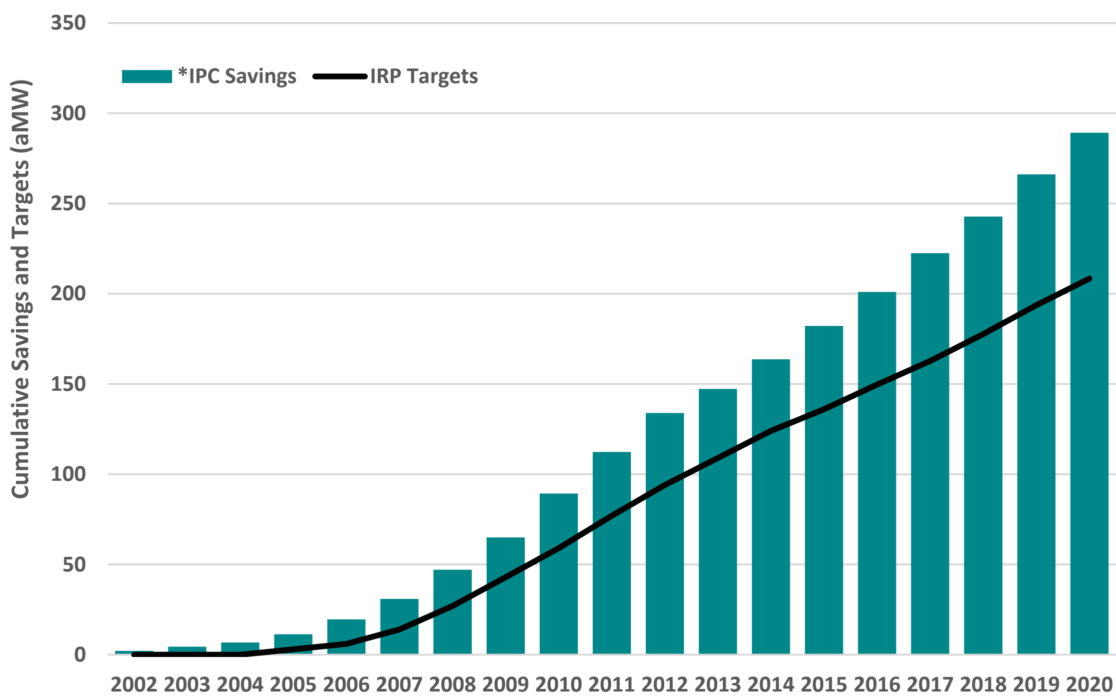
Future Energy Efficiency Potential

The 20-year energy efficiency potential included in the 2021 IRP increased from 234 aMW in the 2019 IRP to 300 aMW in the 2021 IRP. System on-peak potential from energy efficiency also increased from 367 MW to 376 MW from the 2019 IRP to the 2021 IRP. Most of the increase in energy efficiency potential was due to a change in the cost-effectiveness test.
Previously, the Total Resource Cost (TRC) was used, but beginning in 2020 the UCT was used. Typically, the UCT provides a lower threshold for cost-effectiveness relative to the TRC, allowing for additional energy efficiency to be cost-effective.

DSM Program Performance and Reliability

Energy Efficiency Performance

Energy efficiency investments since 2002 have resulted in a cumulative average annual load reduction of 289 aMW, or approximately 2.3 million MWh, of reduced supply-side energy production to customers through 2020. Figure 6.1 shows the cumulative annual growth in energy efficiency savings from 2002 through 2020, along with the associated IRP targets developed as part of the IRP process since 2004.



***** Idaho Power savings include Northwest Energy Efficiency Alliance non-code/federal standards savings

Figure 6.1 Cumulative annual growth in energy efficiency compared with IRP targets

Idaho Power's energy efficiency portfolio is currently a cost-effective and low-cost resource. Table 6.2 shows the 2020 year-end program results, expenses, and corresponding benefit-cost ratios.

Table 6.2 Total energy efficiency portfolio cost-effectiveness summary, 2020 program performance

Customer Class	2020 Savings (MWh)*	UCT ($000s)	Total Utility Benefits ($000s) (NPV**)	UCT: Benefit/ Cost Ratio	UCT Levelized Costs (cents/kWh)
Residential	37,302	$9,626	$15,792	1.6	2.6
Industrial/commercial	130,633	$24,898	$79,127	3.2	1.9
Irrigation	12,884	$3,402	$13,645	4.0	2.5
Total* **	**180,818**	**$40,052**	**$108,563**	**2.7**	**2.1**

* Values may not add to 100% due to rounding

** NPV=Net Present Value

*** Total UCT dollars, benefit/cost ratio and levelized costs include indirect program expenses included in the portfolio level but not in the customer class level

Note: Excludes market transformation program savings.

Energy Efficiency Reliability

The company works with third-party contractors to conduct energy-efficiency program impact evaluations to verify energy savings and process evaluations to assess operational efficiency on a scheduled and as-required basis.

Idaho Power uses industry-standard protocols for its internal and external evaluation efforts, including the National Action Plan for Energy Efficiency—Model Energy Efficiency Program Impact Evaluation Guide, the California Evaluation Framework, the International Performance Measurement and Verification Protocol, the Database for Energy Efficiency Resources, and the Regional Technical Forum's (RTF) evaluation protocols.

The timing of impact evaluations is based on protocols from these industry standards, with large portfolio contributors being evaluated more often and with more rigor. Smaller portfolio contributors are evaluated less often and require less analysis as most of the program measure savings are deemed savings from the RTF or other sources. Evaluated savings are expressed through a realization rate (reported savings divided by evaluated savings). Realized savings of programs evaluated between 2019 and 2020 ranged between 97% and 100%. The savings-weighted-realized-savings average over the same period is 99%.

Demand Response Performance

Demand response resources have been part of the demand-side portfolio since the 2004 IRP. The current demand response portfolio is composed of three programs. Table 6.3 lists the three programs that make up the current demand response portfolio, along with the different program characteristics. The Irrigation Peak Rewards program represents the largest percent of potential demand reduction. During the 2020 summer season, Irrigation Peak Rewards participants contributed 82% of the total potential demand-reduction capacity, or 298 MW. More details on Idaho Power's demand response programs can be found in the *Demand-Side Management 2020 Annual Report*.

Table 6.3 2020 demand response program capacity

Program	Customer Class	Reduction Technology	2020 Total Demand Response Capacity (MW)	Percent of Total 2020 Capacity*
A/C Cool Credit	Residential	Central A/C	32	9%
Flex Peak Program	Commercial, industrial	Various	36	10%
Irrigation Peak Rewards	Irrigation	Pumps	298	82%
Total			**366**	**100%**

*Values may not add to 100% due to rounding.

Figure 6.2 shows the historical annual demand response program capacity between 2004 and 2020. The demand-response capacity was lower in 2013 because of the one-year suspension of both the irrigation and residential programs. The temporary program suspension was due to a lack of near-term capacity deficits in the 2013 IRP.

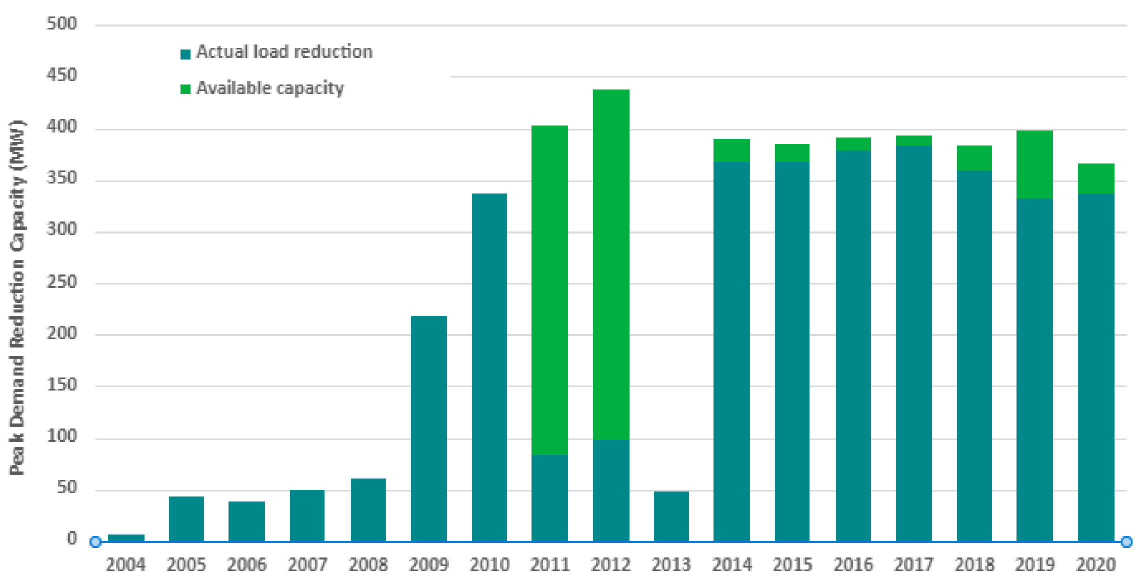


Figure 6.2 Historic annual demand response program performance

Demand Response Resource Potential

In the 2019 IRP, demand response from all programs was committed to provide 380 MW of peak capacity during June and July throughout the IRP planning period, with a reduced amount of program potential available during August.

As part of the 2021 IRP's rigorous examination of the potential for expanded demand response, Idaho Power utilized a Northwest Power and Conservation Council (NWPCC) assessment of DR potential for the Northwest region to determine the DR potential that may be available in Idaho Power's service area. Based on this assessment, Idaho Power estimated 584 MW of DR potential in its service area and concluded that any needed capacity from demand response would be shifted to later hours of the day than what the current DR programs were designed for.

Efforts to redesign each of Idaho Power's current programs to better align with system needs took place over the summer and early fall of 2021. Based on the results of the analysis, Idaho Power submitted filings with both the IPUC and OPUC to modify the program parameters. Based on these proposed changes to the programs, Idaho Power assumed there would likely be a reduction in participation, so starting in 2022, the 380 MW nameplate capacity was adjusted to 300 MW.

The NWPCC assessment of DR also included a potential associated with pricing programs, notably time-of-use (TOU) and critical peak pricing (CPP). The company has existing TOU offerings in both its Idaho and Oregon jurisdictions. The company's Idaho offering was initially developed in 2005 and now has approximately 1,000 customers enrolled. The company implemented TOU in its Oregon jurisdiction in 2018 and has less than five customers enrolled. In Order No. 21-184, the OPUC requested the company report on the number of participants, the total cost of the program to date, and the peak capacity reduction by season. With the level of customer participation data in the Oregon TOU rate, the sample used to develop a comprehensive and reliable assessment of residential peak shifting would be outside an acceptable margin of error tolerance limit at approximately +/-60%. As such, circumstantial behavioral changes could misrepresent peak shifting impacts when expanded to the full residential customer class. To date, the costs of administering the program have been limited to initial marketing efforts and are not materially significant. Finally, the OPUC requested that the company propose what venue to report TOU performance. The company believes it may be most appropriate to report ongoing TOU pilot performance and any changes to the offering in its annual DSP report, beginning with the summer 2022 report.

In summary, DR was evaluated in the 2021 IRP modeling process by using the 584 MW of DR potential with an estimate of 300 MW of capacity from the modified DR programs. Therefore, a maximum of approximately 280 additional MW of DR (584 MW minus 300 MW, rounded down) was available for selection in the AURORA model when analyzing the future load and resource balance. The additional DR capacity was divided into 20-MW bundles and available for selection up to the threshold. Idaho Power will continue to evaluate the DR potential in its service area with each IRP planning cycle.

T&D Deferral Benefits

Energy Efficiency

For the 2019 IRP, Idaho Power determined the T&D deferral benefits associated with energy efficiency by performing an analysis to determine how effective energy efficiency would be at deferring transmission, substation, and distribution projects. To perform the analysis, the company used historical and projected investments over a 20-year period from 2002 to 2021. Transmission, substation, and distribution projects at various locations across the company's system were represented. The limiting capacity (determined by distribution circuit or transformer) was identified for each project, along with the anticipated in-service date, projected cost, peak load, and projected growth rate.

Varying amounts of incremental energy efficiency were used and spread evenly across customer classes on all distribution circuits. Peak demand reduction was calculated and applied to summer and winter peaks for the distribution circuits and substation transformers. If the adjusted forecast was below the limiting capacity, it was assumed an associated project—the distribution circuit, substation transformer, or transmission line—could be deferred. The financial savings of deferring the project were then calculated.

The total savings from all deferrable projects were divided by the total annual energy efficiency reduction required to obtain the deferral savings over the service area.

Idaho Power calculated the corresponding T&D deferral value for each year in the 20-year forecast of incremental achievable energy efficiency. The calculated T&D deferral values ranged from $6.52 per kW-year to $1.40 per kW-year based on a forecasted incremental reduction in system sales of between 0.86% to 0.43% from energy efficiency programs. The 20-year average was $3.74 per kW-year. These values are then used in the calculation of energy efficiency cost-effectiveness.

For the 2021 IRP, Idaho Power has recognized an opportunity to align the timing of the T&D deferral analysis for energy efficiency and the energy efficiency potential assessment (used to calculate the cost-effective measures). The calculated values are used in the energy efficiency potential assessment which occurs a year before a typical IRP analysis (meaning the energy efficiency potential assessment had already been conducted for the 2021 IRP using the values from the 2019 IRP). Idaho Power plans to update the T&D deferral analysis for energy efficiency in the spring of 2022 so that new values will be implemented as part of the 2023 IRP energy efficiency potential assessment.

Distribution System Planning

Although Idaho Power has always conducted distribution system planning (DSP), in March 2019 the OPUC initiated an investigation into distribution system planning in docket UM 2005 with the stated objective of directing electric utilities to "develop a transparent, robust, holistic regulatory planning process for electric utility distribution system operations and investments."[25]

Over nearly two years, OPUC staff, stakeholders, and utilities have engaged in workshops and seminars to discuss distribution system planning possibilities, best practices, and lessons learned from other jurisdictions. These efforts culminated in DSP guidelines from OPUC staff, which were subsequently adopted by the OPUC in Order 20-485 on December 23, 2020. The adopted DSP guidelines identify specific efforts that utilities must conduct, analyze, and compile into reports filed every two years. On October 15, 2021, Idaho Power filed its Distribution System Plan Part I report with the OPUC in docket UM 2196. Within the report the company identified how the DSP and resource planning processes can inform and/or impact each respective plan.

One of the clear relationships between DSP and integrated resource planning is the ability to consider avoided or deferred distribution investments as a cost offset to potential resource investments. The value of such T&D deferral will be evaluated closely in the DSP process, as well as in the company's IRP. Distribution system planning affects the calculation of the T&D deferral value included in the IRP's energy efficiency cost-effectiveness test and the T&D deferral value of DERs in the IRP resource stack. To the extent that IRPs identify DER in the first two to four years of the IRP Action Plan, local load forecasts and the distribution plan would be adjusted based on the anticipated peak demand reduction.

Importantly, however, there are differences between the IRP and DSP processes. The IRP analyzes several long-term peak forecast scenarios focused on long-term resource needs. The DSP, on the other hand, analyzes near-term loading scenarios that can stress the local area capacity or operating constraints that may occur at peak or light loads. Further, any DER identified in the IRP does not specify location. The DSP is needed to inform the locational value (or cost) of DER on Idaho Power's system. With these considerations, the IRP and DSP are linked, and the results of either informs the other in an iterative process.

[25] See OPUC UM 2005, Order No. 19-104.

IRP REPORT:

TRANSMISSION PLANNING

7. TRANSMISSION PLANNING

Past and Present Transmission

500-kilovolt (kV) transmission line near Melba, Idaho

High-voltage transmission lines are vital to the development of energy resources for Idaho Power customers. Transmission lines made it possible to develop a network of hydroelectric projects in the Snake River system, supplying reliable, low-cost energy. In the 1950s and 1960s, regional transmission lines stretching from the Pacific Northwest to the HCC and to the Treasure Valley were central to the development of the HCC projects. In the 1970s and 1980s, transmission lines allowed partnerships in three coal power plants in neighboring states to deliver energy to Idaho Power customers. Today, transmission lines connect Idaho Power to wholesale energy markets and help economically and reliably mitigate the variability of VERs. They also allow Idaho Power to import clean energy from other regions and are consequently critical to Idaho Power achieving its goal to provide 100% clean energy by 2045.

Idaho Power's transmission interconnections provide economic benefits and improve reliability by transferring electricity between utilities to serve load and share operating reserves. Historically, Idaho Power experiences its peak load at different times of the year than most Pacific Northwest utilities; as a result, Idaho Power can purchase energy from the Mid-C energy trading market during its peak load and sell excess energy to Pacific Northwest utilities during their peak. Additional regional transmission connections to the Pacific Northwest would benefit the environment and Idaho Power customers in the following ways:

- Delay or avoid construction of additional resources to serve peak demand
- Increase revenue from off-system sales during the winter and spring, which would then be credited to customers through the PCA
- Increase revenue from sales of transmission system capacity, which would then be credited to Idaho Power customers
- Increase system reliability
- Increase the ability to integrate VERs, such as wind and solar

- Improve the ability to implement advanced market tools more efficiently, such as the EIM

Transmission Planning Process

FERC mandates several aspects of the transmission planning process. FERC Order No. 1000 requires Idaho Power to participate in transmission planning on a local, regional, and interregional basis, as described in Attachment K of the Idaho Power OATT and summarized in the following sections.

Local Transmission Planning

Idaho Power uses a biennial process to create a local transmission plan identifying needed transmission system additions. The local transmission plan is a 20-year plan that incorporates planned supply-side resources identified in the IRP process, transmission upgrades identified in the local-area transmission advisory process, forecasted network customer load (e.g., Bonneville Power Administration [BPA] customers in eastern Oregon and southern Idaho), Idaho Power's retail customer load, and third-party transmission customer requirements. By evaluating these inputs, required transmission system enhancements are identified that will ensure safety and reliability. The local transmission plan is shared with the regional transmission planning process.

A local-area transmission advisory process is performed every 10 years for each of the load centers identified, using unique community advisory committees to develop local-area plans. The community advisory committees include jurisdictional planners, mayors, city council members, county commissioners, representatives from large industry, commercial, residential, and environmental groups. Plans identify transmission and substation infrastructure needed for full development of the local area, accounting for land-use limits, with estimated in-service dates for projects. Local-area plans are created for the following load centers:

1. Eastern Idaho
2. Magic Valley
3. Wood River Valley
4. Eastern Treasure Valley
5. Western Treasure Valley (this load-area includes eastern Oregon)
6. West Central Mountains

Regional Transmission Planning

Idaho Power is active in NorthernGrid, a regional transmission planning association of 13 member utilities. The NorthernGrid was formed in early 2020. Previously, dating back to 2007, Idaho Power was a member of the Northern Tier Transmission Group.

NorthernGrid membership includes Avista, Berkshire Hathaway Energy Canada, BPA, Chelan County PUD, Grant County PUD, Idaho Power, NorthWestern Energy, PacifiCorp (Rocky Mountain Power and Pacific Power), Portland General Electric, Puget Sound Energy, Seattle City Light, Snohomish County PUD, and Tacoma Power. Biennially, NorthernGrid will develop a regional transmission plan using a public stakeholder process to evaluate transmission needs resulting from members’ load forecasts, local transmission plans, IRPs, generation interconnection queues, other proposed resource development, and forecast uses of the transmission system by wholesale transmission customers. The 2020–2021 regional transmission plan was published in December 2021 and can be found on the NorthernGrid website: www.northerngrid.net.

Existing Transmission System

Idaho Power’s transmission system extends from eastern Oregon through southern Idaho to western Wyoming and is composed of 115-, 138-, 161-, 230-, 345-, and 500-kV transmission facilities. Sets of lines that transmit power from one geographic area to another are known as transmission paths. Transmission paths are evaluated by WECC utilities to obtain an approved power transfer rating. Idaho Power has defined transmission paths to all neighboring states and between specific southern Idaho load centers as shown in Figure 7.1.

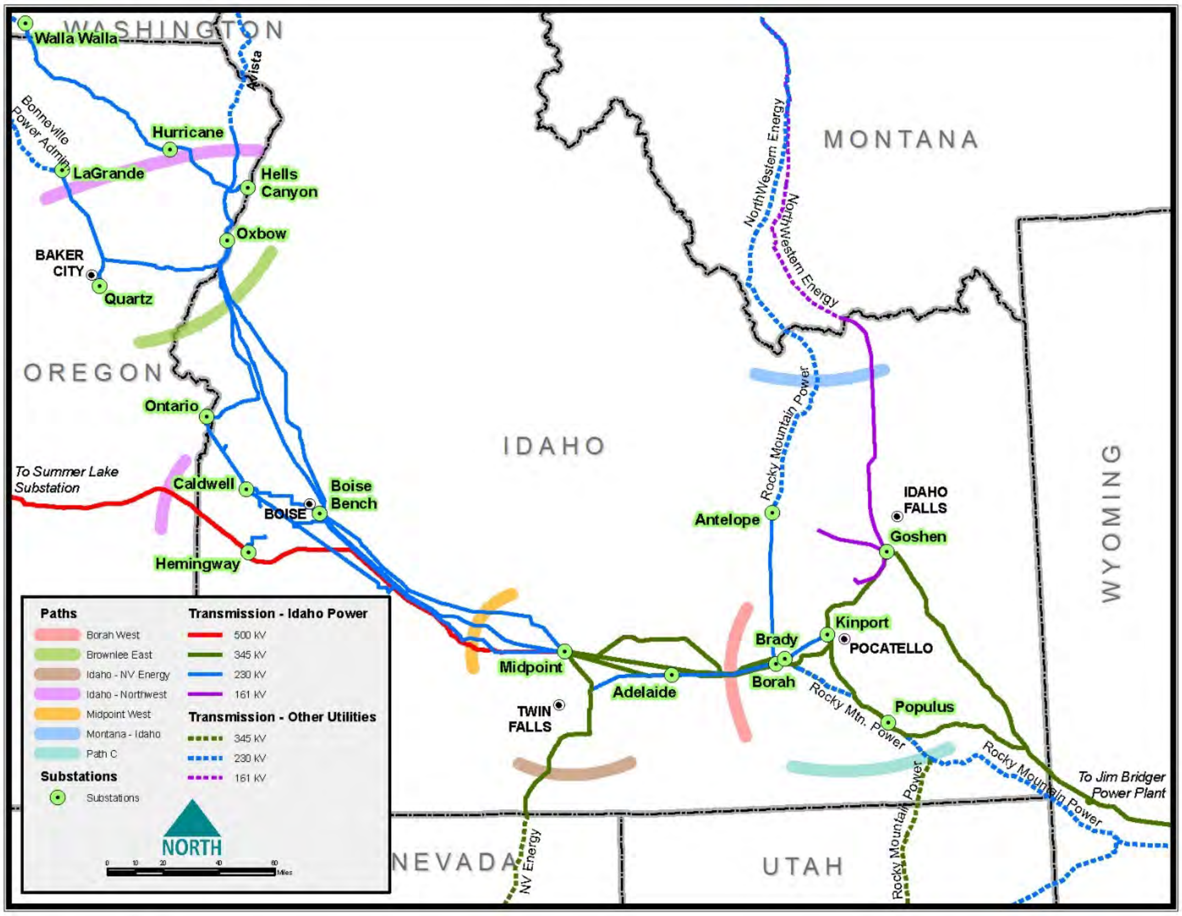


Figure 7.1 Idaho Power transmission system map

The transmission paths identified on the map are described in the following sections, along with the conditions that result in capacity limitations.

Idaho to Northwest Path

The Idaho to Northwest transmission path consists of the 500-kV Hemingway–Summer Lake line, the three 230-kV lines between the HCC and the Pacific Northwest, and the 115-kV interconnection at Harney Substation near Burns, Oregon. The Idaho to Northwest path is capacity-limited during summer months due to energy imports from the Pacific Northwest to serve Idaho Power retail load and transmission-wheeling obligations for the BPA load in eastern Oregon and southern Idaho. Additional transmission capacity is required to facilitate additional market purchases from northwest entities to serve Idaho Power's growing customer base.

Operationally since 2020, Idaho Power has seen increased third-party demand for west-to-east or north-to-south firm transmission from the Pacific Northwest to the desert southwest or California. Idaho Power continues to reserve capacity on internally controlled lines for facilitating external market purchases, but with the increased demand for firm transmission, the company has experienced near-term difficulty in reserving transmission on third-party controlled transmission between the Mid-C market hub and the Idaho to Northwest path. The company has made efforts to reserve transmission capacity on third-party systems since the 2019 IRP (further discussed in *Appendix D*).

Brownlee East Path

The Brownlee East transmission path is on the east side of the Idaho to Northwest path shown in Figure 7.1. Brownlee East comprises the 230-kV and 138-kV lines east of the HCC and Quartz Substation near Baker City, Oregon. When the Hemingway–Summer Lake 500-kV line is included with the Brownlee East path, the path is typically referred to as the Total Brownlee East path.

The Brownlee East path is capacity-limited during the summer months due to a combination of HCC hydroelectric generation flowing east into the Treasure Valley concurrent with transmission-wheeling obligations for BPA southern Idaho load and Idaho Power energy imports from the Pacific Northwest. Capacity limitations on the Brownlee East path limit the amount of energy Idaho Power can transfer from the HCC, as well as energy imports from the Pacific Northwest. If new resources, including market purchases, are located west of the path, additional transmission capacity will be required to deliver the energy to the Treasure Valley load center.

Idaho–Montana Path

The Idaho–Montana transmission path consists of the Antelope–Anaconda 230-kV and Goshen–Dillon 161-kV transmission lines. The Idaho–Montana path is also capacity-limited during the summer months as Idaho Power, BPA, PacifiCorp, and others move energy south from Montana into Idaho. In the north to south direction, Idaho Power has 167 MW of capacity on the path.

Borah West Path

The Borah West transmission path is internal to Idaho Power's system and is jointly owned between Idaho Power and PacifiCorp. Idaho Power owns 1,467 MW of the path, and PacifiCorp owns 1,090 MW of the path. The path includes 345-kV, 230-kV, and 138-kV transmission lines west of the Borah Substation located near American Falls, Idaho. Idaho Power's one-third share of energy from the Jim Bridger plant flows over this path, as well as energy from east-side resources and imports from Montana, Wyoming, and Utah. Heavy path flows are also likely to exist during the light-load hours of the fall and winter months as high eastern thermal and wind production move west across the system to the Pacific Northwest. Additional transmission capacity will likely be required if new resources or market purchases are located east of the Borah West path.

Midpoint West Path

The Midpoint West transmission path is internal to Idaho Power's system and is a jointly owned path between Idaho Power and PacifiCorp. Idaho Power owns 1,710 MW of the path, and PacifiCorp owns 1,090 MW of the path (all on the Midpoint–Hemingway 500-kV line). The path is composed of 500-kV, 230-kV, and 138-kV transmission lines west of Midpoint Substation located near Jerome, Idaho. Like the Borah West path, the heaviest path flows are likely to exist during the fall and winter when significant wind and thermal generation is present east of the path. Additional transmission capacity will likely be required if new resources or market purchases are located east of the Midpoint West path.

Idaho–Nevada Path

The Idaho–Nevada transmission path is the 345-kV Midpoint–Humboldt line. Idaho Power and NV Energy are co-owners of the line, which was developed at the same time the North Valmy Power Plant was built in northern Nevada. Idaho Power is allocated 100% of the northbound capacity, while NV Energy is allocated 100% of the southbound capacity. The import, or northbound, capacity on the transmission path is 360 MW, of which Valmy Unit 2 utilizes approximately 130 MW.

Idaho–Wyoming Path

The Idaho–Wyoming path, referred to as Bridger West, is made up of three 345-kV transmission lines between the Jim Bridger generation plant and southeastern Idaho. Idaho Power owns 800 MW of the 2,400-MW east-to-west capacity. PacifiCorp owns the remaining capacity. The Bridger West path effectively feeds into the Borah West path when power is moving east to west from Jim Bridger; consequently, the import capability of the Bridger West path into the Idaho Power area can be limited by Borah West path capacity constraints.

Idaho–Utah Path

The Idaho–Utah path, referred to as Path C, comprises 345-, 230-, 161-, and 138-kV transmission lines between southeastern Idaho and northern Utah. PacifiCorp is the path owner and operator of all the transmission lines. The path effectively feeds into Idaho Power's Borah West path when power is moving from east to west; consequently, the import capability of Path C into the Idaho Power area can be limited by Borah West path capacity constraints.

Table 7.1 summarizes the import capability for paths impacting Idaho Power operations and lists their total capacity and available transfer capability (ATC); most of the paths are completely allocated with no capacity remaining.

Table 7.1 Transmission import capacity

Transmission Path	Import Direction	Capacity (MW)	ATC (MW)*
Idaho–Northwest	West to east	1,200–1,340	Varies by Month
Idaho–Nevada	South to north	360	Varies by Month
Idaho–Montana	North to south	383	Varies by Month
Brownlee East	West to east	1,915	Internal Path
Midpoint West	East to west	2,800	Internal Path
Borah West	East to west	2,557	Internal Path
Idaho–Wyoming (Bridger West)	East to west	2,400	86 (Idaho Power Share)
Idaho–Utah (Path C)	South to north	1,250	PacifiCorp Path

* The ATC of a specific path may change based on changes in the transmission service and generation interconnection request queue (i.e., the end of a transmission service, granting of transmission service, or cancelation of generation projects that have granted future transmission capacity).

Boardman to Hemingway

In the 2006 IRP, Idaho Power identified the need for a transmission line to the Pacific Northwest electric market. At that time, a 230-kV line interconnecting at the McNary Substation to the greater Boise area was included in IRP portfolios. Since its initial identification, the project has been refined and developed, including evaluating upgrade options of existing transmission lines, evaluating terminus locations, and sizing the project to economically meet the needs of Idaho Power and other regional participants. The project, identified in 2006, has evolved into what is now B2H. The project, which is expected to provide a total of 2,050 MW of bidirectional capacity[26], involves permitting, constructing, operating, and maintaining a new, single-circuit 500-kV transmission line approximately 300 miles long between the proposed Longhorn substation near Boardman, Oregon, and the existing Hemingway *s*ubstation in southwest Idaho. The new line will provide many benefits, including the following:

- Greater access to the Pacific Northwest electric market to economically serve homes, farms, and businesses in Idaho Power's service area
- Improved system reliability and resiliency
- Reduced capacity limitations on the regional transmission system as demands on the system continue to grow
- Flexibility to integrate renewable resources and more efficiently implement advanced market tools, such as the EIM

[26] B2H is expected to provide 1,050 MW of capacity in the West-to-East direction, and 1,000 MW of capacity in the East-to-West direction.

The benefits of B2H in aggregate reflect its importance to the achievement of Idaho Power's goal to provide 100% clean energy by 2045 without compromising the company's commitment to reliability and affordability.

The B2H project has been identified as a preferred resource in IRPs since 2009 and ongoing permitting activities have been acknowledged in every IRP near-term Action Plan since 2009. The 2017 IRP was the first IRP to include construction activities in the near-term Action Plan and the 2019 IRP also included construction activities in the near-term Action Plan. The 2017 IRP and 2019 IRP near-term Action Plans, including B2H construction related activities mentioned within, were acknowledged by both the Idaho and Oregon PUCs.

Given the importance of the B2H project, the company will provide an IRP appendix, anticipated in the first quarter of 2022. *Appendix D—Transmission Supplement* will provide granular detail regarding Idaho Power's need for the project, co-participants, project history, benefits, and risks.

B2H is a regionally significant project; it was identified as a key transmission component of each Northern Tier Transmission Group biennial regional transmission plan for ten years 2010–2019. The B2H project is similarly a major component of the 2020–2021 NorthernGrid regional transmission plan, published in December 2021. Regional transmission planning efforts are widely regarded as producing efficient and cost-effective pathways to meet the load and resource needs of a given region.

The B2H project was selected by the Obama administration as one of seven nationally significant transmission projects that, when built, will help increase electric reliability, integrate new renewable energy into the grid, create jobs, and save consumers money. In a November 17, 2017, United States Department of the Interior press release,[27] B2H was held up as "a Trump Administration priority focusing on infrastructure needs that support America's energy independence…" The release went on to say, "This project will help stabilize the power grid in the Northwest, while creating jobs and carrying low-cost energy to the families and businesses who need it…"

B2H Value

Idaho Power in the 2021 IRP requests acknowledgement of B2H based on the company owning 45% of the project. This ownership share, which represents a change from Idaho Power's 21% share in the 2019 IRP, is the result of negotiations among Idaho Power, PacifiCorp, and BPA. Under such a structure, Idaho Power would absorb BPA's previously assumed ownership share in exchange for BPA entering into a transmission service agreement with Idaho Power.

[27] blm.gov/press-release/doi-announces-approval-transmission-line-project-oregon-and-idaho

This arrangement, along with many other aspects of B2H, will be detailed in the *Appendix D–Transmission Supplement*, which will be filed during the first quarter of 2022.

B2H's value to Idaho Power's customers is substantial, and it is a key least-cost resource.

The Preferred Portfolio, which includes B2H, is significantly more cost-effective than the best alternative resource portfolio that did not include B2H.

- Base with B2H Portfolio NPV (Preferred Portfolio)—$7,942.4 million
- Base without B2H PAC Bridger Alignment Portfolio NPV—$8,207.9 million
- B2H NPV Cost Effectiveness Differential—$265.5 million

Under planning conditions, the Preferred Portfolio (Base with B2H) is approximately $266 million more cost effective than the best portfolio that did not include the B2H project. Detailed portfolio costs can be found in Chapter 10.

Finally, B2H is an important step in moving Idaho Power toward its 2045 clean energy goal. The B2H 500-kV line adds significant regional capacity with some remaining unallocated east-to-west capacity. Additional parties may reduce costs and further optimize the project for all participants.

Project Participants

In January 2012, Idaho Power entered into a joint funding agreement with PacifiCorp and BPA to pursue permitting of the project. The agreement designates Idaho Power as the permitting project manager for the B2H project. Table 7.2 shows each party's B2H capacity and permitting cost allocation.

Table 7.2 B2H capacity and permitting cost allocation

	Idaho Power	BPA	PacifiCorp
Capacity (MW) west to east	350: 200 winter/500 summer	400: 550 winter/250 summer	300
Capacity (MW) east to west	85	97	818
Permitting cost allocation	21%	24%	55%

For the 2021 IRP, Idaho Power modeled B2H assuming that BPA transitions from an ownership stake in the B2H project to a service-based stake in the project. Further details regarding this assumption will be provided in *Appendix D*, which is anticipated to be filed during the first quarter of 2022. Table 7.3 shows what each party's new B2H capacity allocation would be, given this assumption.

Table 7.3 B2H capacity allocation

	Idaho Power	BPA	PacifiCorp
Capacity (MW) west to east	750	0	300
Capacity (MW) east to west	182	0	818
Permitting cost allocation	45%	0%	55%

Figure 7.2 shows the transmission line route submitted to the ODOE in 2017.

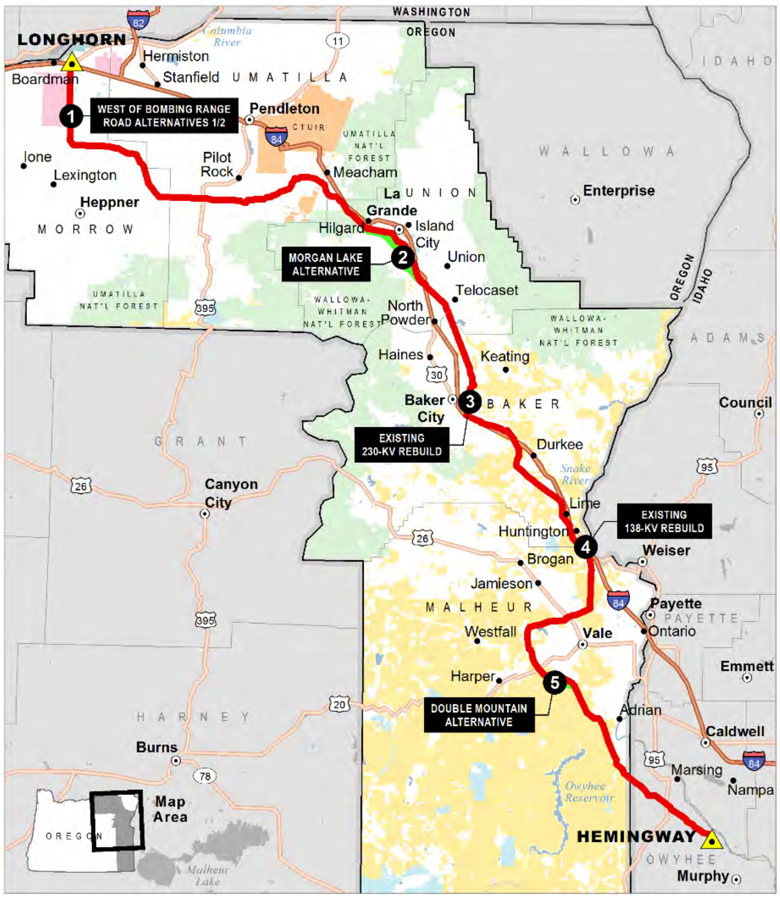


Figure 7.2 B2H route submitted in 2017 Oregon Energy Facility Siting Council (EFSC) Application for Site Certificate

Permitting Update

Permitting of the B2H project is subject to review and approval by, among other government entities, the Bureau of Land Management (BLM), United States Forest Service (USFS), United States Navy, and the Energy Facilities Siting Council of Oregon (EFSC). The federal permitting process is dictated primarily by the *Federal Land Policy Management Act and National Forest Management Act* and is subject to NEPA review. The BLM is the lead agency in administering the NEPA process for the B2H project. On November 25, 2016, BLM published the

Final EIS, and the BLM issued a Record of Decision (ROD) on November 17, 2017, approving a right-of-way grant for the project on BLM-administered lands.

The USFS issued a separate ROD on November 13, 2018, approving the issuance of a special-use authorization for a portion of the project that crosses the Wallowa–Whitman National Forest.

The Department of Defense issued its ROD on September 25, 2019, approving a right-of-way easement for a portion of the project that crosses the Naval Weapons System Training Facility in Boardman, Oregon.

On August 4, 2021, a federal district court in Oregon issued an order granting Idaho Power and the federal defendants' motions for summary judgment, dismissing the Stop B2H Coalition's challenge to the BLM and Forest Service's issuance of the rights-of-way. That order was not appealed to the Ninth Circuit Court of Appeals within the requisite timeframe, and thus the district court's decision upholding the federal rights-of-way is not subject to appeal.

For the State of Oregon permitting process, Idaho Power submitted the preliminary Application for Site Certificate (pASC) to EFSC in February 2013 and submitted an amended pASC in summer 2017. The amended pASC was deemed complete by ODOE in September 2018. The ODOE reviewed Idaho Power's application for compliance with EFSC siting standards and released a Draft Proposed Order (DPO) for B2H on May 22, 2019. Public comment on the DPO findings were taken by ODOE and EFSC, and—based on those comments—ODOE issued a Proposed Order on July 2, 2020. A contested case on the Proposed Order has been initiated and is being presided over by an EFSC-appointed Administrative Law Judge. Idaho Power currently expects the EFSC to issue a final order and site certificate in the second half of 2022. Permitting in Idaho will consist of a Conditional Use Permit issued by Owyhee County.

Idaho Power expects construction to begin in 2023, with the line in service in 2026.

Next Steps

With the issuance of a Proposed Order, sufficient route certainty exists to begin preliminary construction activities. These activities include, but are not limited to, the following:

- Geotechnical surveys
- Detailed ground surveys (light detection and ranging [LiDAR] surveys)
- Sectional surveys
- Right-of-way activities
- Detailed design
- Construction bid package development

After the B2H project receives a Final Order and Site Certificate from EFSC, construction activities will commence. Construction activities include, but are not limited to, the following:

- Long-lead material acquisition
- Transmission line construction
- Substation construction or upgrades

The specific timing of each of the preliminary construction and construction activities will be coordinated with the project co-participants. Additional project information is available at boardmantohemingway.com.

B2H Cost Treatment and Modeling in the IRP

The B2H transmission line project is modeled in AURORA as additional transmission capacity available for Idaho Power energy purchases from the Pacific Northwest. In general, for new supply-side resources modeled in the IRP process, surplus sales of generation are included as a cost offset in the AURORA portfolio modeling. Transmission wheeling revenues, however, are not included in AURORA calculations. To remedy this inconsistency, in the 2019 IRP, Idaho Power modeled incremental transmission wheeling revenue from non-native load customers as an annual revenue credit for B2H portfolios. In the 2021 IRP, Idaho Power continued to model expected incremental third-party wheeling revenues as a reduction in costs ultimately benefitting retail customers.

Idaho Power's transmission assets are funded by native load customers, network customers, and point-to-point transmission wheeling customers based on a ratio of each party's usage of the transmission system. For the 2021 IRP, Idaho Power modeled B2H assuming the company has a 45% ownership interest and is providing transmission service to BPA, with BPA transmission wheeling payments acting as a cost-offset to the overall B2H project costs. Additionally, portfolios involving B2H result in a higher FERC transmission rate than portfolios without B2H. Although B2H provides significant incremental capacity, and will likely result in increased transmission sales, Idaho Power assumed flat transmission sales volume as a conservative assumption (other than increased volumes associated with transmission network customers such as BPA). The flat sales volume, applied to the higher FERC transmission rate, results in an additional cost offset for IRP portfolios with B2H.

In IRP modeling, Idaho Power assumes a 45.45% share of the direct expenses of B2H, plus an Allowance for Funds Used During Construction (AFUDC) cost. Total Cost Estimate: $485 million, which includes $35 million in local interconnection upgrades.

Gateway West

The Gateway West transmission line project is a joint project between Idaho Power and PacifiCorp to build and operate approximately 1,000 miles of new transmission lines from the planned Windstar Substation near Glenrock, Wyoming, to the Hemingway Substation near Melba, Idaho. PacifiCorp is currently the project manager for Gateway West, with Idaho Power providing a supporting role.

Figure 7.3 shows a map of the project identifying the authorized routes in the federal permitting process based on the BLM's November 2013 ROD for segments 1 through 7 and 10. Segments 8 and 9 were further considered through a Supplemental EIS by the BLM. The BLM issued a ROD for segments 8 and 9 on January 19, 2017. In March 2017, this ROD was rescinded by the BLM for further consideration. On May 5, 2017, the Morley Nelson Snake River Birds of Prey National Conservation Area Boundary Modification Act of 2017 (H.R. 2104) was enacted. H.R. 2104 authorized the Gateway West route through the Birds of Prey area that was proposed by Idaho Power and PacifiCorp and supported by the Idaho Governor's Office, Owyhee County and certain other constituents. On April 18, 2018, the BLM released the Decision Record granting approval of a right-of-way for Idaho Power's proposed routes for segments 8 and 9.

In its 2017 IRP, PacifiCorp announced plans to construct a portion of the Gateway West Transmission Line in Wyoming. PacifiCorp has subsequently constructed the 140-mile segment between the Aeolus substation near Medicine Bow, Wyoming, and the Jim Bridger power plant near Point of Rocks, Wyoming. The Aeolus to Anticline 500-kV line segment was energized November 2020.

Idaho Power has a one-third interest in the segments between Midpoint and Hemingway (segment 8), Cedar Hill and Hemingway (segment 9), and Cedar Hill and Midpoint (segment 10). Further, Idaho Power has interest in the segment between Borah and Midpoint (segment 6), which is an existing transmission line operated at 345 kV but constructed at 500 kV.

Figure 7.3 Gateway West map

Gateway West will provide many benefits to Idaho Power customers, including the following:

- Relieve Idaho Power's constrained transmission system between the Magic Valley (Midpoint) and the Treasure Valley (Hemingway). Transmission connecting the Magic Valley and Treasure Valley is part of Idaho Power's core transmission system, connecting two major Idaho Power load centers.
- Provide the option to locate future generation resources east of the Treasure Valley
- Provide future load-service capacity to the Magic Valley from the Cedar Hill Substation
- Help meet the transmission needs of the future, including transmission needs associated with VERs

The completed Gateway West project would provide a total of 3,000 MW of additional transfer capacity. As detailed previously, Idaho Power has a one-third interest in the capacity additions between Midpoint and Hemingway. Along with the B2H project, Gateway West is a major component of the 2020–2021 NorthernGrid regional transmission plan. The Gateway West and B2H projects are complementary and will provide upgraded transmission paths from the Pacific Northwest across Idaho and into eastern Wyoming. Regional transmission plans produce a more efficient or cost-effective plan for meeting the transmission requirements associated with the load and resource needs of the regional footprint.

Gateway West Cost Treatment and Modeling in the 2021 IRP

Similar to the B2H project, Idaho Power is working with PacifiCorp to develop the Gateway West transmission project. While B2H provides Idaho Power additional access to the liquid Mid-C market hub, and therefore acts as a stand-alone resource, the Gateway West project serves a different function. Gateway West enables additional resources to be integrated onto the Idaho Power transmission system east of the Treasure Valley. Without Gateway West the quantity of incremental resources is constrained.

The transmission capacity associated with Gateway West can relieve two primary transmission constraints: 1) transmission capacity between the Magic Valley and Treasure Valley (Midpoint West), and 2) transmission capacity between the Mountain Home area, and the Treasure Valley (Boise East). Given identified coal unit exits at the Jim Bridger and North Valmy power plants, the company can repurpose significant Midpoint West capacity to integrate resources on the east side of the Idaho Power transmission system. However, the Boise East path remains constrained.

For the 2021 IRP, the company modeled a Gateway West segment, the Midpoint to Hemingway #2 500-kV line (segment 8), as being phased in with two separate transmission projects. The transmission sub-segments were modeled as being triggered coincident with different quantities of net incremental resource additions. The first sub-segment of Gateway West is required following the incremental addition of about 900 to 1,300 MW of resources. This sub-segment is the section from Mountain Home to the Treasure Valley, with Idaho Power modeling the line as being constructed as a 500-kV line but operated at 230 kV.

The second sub-segment of Gateway West is required following 700 MW of additional incremental resources (1,600-2,000 MW in total). This sub-segment connects the Magic Valley to Mountain Home, constructed and operated at 500 kV, with the assumed conversion of the first sub-segment of the line to 500 kV as well.

To determine a cost-estimate for these sub-segments, the company utilized costs associated with its Gateway West federal permit, transmission cost-per-mile estimates for B2H, and 230-kV substation estimates. The total cost estimate for Idaho Power is $176 million, plus local interconnection upgrades totaling $35 million, if necessary.

Nevada Transmission without North Valmy

The Idaho–Nevada transmission path is co-owned by Idaho Power and NV Energy. After the anticipated Idaho Power exit from the North Valmy unit, the existing Midpoint-Valmy transmission agreement between Idaho Power and NV Energy will likely be terminated. Idaho Power will own and control the bi-directional transmission capacity from the

Idaho–Nevada border to Midpoint and NV Energy will own and control the bi-directional transmission capacity from North Valmy to the Idaho–Nevada border.

With this assumption, import availability was evaluated on the transmission path as part of the 2021 study evaluating Valmy Unit 2 exit dates. The analysis determined that no long-term firm transmission is available on third party transmission across the NV Energy system from southern market energy hubs to the Idaho Power border. Given the lack of long-term firm transmission availability south of NV Energy, the transmission path capacity into the Idaho Power system is not included within Idaho Power's capacity planning margin. The path, however, is expected to continue to be heavily utilized for real-time transactions by the Energy Imbalance Market.

Southwest Intertie Transmission Project-North

The Southwest Intertie Transmission Project-North (SWIP-North) is a proposed 275-mile 500-kV transmission project being developed by Great Basin Transmission, LLC which is an affiliate of LS Power. The SWIP-North connects Idaho Power's Midpoint substation near Twin Falls, Idaho, and the Robinson Summit substation near Ely, Nevada. The project would provide a connection to the One Nevada 500-kV Line (ON Line) which is an in-service segment between Robinson Summit and the Harry Allen substation in the Las Vegas, Nevada, area. The two projects together are the combined SWIP project. The combined SWIP project is expected to have a bi-directional WECC-approved path rating of approximately 2,000 MW.

The addition of the SWIP-North segment would unlock additional capacity on the existing ON Line that connects northern and southern Nevada. Contractual ownership of capacity on SWIP-North would provide capacity rights to and from the Harry Allen substation in the Las Vegas area. The Harry Allen substation is connected to the California Independent System Operator (CAISO) via the newly constructed DesertLink 500-kV line. The substation is also near the desert southwest market hub, Mead. Idaho Power's potential participation in the project could provide the company transmission access—past congestion on NV Energy's system—from the desert southwest market and CAISO directly to Idaho Power. Figure 7.4 shows the SWIP-North Preliminary Route and the locations of the ON Line and DesertLink 500-kV lines to the south.

To determine a cost-estimate for SWIP-North, the company used publicly available cost data for similar lines recently constructed in Nevada and assumed that Idaho Power would own a 200-MW share of the south-to-north capacity. The SWIP-North project was not considered for inclusion in the company's Preferred Portfolio in the 2021 IRP due to uncertainty related to total project viability and available partners. The project was evaluated to determine whether further exploration is warranted. Given the results detailed in Chapter 11, the company plans to engage in discussions with the SWIP-North project developer to perform a more detailed evaluation in future IRPs.

Total Cost Estimate (200 MW share): $133 million with a pre-summer 2025 in-service date.

Figure 7.4 SWIP-North Preliminary Route

Transmission Assumptions in the IRP Portfolios

Idaho Power makes resource location assumptions to determine transmission requirements as part of the IRP development process. Supply-side resources included in the resource stack typically require local transmission improvements for integration into Idaho Power's system. Additional transmission improvement requirements depend on the location and size of the resource. The transmission assumptions and transmission upgrade requirements for incremental resources are summarized in Table 7.4. The company assumed all resources

Transmission lines under construction at the Hemingway substation.

were located east of the Treasure Valley. Backbone transmission assumptions include an assignment of the pro-rata share for transmission upgrades identified for resources east of Boise.

Table 7.4 Transmission assumptions and requirements

Resource	Capacity (MW)	Cost Assumption Notes	Local Interconnection Assumptions
Biomass indirect—anaerobic digester	35	Distribution feeder locations in the Magic Valley; displaces equivalent MW of portfolio resources in same region.	Connection to distribution feeder.
Geothermal (binary-cycle)—Idaho	30	Raft River area location; displaces equivalent MW of portfolio resources in same region.	Requires 5-mile, 138-kV line to nearby station with new 138-kV substation line terminal bay.
Natural gas—SCCT frame F class	170	Mountain Home location; displaces equivalent MW of portfolio resources in same region.	Connection to 230 kV ring bus.
Natural gas—reciprocating gas engine Wärtsilä 34SG	55	Mountain Home location; displaces equivalent MW of portfolio resources in same region.	Interconnecting at 230-kV Rattlesnake Substation.
Natural gas—CCCT (1x1) F class with duct firing	300	Mountain Home location; displaces equivalent MW of portfolio resources in same region.	Interconnecting at 230-kV Rattlesnake Substation.
Nuclear—SMR	77	Tie into Antelope 230-kV transmission substation; displaces equivalent MW of portfolio resources east of Boise.	Two 2-mile, 138-kV lines to interconnect to Antelope Substation. New 138-kV terminal at Antelope Substation. New 55-mile 230-kV line from Antelope to Brady Substation. New 230-kV terminal at Brady Substation.
Pumped storage—new upper reservoir and new generation/ pumping plant	250	Anderson Ranch location; displaces equivalent MW of portfolio resources in same region.	18-mile, 230-kV line to connect to Rattlesnake Substation.
Solar PV—utility-scale 1-axis tracking	100	Magic Valley location; displaces equivalent MW of portfolio resources in same region.	1-mile, 230-kV line and associated stations equipment.
Wind—Idaho	100	Location within 5 miles of Midpoint Substation; displaces equivalent MW of portfolio resources in same region.	5-mile, 230-kV transmission from Midpoint Substation to project site.
Wind—Wyoming	100	Location within 5 miles of Jim Bridger–Populus 345-kV transmission line	5-mile, 345-kV transmission from Jim Bridger—Populus line to project site

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IRP REPORT:

PLANNING PERIOD FORECASTS

8. PLANNING PERIOD FORECASTS

Chobani plant near Twin Falls, Idaho.

The IRP process requires Idaho Power to prepare numerous forecasts and estimates, which can be grouped into four main categories:

1. Load forecasts
2. Generation forecast for existing resources
3. Natural gas price forecast
4. Resource cost estimates

The load and generation forecasts—including supply-side resources, DSM, and transmission import capability—are used to estimate surplus and deficit positions in the load and resource balance. The identified deficits are used to develop resource portfolios evaluated using financial tools and forecasts. The following sections provide details on the forecasts prepared as part of the 2021 IRP. A more detailed discussion on these topics is included in *Appendix A—Sales and Load Forecast*.

Load Forecast

Each year, Idaho Power prepares a forecast of sales and demand of electricity using the company's electrical T&D network. This forecast is a product of historical system data and trends in electricity usage along with numerous external economic and demographic factors.

Idaho Power has its annual peak demand in the summer, with peak loads driven by irrigation pumps and air conditioning (A/C) in June, July, and August. Historically, Idaho Power's growth rate of the summertime peak-hour load has exceeded the growth of the average monthly load. Both measures are important in planning future resources and are part of the load forecast prepared for the 2021 IRP.

The anticipated average energy (average load) and anticipated peak-hour demand forecast represent Idaho Power's most probable outcome for load requirements during the planning period. In addition, Idaho Power prepares other probabilistic load forecasts that address the load variability associated with abnormal weather and economic scenarios.

The anticipated forecast for system load growth is determined by summing the load forecasts for individual classes of service, as described in *Appendix A—Sales and Load Forecast*.
For example, the anticipated annual average system load growth of 1.4% (over the period 2021 through 2040) comprises a residential load growth of 0.8%, a commercial load growth of 0.9%,

an irrigation load growth of 0.6%, an industrial load growth of 1.6%, and an additional firm load growth of 6.3%.

The number of residential customers in Idaho Power's service area is expected to increase 1.9% annually from 491,229 at the end of 2020 to nearly 719,500 by the end of the planning period in 2040. Growth in the number of customers within Idaho Power's service area, combined with an expected declining consumption per customer, results in a 0.8% average annual residential load-growth rate over the forecast term.

Significant factors that influenced the outcome of the 2021 IRP load forecast include, but are not limited to, the following items:

- Weather plays a primary role in impacting the load forecast on a monthly and seasonal basis. In the anticipated case load forecast of energy and peak-hour demand, Idaho Power assumes average temperatures and precipitation over a 30-year meteorological measurement period or defined as normal climatology. Probabilistic variations of weather are also analyzed.
- The economic forecast used for the 2021 IRP reflects the continued expansion of the Idaho economy in the near-term and reversion to the long-term trend of the service-area economy. Customer growth was at a near standstill until 2012, but since then acceleration of net migration and business investment has resulted in renewed positive activity. The state of Idaho had the highest residential population growth rate of any state in the United States over the past five years (ending 2020).
- Conservation impacts—including DSM energy efficiency programs, codes, and standards, and other naturally occurring efficiencies—are integrated into the sales forecast. These impacts are expected to continue to erode use per customer over much of the forecast period. Impacts of demand response programs (on peak) are accounted for in the load and resource balance analysis within supply-side planning (i.e., demand response is treated as a supply-side peaking resource). The amount of committed and implemented DSM programs for each month of the planning period is shown in the load and resource balance in *Appendix C—Technical Appendix*. Additional impacts from on-site generation customers and electric vehicles are included as well.
- Although interest from large customers has been robust, there is some uncertainty associated with these industrial and special contract customers due to the number of parties that contact Idaho Power expressing interest in locating operations within Idaho Power's service area, typically with an uncertain magnitude of the energy and peak-demand requirements. The anticipated load forecast reflects only those industrial customers that have made a sufficient and significant binding investment and/or

interest indicating a commitment of the highest probability of locating in the service area. The large number of businesses that have indicated some interest in locating in Idaho Power's service area but have not made sufficient commitments are not included in the anticipated-case sales and load forecast.

- The electricity price forecast used to prepare the sales and load forecast in the 2021 IRP reflects the additional plant investment and variable costs of integrating the resources identified in the 2019 IRP Preferred Portfolio. When compared to the electricity price forecast used to prepare the 2019 IRP sales and load forecast, the 2021 IRP price forecast yields lower future prices. The retail prices are mostly lower throughout the planning period which can impact the sales forecast, a consequence of the inverse relationship between electricity prices and electricity demand.
- As discussed above, the response to the novel coronavirus influenced electric usage behavior across the major rate classes. These impacts tended to balance one another; e.g., increased residential consumption due to work-from-home behavior was offset by decreased use from office and other commercial facilities. While these impacts continue to play out in decreasing importance, the impact on the long-term forecast horizon is inconsequential.

Weather Effects

The anticipated load forecast assumes average temperatures and precipitation over a 30-year meteorological measurement period, or normal climatology. This implies a 50% chance loads will be higher or lower than the anticipated load forecast due to colder-than-normal or hotter-than-normal temperatures and wetter-than-normal or drier-than-normal precipitation. Since actual loads can vary significantly depending on weather conditions, additional scenarios for an increased load requirement were analyzed to address load variability due to abnormal weather—the 70th- and 90th-percentile load forecasts. Seventieth-percentile weather means that in 7 out of 10 years, load is expected to be less than forecast, and in 3 out of 10 years, load is expected to exceed the forecast. Ninetieth-percentile load has a similar definition with a 1-in-10 likelihood the load will be greater than the forecast.

Idaho Power's operating results fluctuate seasonally and can be adversely affected by changes in weather and climate. Idaho Power's peak electric power sales are bimodal over a year, with demand in Idaho Power's service area peaking during the summer months. Currently, summer months exhibit a reliance on the system for cooling load in tandem with requirements for irrigation pumps. A secondary peak during the winter months also occurs, driven primarily by colder temperatures and heating. As Idaho Power has become a predominantly summer peaking utility, timing of precipitation and temperature can impact which of those months demand on the system is greatest. Idaho Power tests differing weather probabilities hinged on a 30-year normal period. A more detailed discussion of the weather-based probabilistic scenarios and seasonal peaks is included in *Appendix A—Sales and Load Forecast*.

Weather is the primary factor affecting the load forecast on a monthly or seasonal basis. During the forecast period, economic and demographic conditions also influence the load forecast.

Economic Effects

Numerous external factors influence the sales and load forecast that are primarily economic and demographic. Moody's Analytics is the primary provider for these data. The national, state, metropolitan statistical area (MSA), and county economic and demographic projections are tailored to Idaho Power's service area using an in-house economic database. Specific demographic projections are also developed for the service area from national and local census data. Additional data sources used to substantiate said economic data include, but are not limited to, the United States Census Bureau, the Bureau of Labor Statistics, the Idaho Department of Labor, Woods & Poole, Construction Monitor, and Federal Reserve economic databases.

The state of Idaho had the highest population growth rate of any state in the United States over the past five years (ending 2020). The number of households in Idaho is projected to grow at an annual rate of 2% during the forecast period, with most of the population growth centered on the Boise City–Nampa MSA. The Boise MSA (or the Treasure Valley) encompasses Ada, Boise, Canyon, Gem, and Owyhee counties in southwestern Idaho. The number of households in the Boise–Nampa MSA is projected to grow faster than the state of Idaho, at an annual rate of 2.6% during the forecast period. In addition to the number of households, incomes, employment, economic output, and electricity prices are economic components used to develop load projections.

Idaho Power continues to manage a pipeline of prospective large-load customers (over 1 MW)—both existing customers anticipating expansion and companies considering new investment in the state—that are attracted to Idaho's positive business climate and low electric prices. Idaho Power's economic development strategy is focused on optimizing Idaho Power's generation resources and infrastructure by attracting new business opportunities to our service area in both Idaho and eastern Oregon. Idaho Power's service offerings are benchmarked against other utilities. The company also partners with the states and communities to support local economic development strategies, and coordinates with large load customers engaged in a site selection process to locate in Idaho Power's service area.

The 2021 IRP average annual system load forecast reflects continued improvement in the service-area's economy. The improving economic and demographic variables driving the 2021 forecast are reflected by a positive sales outlook throughout the planning period.

Average-Energy Load Forecast

Potential monthly average-energy use by customers in Idaho Power's service area is defined by three load forecasts that reflect load uncertainty resulting from different weather-related assumptions. Figure 8.1 and Table 8.1 show the results of the three forecasts used in the 2021 IRP as annual system load growth over the planning period. There is an approximately 50% probability Idaho Power's load will exceed the expected-case forecast, a 30% probability of load exceeding the 70th-percentile forecast, and a 10% probability of load exceeding the 90th-percentile forecast. The projected 20-year compound annual growth rate in the expected case forecast and 70th-percentile forecast is 1.4% during the 2021 through 2040 period. The projected 20-year average compound annual growth rate in the 90th percentile forecast is 1.4% over the 2021 through 2040 period.

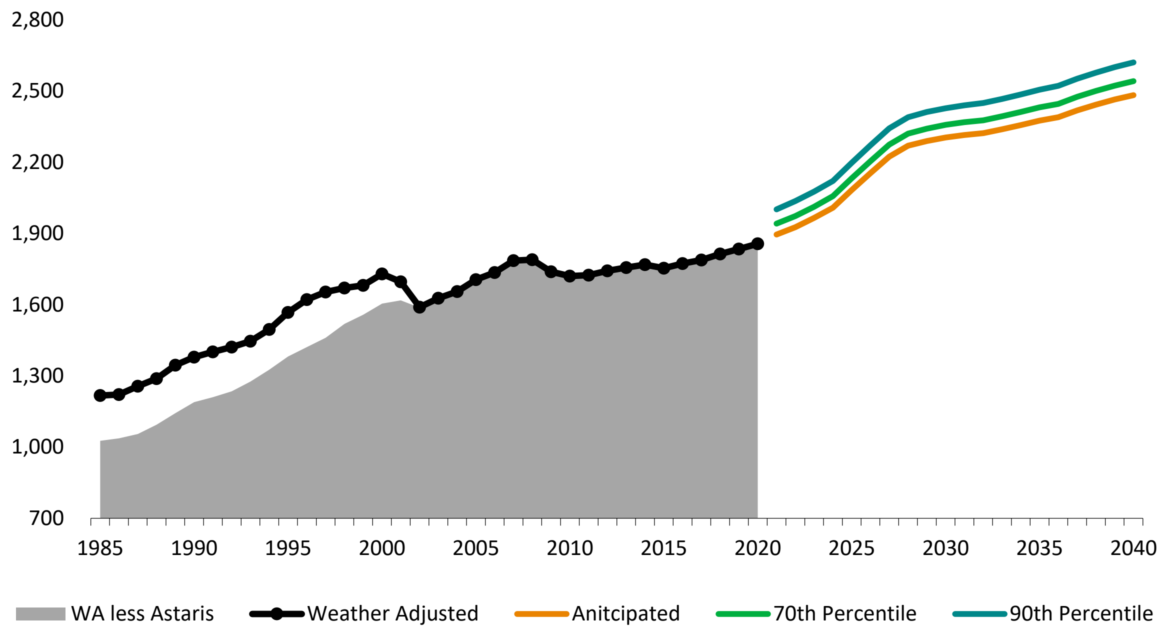

Figure 8.1 Average monthly load-growth forecast (aMW)

Table 8.1 Load forecast—average monthly energy (aMW)

Year	Anticipated	70th Percentile	90th Percentile
2021	1,895	1,941	2,001
2022	1,926	1,973	2,036
2023	1,965	2,012	2,076
2024	2,008	2,057	2,121
2025	2,082	2,132	2,197
2026	2,154	2,204	2,271
2027	2,223	2,274	2,342
2028	2,269	2,320	2,389
2029	2,289	2,341	2,411
2030	2,304	2,357	2,427
2031	2,314	2,368	2,439
2032	2,322	2,376	2,449
2033	2,338	2,393	2,466
2034	2,356	2,411	2,485
2035	2,375	2,431	2,505
2036	2,389	2,445	2,521
2037	2,418	2,475	2,551
2038	2,442	2,500	2,577
2039	2,464	2,522	2,600
2040	2,482	2,541	2,620
Growth Rate (2021–2040)	**1.4%**	**1.4%**	**1.4%**

Peak-Hour Load Forecast

The average-energy load forecast, as discussed in the preceding section, is an integral component of the load forecast. The peak-hour load forecast is similarly integral. Peak-hour forecasts are derived from the sales forecast, and as the impact of peak-day temperatures.

The system peak-hour load forecast includes the sum of the individual coincident peak demands of residential, commercial, industrial, and irrigation customers, as well as special contracts.

Idaho Power's system peak-hour load record—3,751 MW—was recorded on Wednesday, June 30, 2021, at 7 p.m. Summertime peak-hour load growth accelerated in the previous decade as A/C became standard in nearly all new home construction and new commercial buildings. System peak demand slowed considerably in 2009, 2010, and 2011—the consequences of a severe recession that brought home and business construction to a standstill. Demand response programs have also been effective at reducing peak demand in the summer. The 2021 IRP load forecast projects annual peak-hour load to grow by approximately 55 MW per year throughout the planning period. The peak-hour load forecast does not reflect the company's demand response programs, which are accounted for in the load and resource balance and are treated similarly to a supply-side resource.

Idaho Power's winter peak-hour load record is 2,527 MW, recorded January 6, 2017, at 9 a.m., matching the previous record peak December 10, 2009, at 8 a.m. Historical winter peak-hour load is much more variable than summer peak-hour load. The winter peak variability is due to peak-day temperature variability in winter months, which is far greater than the variability of peak-day temperatures in summer months.

Figure 8.2 and Table 8.2 summarize three forecast outcomes of Idaho Power's estimated annual system peak load—median, 90th-percentile, and 95th-percentile. As an example, the 95th-percentile forecast uses the 95th-percentile peak-day average temperature to determine monthly peak-hour demand. Alternative scenarios are based on their respective peak-day average temperature probabilities to determine forecast outcomes.

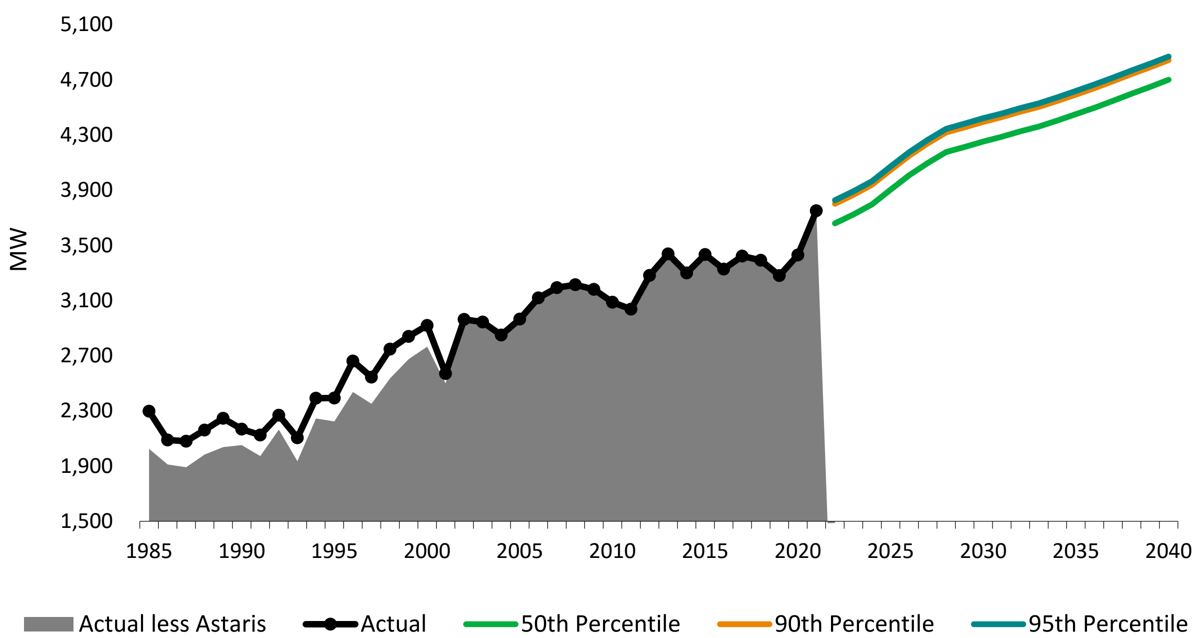

Figure 8.2 Peak-hour load-growth forecast (MW)

Table 8.2 Load forecast—peak hour (MW)

Year	50th Percentile	90th Percentile	95th Percentile
2020 (Actual)	3,430	3,430	3,430
2021	3,603	3,745	3,771
2022	3,659	3,801	3,827
2023	3,724	3,866	3,892
2024	3,797	3,939	3,965
2025	3,903	4,045	4,071
2026	4,007	4,149	4,175
2027	4,096	4,238	4,264
2028	4,176	4,318	4,344
2029	4,213	4,355	4,382
2030	4,252	4,394	4,421
2031	4,287	4,429	4,455
2032	4,326	4,468	4,494
2033	4,361	4,503	4,529
2034	4,405	4,547	4,573
2035	4,450	4,592	4,619
2036	4,497	4,639	4,666
2037	4,547	4,689	4,715
2038	4,599	4,741	4,767
2039	4,648	4,790	4,816
2040	4,700	4,842	4,868
Growth Rate (2021–2040)	**1.4%**	**1.4%**	**1.4%**

The median peak-hour load forecast predicts that peak-hour load will grow to 4,700 MW in 2040—an average annual compound growth rate of 1.4%. The projected average annual compound growth rate of the 95th-percentile peak forecast is also 1.4%.

Additional Firm Load

The additional firm-load category consists of Idaho Power's largest customers. Idaho Power's tariff requires the company to serve requests for electric service greater than 20 MW under a special-contract schedule negotiated between Idaho Power and each large-power customer. The contract and tariff schedule are approved by the appropriate state commission. A special contract allows a customer-specific cost-of-service analysis and unique operating characteristics to be accounted for in the agreement.

Individual energy and peak-demand forecasts are developed for special-contract customers, including Micron Technology, Inc.; Simplot Fertilizer Company (Simplot Fertilizer); INL, and an anticipated new special contract customer. These special-contract customers comprise the entire forecast category labeled additional firm load.

Micron Technology

Micron Technology represents Idaho Power's largest electric load for an individual customer and employs 5,000 to 6,000 workers in the Boise MSA. The company operates its research and development fabrication facility in Boise and performs a variety of other activities, including product design and support; quality assurance; systems integration; and related manufacturing, corporate, and general services. Micron Technology's electricity use is a function of the market demand for their products.

Simplot Fertilizer

This facility, named the Don Plant, is located just outside Pocatello, Idaho. The Don Plant is one of four fertilizer manufacturing plants in the J.R. Simplot Company's Agribusiness Group. Vital to fertilizer production at the Don Plant is phosphate ore mined at Simplot's Smoky Canyon Mine on the Idaho–Wyoming border. According to industry standards, the Don Plant is rated as one of the most cost-efficient fertilizer producers in North America. In total, J.R. Simplot Company employs 2,000–3,000 people throughout its Idaho locations.

INL

INL is one of the United States Department of Energy's (DOE) national laboratories and is the nation's lead laboratory for nuclear energy research, development, and demonstration. The DOE, in partnership with its contractors, is focused on performing research and development in energy programs and national defense. Much of the work to achieve this mission at INL is performed in government-owned and leased buildings on the Research and Education Campus in Idaho Falls, Idaho, and on the INL site, approximately 50 miles west of Idaho Falls. INL is a critical economic driver and important asset to the state of Idaho. It is the fifth-largest employer in the state of Idaho with an estimated 4,225 employees.

Anticipated Large Load Growth

Idaho Power's anticipated load forecast includes new large load growth. This growth reflects industrial customers that have made a sufficient and significant binding investment and/or interest indicating a commitment of the highest probability of locating in Idaho Power's service area.

Generation Forecast for Existing Resources

Hydroelectric Resources

For the 2021 IRP, Idaho Power continues the practice of using 50th-percentile future streamflow conditions for the Snake River Basin as the basis for the projections of monthly average hydroelectric generation. The 50th-percentile means basin streamflows are expected to exceed the planning criteria 50% of the time and are expected to be worse than the planning criteria 50% of the time.

C.J. Strike Dam near Mountain Home, Idaho.

Idaho Power uses two modeling methods to develop future flows for the IRP. The first method is for accounting for surface water regulation in the system, this consists of two models built in the Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) RiverWare modeling framework collectively referred to as the “Planning Models.” The first of these models covers the spatial extent of the Snake River Basin from the headwaters to Brownlee Reservoir inflow. The second model takes the results of the first and regulates the flows through the HCC. The second method uses the Enhanced Snake Plain Aquifer Model (ESPAM) to model aquifer management practices implemented on the ESPA. Modeling for the 2021 IRP used version 2.1 of the ESPAM model. The two modeling methods used in combination produce a normalized hydrologic record for the Snake River Basin from water year 1951 through 2018.
The record is normalized to account for specified conditions relating to Snake River reach gains, water management facilities, irrigation facilities, and operations. The 50th percentile modeled streamflows are derived from the normalized hydrologic record. Further discussion of flow modeling for the 2021 IRP is included in *Appendix C—Technical Report*.

Discharges from the ESPA to the Snake River, commonly referred to as “reach gains,” have shown a declining trend for several decades. Those declines are mirrored in documented well-level and storage declines in the ESPA. Although reach gains improved from 2017 to 2020, drought conditions in 2021 have resulted in a return to low discharges for some gauged springs. Since 2013, reach gains have remained below long-term historic median flows.

A water management practice affecting Snake River streamflows is the release of water to augment flows during salmon outmigration. Various federal agencies involved in salmon migration studies have, in recent years, supported efforts to shift delivery of flow augmentation water from the Upper Snake River and Boise River basins from the traditional months of July and August to the spring months of April, May, and June. The objective of the streamflow augmentation is to mimic the timing of naturally occurring flow conditions. Reported biological opinions indicate the shift in water delivery is most likely to take place during worse-than-median water years. Idaho Power continues to incorporate the shifted delivery of flow augmentation water from the Upper Snake River and Boise River basins for the IRP. Augmentation water delivered from the Payette River Basin is assumed to remain in July and August.

Monthly average generation for Idaho Power's hydroelectric resources is calculated within the Planning Models described in *Appendix C—Technical Report*. The Planning Models mathematically compute hydroelectric generation while adhering to the reservoir operating constraints and requirements.

A representative measure of the streamflow condition is the annual inflow volume to Brownlee Reservoir. Figure 8.3 shows historical annual Brownlee inflow volume as well as modeled Brownlee inflow distributions for each year of the 2021 IRP. The 2019 IRP modeling results for the 50th, 70th, and 90th percentiles are shown for reference only to benchmark the changes in hydrogeneration modeling between IRP cycles. As Figure 8.3 shows, the 2021 hydrogeneration distributions are very similar to the 2019 hydrogeneration results. The historical record demonstrates the variability of inflows to Brownlee Reservoir. The modeled inflows include reductions related to declining base flows in the Snake River and projected future management practices. As noted previously in this section, these declines are assumed to continue through the planning period.

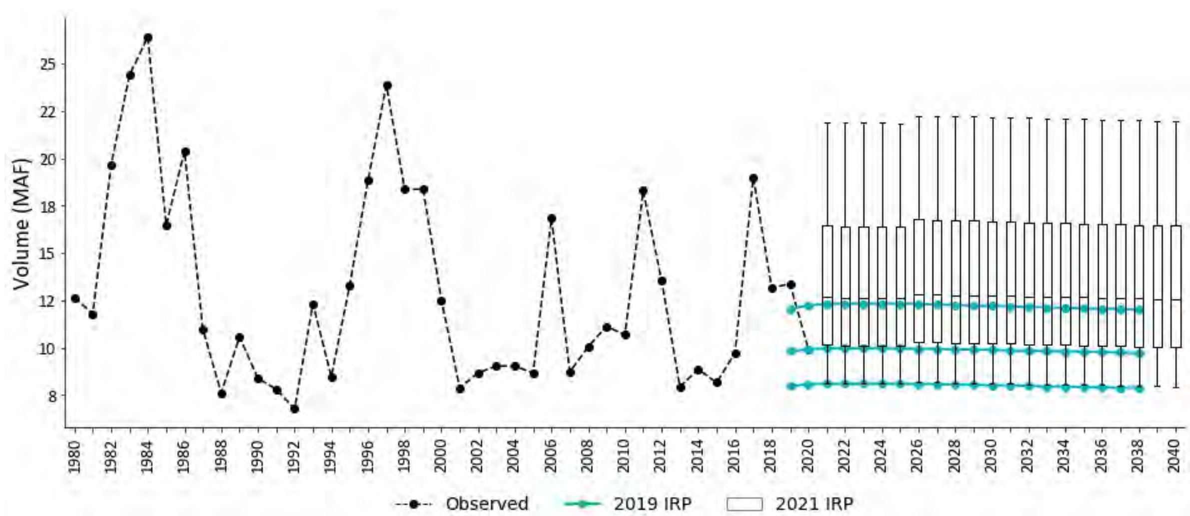

Figure 8.3 Brownlee inflow volume historical and modeled percentiles

Coal Resources

In the 2021 IRP, Idaho Power continued to analyze exiting from coal units before the end of their depreciable lives. The coal units continue to deliver generating capacity and energy during high-demand periods and/or during periods of high wholesale-electric market prices.
Within the coal fleet, the Jim Bridger plant provides recognized flexible ramping capability enabling the company to demonstrate ramping preparedness required of EIM participants. Despite the system reliability benefits, the economics of coal plant ownership and operation remain challenging because of frequent low wholesale-electric market prices coupled with the need for capital investments for environmental retrofits. Moreover, the evaluation of exiting from coal unit participation is consistent with the company's glide path away from coal and goal to provide 100% clean energy by 2045.

Jim Bridger

The four Jim Bridger units are assumed to reach the end of their depreciable lives in 2034. Units 1 and 2 currently require Selective Catalytic Reduction (SCR) investment by year-end 2021 and 2022 for continued coal operation. The SCR investments on units 1 and 2 are not currently planned or included in the IRP analysis. PacifiCorp, in its 2021 IRP, has modeled these two units ceasing coal operations at the end of 2023 and converting to natural gas and operational in May of 2024.

For the 2021 IRP, Idaho Power used AURORA's LTCE model to determine the best Bridger operating option specific to Idaho Power's system subject to the following constraints:

- Unit 1—Allowed to exit year-end 2023 or convert to natural gas. If converted to natural gas, the unit will operate through 2034.
- Unit 2—Allowed to exit between year-end 2023 and year-end 2026 or convert to natural gas as early as year-end 2023. If converted to natural gas, the unit will operate through 2034.
- Unit 3—Can exit no earlier than year-end 2025 and no later than year-end 2034.
- Unit 4—Can exit no earlier than year-end 2027 and no later than year-end 2034.

Costs associated with continued capital investments and early exit or conversion were included in the analysis. If the units were converted to natural gas, changes to the fuel costs and operating expenses were modeled to accurately capture the change in fuel. For those scenarios where units 1 and 2 convert to natural gas, they are assumed to operate through their useful life and are exited in 2034.

The Jim Bridger units provide system reliability benefits, particularly related to the company's flexible ramping capacity needs for EIM participation and reliable system operations. The need for flexible ramping is simulated in the AURORA modeling as previously described. However, the AURORA modeling indicates removal of Jim Bridger units needs to be carefully evaluated because of potential heightened concerns about meeting regulating reserve requirements following their removal. For this reason, in the model, the first opportunity for each unit to exit is set two years following the previous units, except for units 1 and 2, which are allowed to exit or convert to natural gas operation in the same year. This spacing will give Idaho Power time to assess these system changes and ensure that a sufficient level of reliability is being achieved.

North Valmy

Idaho Power's participation in North Valmy Unit 1 ceased at year-end 2019. Exit from Unit 2 at year-end 2025 or earlier was evaluated as part of the AURORA capacity expansion modeling.

Natural Gas Resources

Idaho Power owns and operates four natural gas SCCTs and one natural gas CCCT, having combined nameplate capacity of 762 MW. The SCCT units are typically operated during peak-load events in the summer and winter. Idaho Power's CCCT, Langley Gulch, is typically dispatched more frequently and for longer runtimes than the SCCTs because of the higher efficiency rating of a CCCT. The company plans to continue to operate each of its existing gas units through the 20-year planning horizon. Idaho Power is monitoring alternative fuels, such as hydrogen, or hydrogen/natural-gas fuel blends for potential use in the future at existing natural gas plants.

Natural Gas Price Forecast

To make continued improvements to the natural gas price forecast process, and to provide greater transparency, Idaho Power began researching natural gas forecasting practices used by electric utilities and local distribution companies in the region. Table 8.3 provides excerpts from IRP and avoided-cost filings, as an indication of the approaches used to forecast natural gas prices.

Table 8.3 Utility peer natural gas price forecast methodology

Utility	Gas Price Forecast Methodology
PacifiCorp 2019 IRP	PacifiCorp uses a blend of forward market prices and projections from third-party experts.
Avista Electric 2021 IRP	Avista uses a blend of forward market prices, forecast from a prominent energy industry consultant, and the EIA to develop the natural gas price forecast for this IRP.
Avista Gas 2021 Natural Gas IRP	Avista reviewed several price forecasts from credible sources and created a blended price forecast to represent an expected price.
PGE 2019 IRP	PGE derived the Reference Case natural gas forecast from market forward prices for the period 2020 through 2023 and the Wood Mackenzie long-term fundamental forecast for the period 2025 through 2040. A transition from the market price curve to Wood Mackenzie's long-term forecast is made by linearly interpolating for one year (2024). For the remaining years (2041 through 2050), PGE applies the rate of inflation to the 2040 forecast.

Based on the methodologies employed by Idaho Power's peer utilities, as well as feedback received during IRPAC meetings, Idaho Power enlisted Platts, a well-known third-party vendor, as the source for the IRP planning case natural gas price forecast.

The Platts forecast information below was presented by the vendor representative at the February 9, 2021, IRPAC meeting.

The third-party vendor uses the following inputs/techniques to develop its gas price forecast:

- Supply/demand balancing network model of the North American gas market
- Oil and natural gas rig count data
- Model pricing for the entire North American grid
- Model production, transmission, storage, and multi-sectoral demand every month
- Individual models of regional gas supply/demand, pipelines, rate zones and structures, interconnects, capacities, storage areas and operations and combines these models into an integrated North American gas grid
- Solves for competitive equilibrium, which clears supply and demand markets as well as markets for transportation and storage

The following industry events helped inform the third-party 2021 natural gas price forecast used in the IRP analysis:

- Status of North American major gas basins (Figure 8.4) and pipeline capacity
- Oil prices and the associated gas production
- New and existing natural gas electric generation and the possible replacement of coal and nuclear capacity retirements

- Changes to residential and commercial customer gas demand from energy efficiency gains as well as policy changes that include new gas appliance service bans
- Global competition from gas producers such as Russia and Qatar and the role of liquefied natural gas exports
- Possible policy changes at the federal level included carbon price and societal cost inclusion to natural gas as well as other wider energy policy developments

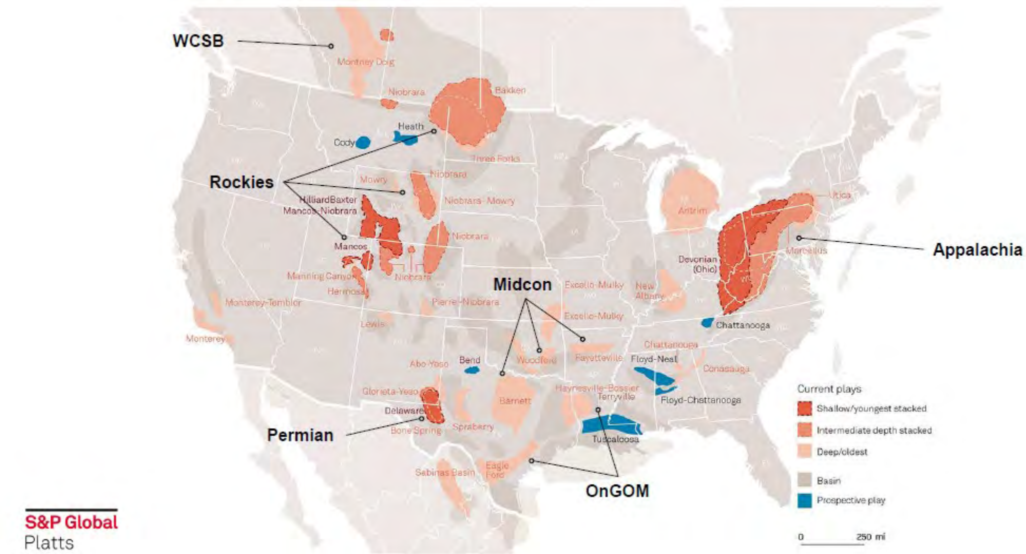

Figure 8.4 North American major gas basins

To verify the reasonableness of the third-party vendor's forecast, Idaho Power compared the forecast to Moody's Analytics, the United States Energy Information Administration (EIA), and the New York Mercantile Exchange (NYMEX) natural gas futures settlements. Based on a thorough examination of the forecasting methodology and comparative review of the other sources (i.e., Moody's, EIA, and NYMEX), Idaho Power concluded that the third-party vendor's natural gas forecast is appropriate for the planning case forecast in the 2021 IRP.

Platts' 2021 Henry Hub long-term forecast, after applying a basis differential and transportation costs from Sumas, Washington, served as the planning case forecast of fueling costs for existing and potential new natural gas generation on the Idaho Power system. Sumas is where most of the fuel for Idaho Power's natural gas generation comes from.

Given that gas price forecasts are a significant driver of costs in the IRP process, Idaho power also relied on the EIA's Low Oil & Gas Supply forecast from their *Annual Energy Outlook 2021* to examine the impact of higher gas prices on the IRP. This forecast assumes lower oil and gas production, which creates a higher natural gas price. More details on the EIA forecast can be found in their *Annual Energy Outlook 2021*[28].

Natural Gas Transport

Ensuring pipeline capacity will be available for future natural gas generation will require the reservation of pipeline capacity before a prospective resource's in-service date. Consistent with the 2019 IRP, Idaho Power believes that turnback pipeline capacity (existing contracts expiring without renewal) from Stanfield, Oregon, to Idaho could serve the need for natural gas generating capacity for up to 600 MW of installed nameplate capacity. Williams Northwest Pipeline has recently entered a similar capacity reservation contract with a shipper where a discount was offered (a 10-cent rate versus full tariff of 39 cents) for the first five years before the implementation of full tariff rate for the remainder of the term. Using this information, a rate was applied reflective of the capacity reservation contract rate discounted until the in-service date, and full tariff thereafter.

Idaho Power projects that require additional natural gas generating capacity beyond an incremental 600 MW of capacity would require an expansion of Northwest Pipeline from the Rocky Mountain supply region to Idaho. The 600 MW limit, beyond which pipeline expansion is required, is derived from Northwest Pipeline's estimation of expected turnback capacity from Stanfield, Oregon, to Idaho as presented in Northwest Pipeline's fall 2019 Customer Advisory Board meeting. Besides the uncertainty of acquiring capacity on existing pipeline beyond that necessary for 600 MW of incremental natural gas generating capacity, a pipeline expansion would provide diversification benefits from the current mix of firm transportation composed of 60% from British Columbia, 40% from Alberta, and no firm capacity from the Rocky Mountain supply region. In response to a request for a cost estimate for a pipeline expansion from the Rocky Mountain supply region, Northwest Pipeline calculated a levelized cost for a 30-year contract of $1.39/Million British Thermal Units (MMBtu) per day. Idaho Power applied this rate to potential natural gas generation types with an assumption of high-capacity factor (100% capacity coverage), medium capacity factor (33%), and low-capacity factor (25%). For the medium- and low-capacity factor plants, it is assumed that transportation would be procured in the short-term capacity release market, or through delivered supply transactions to cover 100% of the requirements on any given day.

Analysis of IRP Resources

For the 2021 IRP, Idaho Power continues to analyze resources based on cost, specifically the cost of a resource to provide energy and peaking capacity to the system. In addition to the

[28] United States Energy Information Administration, *Annual Energy Outlook 2021* (AEO2021), (Washington, D.C., February 2021).

ability to provide flexible capacity, the system attributes analyzed include the ability to provide dispatchable peaking capacity, non-dispatchable (i.e., coincidental) peaking capacity, and energy. Importantly, energy in this analysis is considered to include not only baseload-type resources but also resources, such as wind and solar, that provide relatively predictable output when averaged over long periods (i.e., monthly, or longer). The resource attribute analysis also designates those resources whose variable production gives rise to the need for flexible capacity.

Resource Costs—IRP Resources

Resource costs are shown using two cost metrics: levelized cost of capacity (fixed) (LCOC) and LCOE. These metrics are discussed later in this section. Resources are evaluated from a TRC perspective. Idaho Power recognizes the TRC is not in all cases the realized cost to the company. Examples for which the TRC is not the realized cost include energy efficiency resources where the company incentivizes customer investment, and supply-side resources whose production is purchased under long-term contract (e.g., PPA and PURPA). Nevertheless, Idaho Power views the evaluation of resource options using the TRC as allowing a like-versus-like comparison between resources, and consequently is in the best interest of our customers.

In resource cost calculations, Idaho Power assumes potential IRP resources have varying economic lives. Financial analysis for the IRP assumes the annual depreciation expense of capital costs is based on an apportionment of the capital costs over the entire economic life of a given resource.

The levelized costs for the various resource alternatives analyzed include capital costs, O&M costs, fuel costs, and other applicable adders and credits. The initial capital investment and associated capital costs of resources include engineering development costs, generating and ancillary equipment purchase costs, installation costs, plant construction costs, and the costs for a transmission interconnection to Idaho Power's network system. The capital costs also include an AFUDC (capitalized interest). The O&M portion of each resource's levelized cost includes general estimates for property taxes and property insurance premiums. The value of RECs is not included in the levelized cost estimates but is accounted for when analyzing the total cost of each resource portfolio in AURORA. Net levelized costing for the bundled energy efficiency resource options modeled in the IRP are provided in Chapter 5. The net levelized costs for energy efficiency resource options include annual program administrative and marketing costs, an annual incentive, and annual participant costs.

Specific resource cost inputs, fuel forecasts, key financing assumptions, and other operating parameters are provided in *Appendix C—Technical Report*.

LCOC—IRP Resources

The annual fixed revenue requirements in nominal dollars for each resource are summed and levelized over the assumed economic life and are presented in terms of dollars per kW of nameplate capacity per month. Included in these LCOCs are the initial resource investment and associated capital cost and fixed O&M estimates. As noted earlier, resources are considered to have varying economic lives, and the financial analysis to determine the annual depreciation of capital costs is based on an apportioning of the capital costs over the entire economic life.

The expression of these costs in terms of kW of *peaking* capacity can have significant effect, particularly for VERs (e.g., wind) having peaking capacity significantly less than installed capacity. The LCOC values for the potential IRP resources are provided in Figure 8.5.

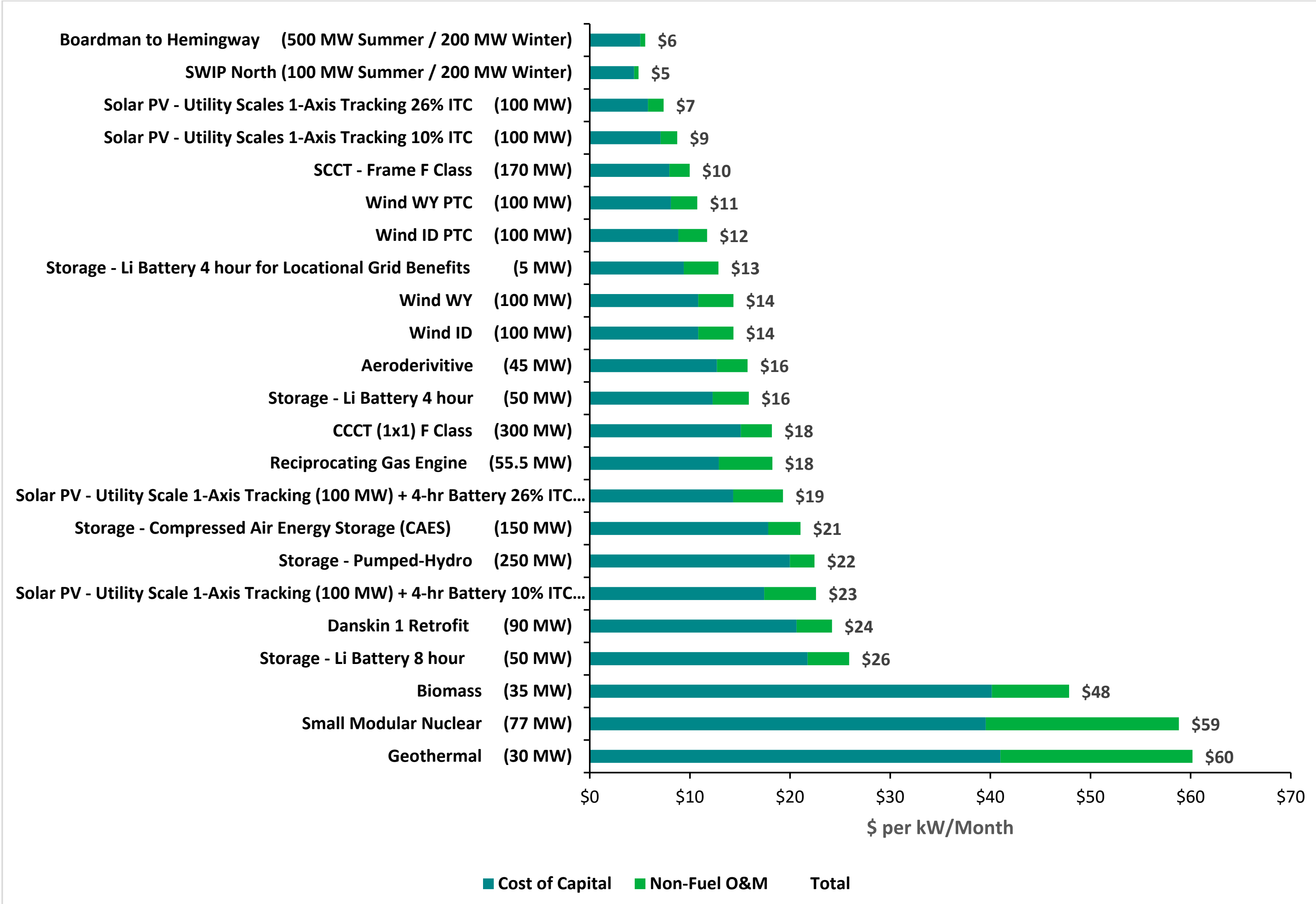

Figure 8.5 Levelized capacity (fixed) costs in millions of 2021 dollars per kW per month[29]

LCOE—IRP Resources

Certain resource alternatives carry low fixed costs and high variable operating costs, while other alternatives require significantly higher capital investment and fixed operating costs but have low (or zero) operating costs. The LCOE metric represents the estimated annual cost (revenue requirements) per MWh in nominal dollars for a resource based on an expected level of energy output (capacity factor) over the economic life of the resource. The nominal LCOE assuming the expected capacity factors for each resource is shown in Figure 8.6. Included in these costs are the capital cost, non-fuel O&M, and fuel costs. The cost of recharge energy for storage resources and wholesale energy for B2H are not included in the graphed LCOE values.

The LCOE is provided assuming a common online date of 2021 for all resources and based on Idaho Power specific financing assumptions. Idaho Power urges caution when comparing LCOE values between different entities or publications because the valuation is dependent on several underlying assumptions. The LCOE graphs also illustrate the effect of the Investment Tax Credit on solar-based energy resources, including coupled solar-battery systems. Idaho Power emphasizes that the LCOE is provided for informational purposes and is essentially a convenient summary metric reflecting the approximate cost competitiveness of different generating technologies. However, the LCOE is not an input into AURORA modeling performed for the IRP.

When comparing LCOEs between resources, consistent assumptions for the computations must be used. The LCOE metric is the annual cost of energy over the life of a resource converted into an equivalent annual annuity. This is like the calculation used to determine a car payment; however, in this case the car payment would also include the cost of gasoline to operate the car and the cost of maintaining the car over its useful life.

An important input into the LCOE calculation is the assumed level of annual energy output over the life of the resource being analyzed. The energy output is commonly expressed as a capacity factor. At a higher capacity factor, the LCOE is reduced because of spreading resource fixed costs over more MWh. Conversely, lower capacity-factor assumptions reduce the MWh over which resource fixed costs are spread, resulting in a higher LCOE.

For the portfolio cost analysis, resource fixed costs are annualized over the assumed economic life for each resource and are applied only to the years of output within the IRP planning period, thereby accounting for end effects.

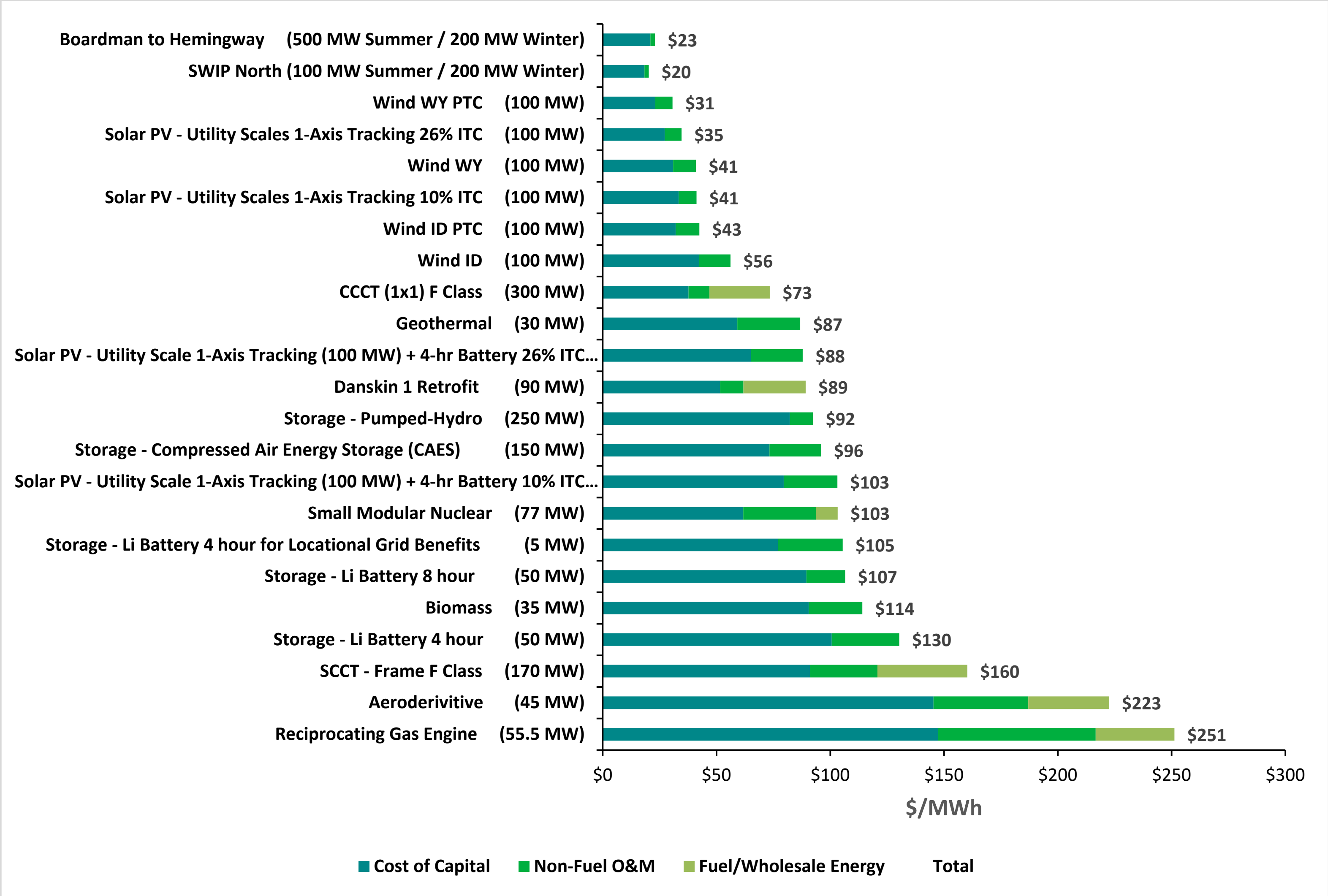

Figure 8.6 Levelized cost of energy (at stated capacity factors) in 2021 dollars

Resource Attributes—IRP Resources

While the cost metrics described in this section are informative, caution must be exercised when comparing costs for resources providing different attributes to the power system. For the LCOC metric, this critical distinction arises because of differences for some resources between *installed* capacity and *peaking* capacity. Specifically, for VERs, an installed capacity of 1 kW equates to an on-peak capacity of less than 1 kW. For example, Idaho wind is estimated to have an LCOC of $12 per month per kW of installed capacity.[30] However, assuming wind delivers an ELCC equal to 11.2% of installed capacity, the LCOC ($12/month/kW) converts to $107 per month per kW of peaking capacity.

For the LCOE metric, the critical distinction between resources arises because of differences for some resources with respect to the timing at which MWh are delivered. For example, wind and biomass resources have similar LCOEs. However, the energy output from biomass generating facilities tends to be delivered in a steady and predictable manner during peak-loading periods. Conversely, wind tends to deliver during the high-value peak loading periods less dependably. Utilizing wind to meet peak demands can also be effective when applying diversity (the wind may not be blowing in one location but is likely blowing in another) and the overall cost of the resource. All these characteristics should be considered when comparing LCOEs for these resources.

In recognition of differences between resource attributes, potential IRP resources for the 2021 IRP are classified based on their attributes.

[30] The units of the denominator can be expressed in reverse order from the cost estimates provided in Figure 8.5 without mathematically changing the cost estimate.

Table 8.4 Resource attributes

Resource	Variable Energy	Dispatchable Capacity-Providing	Non-Dispatchable (Coincidental) Capacity-Providing[31]	Balancing/ Flexibility-Providing	Energy-Providing	Size Potential
Aeroderivitive		✓		✓	✓	45 MW increments
Biomass—Anaerobic Digester		✓			✓	Scalable up to about 35 MW
Boardman to Hemingway 500 kV Project		✓		✓	✓	(500 MW April–Sept., 200 MW Oct.–March)
Compressed Air Energy Storage		✓		✓		150 MW increments
Danskin 1 Retrofit		✓		✓	✓	90 MW
Demand Response		✓				Scalable from 300 MW (default) up to 580 MW in 20 MW increments
Energy Efficiency (Additional Bundles)			✓		✓	Scalable up to achievable potential
Geothermal		✓			✓	Scalable up to about 30 MW
CCCT (1x1)		✓		✓	✓	300 MW increments
SCCT—Frame F Class		✓		✓		170 MW increments
Reciprocating Gas Engine		✓		✓	✓	55.5 MW increments
Small Modular Nuclear		✓		✓	✓	77 MW increments
Solar PV—Utility-Scale 1-Axis Tracking	✓		✓		✓	Scalable
Solar PV—AC Coupled with Lithium Battery	✓	✓			✓	Scalable
Storage—Pumped Hydro		✓		✓		250 MW increments
Storage—Lithium Battery		✓		✓		Scalable
SWIP-North 500 kV Project		✓		✓	✓	(100 MW Summer, 200 MW Winter)
Wind (Wyoming/Idaho)	✓				✓	Scalable

[31] The peaking capacity impact in MW for resources providing coincidental peaking capacity is expected to be less than installed capacity in MW. For solar resources, the coincidental peaking capacity impact diminishes with increased installed solar capacity on system, as described in Chapter 4.

The following resource attributes are considered in this analysis:

- *Variable energy*—Renewable resources characterized by variable output and potentially causing an increased need for resources providing balancing or flexibility
- *Dispatchable capacity-providing*—Resources that can be dispatched as needed to provide capacity during periods of peak-hour loading or to provide output during generally high-value periods
- *Non-dispatchable (coincidental) capacity-providing*—Resources whose output tends to naturally occur with moderate likelihood during periods of peak-hour loading or during generally high-value periods
- *Balancing/flexibility-providing*—Fast-ramping resources capable of balancing the variable output from VERs
- *Energy-providing*—Resources producing or reducing the need for energy that are relatively predictable when averaged over long time periods (i.e., monthly or longer)

Table 8.4 provides classification of potential IRP resources with respect to the above attributes. The table also provides cost information on the estimated size potential and scalability for each resource.

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IRP REPORT:
PORTFOLIOS

9. PORTFOLIOS

Prior to modeling for the 2021 IRP, Idaho Power conducted an extensive review of IRP model inputs, system settings and specifications, and model validation and verification. The objective of the review was to ensure accuracy of the company's modeling methods, processes, and, ultimately, the IRP results. The review was a preliminary step prior to modeling for the 2021 IRP. As a result, the sections below describe work that began where the review process concluded. For further detail on the IRP review process, refer to the *2019 IRP Review Report*.

Capacity Expansion Modeling

For the 2021 IRP, Idaho Power used the LTCE capability of AURORA to produce optimized portfolios under various future conditions. The logic of the LTCE model optimizes resource additions and exits based on the performance of each zone defined within the WECC. As Idaho Power's electrical system was modeled as a separate zone, the resource portfolios produced by the LTCE and examined in this IRP are optimized for Idaho Power. The optimized portfolios discussed in this document refer to the addition of supply-side and demand-side resources for Idaho Power's system and exits from current coal-generation units.

The selection of new resources in the optimized portfolios maintains sufficient reserves as defined in the model. To ensure the AURORA-produced optimized portfolios provide the least-cost, least-risk future specific to the company's customers, the 2021 IRP process used a branching process to find the Preferred Portfolio. This branching process is discussed further in the following sections.

The portfolios developed in the 2021 IRP selected from a broad range of resource types, as well as varied amounts of nameplate generation additions:

- Wind (between 0 and 2,300 MW in total)
    - Wyoming (between 0 and 800 MW)
    - Idaho (between 0 and 1,500 MW)
- Solar (between 785 and 5,285 MW in total)
    - Standalone (between 785 and 2,285 MW)
    - With Battery Storage (between 0 and 3,000 MW)
- Standalone Storage (between 0 and 2,700 MW in total)
    - Pumped Hydro (between 0 and 500 MW)
    - Compressed Air Energy Storage (between 0 and 600 MW)
    - Battery Energy Storage

        - 4 Hour Transmission Connected (between 0 and 1,000 MW)
        - 4 Hour Distribution Connected (between 0 and 100 MW)
        - 8 Hour Transmission Connected (between 0 and 500 MW)
- Natural Gas (between 0 and 2,500 MW in total)
    - Reciprocating Engines (between 0 and 333 MW)
    - CCCT (between 0 and 600 MW)
    - SCCT (between 0 and 850 MW)
        - Aeroderivative (between 0 and 270 MW)
        - Danskin Unit 1 retrofit (0 or 90 MW)
    - Coal to Natural Gas Conversion of Jim Bridger units 1 and 2 (between 0 and 357 MW)
- Nuclear Small Modular Reactor (between 0 and 924 MW)
- Biomass (between 0 and 350 MW)
- Geothermal (between 0 and 300 MW)
- Demand Response (between 0 and additional 280 MW)
- Accelerated Coal Exits (up to 841 MW in total)
    - Jim Bridger (up to 707 MW)
    - North Valmy Unit 2 (134 MW)

Planning Margin

The 2021 IRP used the LTCE capability of the AURORA model to develop a multitude of least-cost portfolio buildouts based on standards, policies, and resources needed to assure reliability. Specifically, to assure reliability, Idaho Power utilized a 50th percentile hourly load forecast and required the AURORA model's LTCE functionality to meet a 15.5% peak-hour planning margin for each of the portfolios that were developed.

The 15.5% target planning margin was calculated based on the 1 day in 20 years (1-in-20), or 0.05 days per year, reliability hurdle as measured by the LOLE. The year 2023 was used as the benchmark year to obtain the planning margin value. The 1-in-20 reliability threshold was chosen to 1) account for the extreme weather events that are becoming more frequent in the Northwest, and 2) factor in water availability uncertainty year to year. A poor water year, resulting in reduced hydro generation, can look equivalent to a season-long resource outage.

This 0.05 days per year threshold is consistent with the metric used by the Northwest Power Conservation Council.

Idaho Power developed an internal LOLE tool which was used to determine the amount of perfect capacity needed, in addition to the company's existing resources, to achieve a target LOLE of 0.05 days per year. The planning margin was then calculated by dividing the total capacity requirements derived in the tool for 2023 by the forecasted peak load for 2023. The summary of the resources and their corresponding summer capacities (in MW) is shown in Table 9.1 below.

Table 9.1 Planning margin calculation breakdown

Resource Type	Summer Capacity (MW)*
Coal	785
Gas	670
Hydro	1,355
Variable Energy Resources	346
Demand Response	176
CSPP (Non-Variable)	163
Capacity Benefit Margin	330
Perfect Resource Requirement from LOLE Tool	463
Total Generation	**4,288**
Forecast Peak Load	**3,712**
Planning Margin	**15.5%**

*The values in this column are adjusted for Effective Forced Outage Rate (EFOR) or ELCC.

More information on the LOLE methodology used in the planning margin calculation can be found in the Loss of Load Expectation section of *Appendix C—Technical Report*.

Portfolio Design Overview

The AURORA LTCE process develops resource portfolios under varying future conditions, or sensitivities for natural gas prices, carbon costs, load growth and electrification, transmission, and clean energy constraints and timelines. The LTCE applies a planning margin hurdle and regulation reserve requirements, and then optimizes resource selections around those constraints to determine a least-cost, least-risk portfolio. Available future resources possess a wide range of operating, development, and environmental attributes. Impacts to system reliability and portfolio costs of these resources depend on future assumptions. Each portfolio consists of a combination of resources derived from the LTCE process that should enable Idaho Power to supply cost-effective electricity to customers over the 20-year planning period.

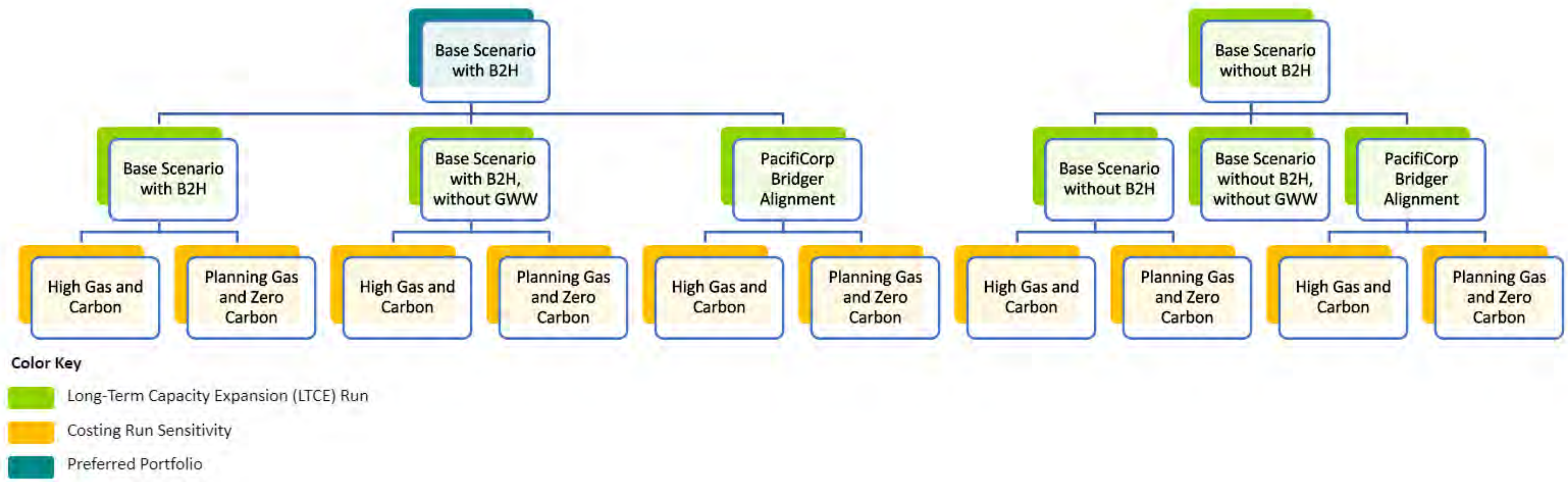

Figure 9.1 Branching analysis diagram

For the 2021 IRP, the company developed a branching scenario analysis strategy to ensure that it had reasonably identified an optimal solution specific to its customers. Figure 9.1 details the initial branching evaluation where the company compared AURORA-optimized portfolios for a base scenario (i.e., planning conditions for all key inputs such as load growth, natural gas price, carbon price, etc.) for six potential future portfolios. Each of these portfolios was fully optimized by the AURORA LTCE model.

1. Base with B2H
2. Base with B2H without Gateway West (ultimately not required)
3. Base with B2H PAC Bridger Alignment
4. Base without B2H
5. Base without B2H without Gateway West
6. Base without B2H PAC Bridger Alignment

The company then compared the base portfolios that included B2H to determine an optimal B2H-included portfolio and compared the base portfolios that did not include B2H to determine an optimal B2H-excluded portfolio. Cost information associated with each portfolio is detailed in Chapter 10.

In the Base with B2H portfolio, the AURORA LTCE model did not identify enough resources to trigger the need for Gateway West; therefore, a Base with B2H without Gateway West portfolio was not required. For the B2H-excluded portfolios, the Gateway West project was required.

The company also developed costs for each of the portfolios assuming a future with: 1) no price on carbon, i.e., zero carbon, and 2) a high price on both carbon and gas. For the Base without B2H without Gateway West portfolio, the company did not continue further evaluation beyond planning conditions due to the portfolio's inferior performance (high-cost, poor reliability, and poor emissions performance).

Comparing the NPV cost of the best B2H-included portfolio—the Base with B2H portfolio—to the best B2H-excluded portfolio—the Base without B2H PAC Bridger Alignment portfolio—there is a $270 million difference. This cost difference definitively shows that the B2H project is a necessary component of the company's Preferred Portfolio (assuming comparable risk performance to other portfolios, which will be explored later in this document) and additional robustness testing, including various sensitivities and scenarios, should be focused on portfolios that include B2H.

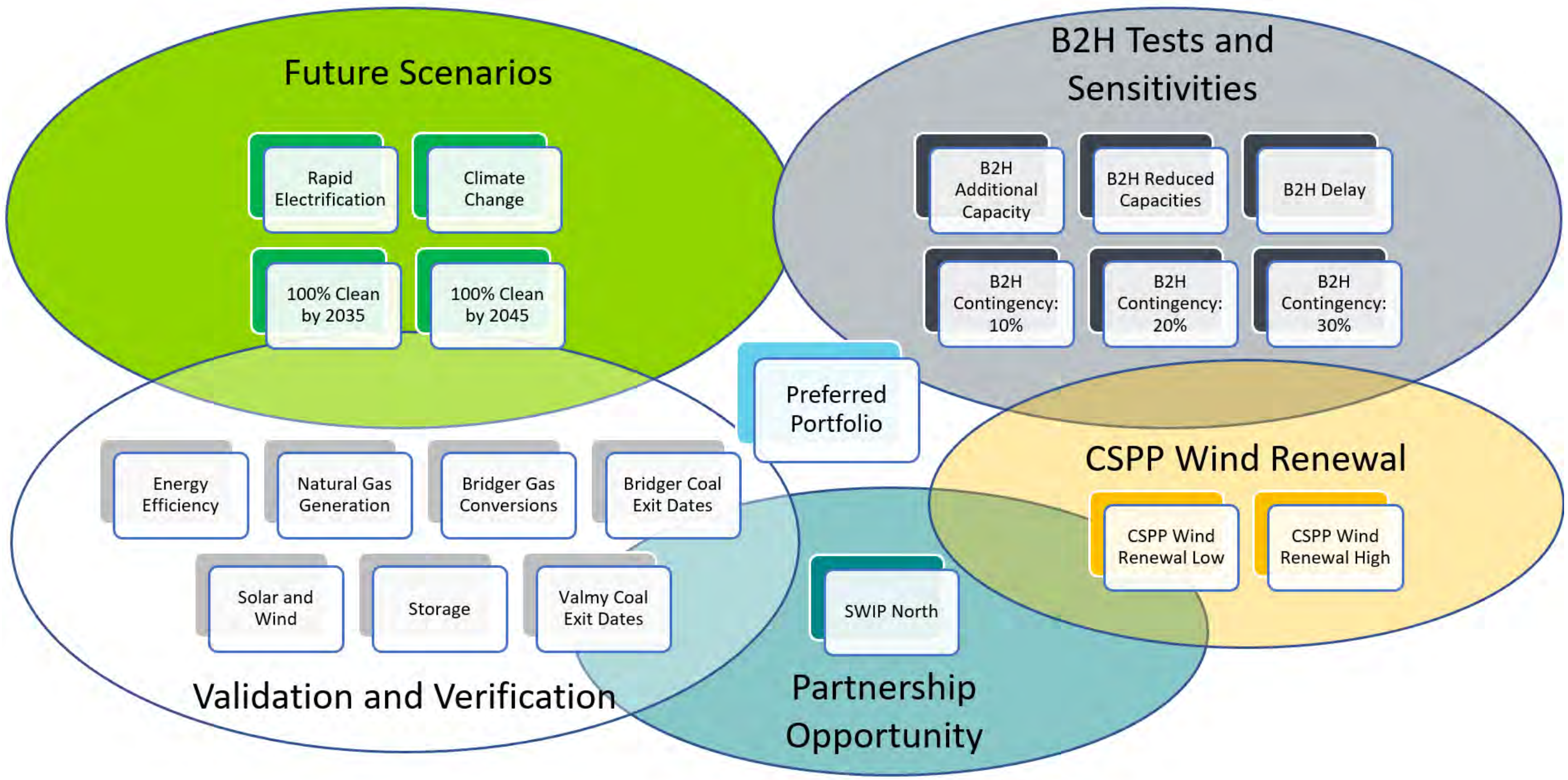

Figure 9.2 Sensitivity analysis diagram

Further branching from the Base with B2H portfolio, the company developed numerous additional portfolios:

- Working with members of the IRPAC, the company developed four future scenarios, in green boxes in Figure 9.2, and described later in this section
- Two sensitivity studies based on varying CSPP Wind Renewal rates, in orange boxes in Figure 9.2, and described later in this section
- One potential regional partnership opportunity, the SWIP-North, in teal boxes in Figure 9.2, and described later in this section
- Several validation and verification tests, in gray boxes in Figure 9.2, and described later in this section
- Various B2H robustness sensitivities and cost tests, in black boxes in Figure 9.2, and described later in this section

Future Scenarios—Purpose: Risk Evaluation

The future scenarios are represented by green boxes in Figure 9.2. These scenarios were developed in collaboration with the IRPAC, including the addition of one scenario, and data sharing. The evaluation and formation of scenarios helps the company assess risk.

The following is a description of the four future scenarios assessed in the 2021 IRP.

Rapid Electrification

The company forecasts moderate building and transportation electrification in all scenarios. The Rapid Electrification scenario was developed to determine what kind of adjustments would need to be made to the plan to accommodate a very rapid transition toward electrification. This rapid transition includes increasing the electric vehicle forecast and the penetration of electric heat pumps for building heating and cooling each by a factor of 10. This aggressive forecast assumes over a half-million electric vehicles as well as adoption of an 80% penetration of heat pump technology at residences within the company's service area. These levels are blended into the load forecast over the next 20 years and do not factor in current economic consumer choice or the impact of existing legislation and/or incentives. The Rapid Electrification scenario is meant to serve as a high bookend on what is possible with the transition to electrification. As a bookend, the Rapid Electrification scenario is considered improbable.

Climate Change

The Climate Change scenario includes both an increased demand forecast associated with extreme temperature events and a variable supply of water from year to year.

100% Clean by 2035 Scenario

In the 100% Clean by 2035 scenario, the carbon price adder forecast was removed with an assumption that there was a legislative mandate to move toward 100% clean energy by the year 2035. The AURORA model struggled to obtain a robust solution to achieve zero emissions, WECC-wide, by 2035. To achieve a solution for a 100% clean Idaho Power system by 2035, the company modeled Idaho Power gas unit retirements starting in early 2030, through 2035. The company replaced the retired gas with a non-emitting nuclear resource.

The struggles of the model to achieve a 100% Clean by 2035 scenario are indicative of the challenges faced by the industry to meet a 100% target given technologies commercially available today. Technology breakthroughs, such as cost-effective long-duration energy storage, nuclear energy, or hydrogen, will likely be required to meet this goal.

100% Clean by 2045 Scenario

The 100% Clean by 2045 scenario removes carbon price adder forecasts and assumes a legislative mandate to move towards 100% clean energy by the year 2045 throughout the WECC. The scenario modeling is achieved by applying carbon emission constraints starting in 2021 with current emission levels and decreasing linearly to achieve 0% by the target year. The same constraints were applied to Idaho Power's service area and the surrounding WECC.

Non-emitting resources were used to replace carbon-emitting resources.

CSPP Wind Renewal Sensitivity Studies—Purpose: Portfolio Sensitivity to the Percentage of CSPP Renewal

The CSPP Wind Renewal Sensitivity Studies are represented by orange boxes in Figure 9.2. For the 2021 IRP analysis, based on ongoing discussions with wind developers and the desire to adequately plan for the future, it is assumed that 25% of CSPP wind developers will continue to produce wind energy through 2040. This 25% renewal rate is a departure from the 2019 IRP, in which no wind contracts were assumed to renew. While Idaho Power's developer discussions have not indicated intentions to renew existing contracts, the company and IRP stakeholders, as well as the IPUC and OPUC, agreed that there is value to understanding the portfolio impact of different wind renewal assumptions. In the resulting wind sensitivity analysis, the *CSPP Wind Renewal Low* and *CSPP Wind Renewal High* sensitivities test the 25% renewal assumption by replacing it with 0% and 100% renewal rates, respectively.

Opportunity Evaluation—Purpose: Evaluate Whether to Further Explore SWIP-North

The SWIP-North Opportunity Study is represented by a teal box in Figure 9.2. The SWIP-North opportunity evaluation tests whether Idaho Power customers could benefit from Idaho Power's involvement in the project assuming a pre-summer 2025 project in-service date.

The SWIP-North scenario is described in more detail in Chapter 6—Transmission Planning. The sensitivity test assumes the transmission line could add 100 MW of import capacity during the summer and 200 MW of import capacity during the winter for Idaho Power. The 100 MW in the summer and 200 MW in the winter would count toward meetings the company's planning margin requirements, i.e., the line is being treated as a 100 MW summer resource and a 200 MW winter resource.

Model Validation and Verification—Purpose: Model Validation and Verification

The Model Validation and Verification tests are represented by gray boxes in Figure 9.2. The Model Validation and Verification tests on the diagram represent several sensitivities and test studies performed to ensure the model is operating as expected and to verify that the selected Preferred Portfolio represents a robust optimization of cost and risk, with a specific focus on validation and verification within the Action Plan window. The following list includes significant examples but is not all-inclusive of the testing that was performed on the model.

Demand Response

Background—Concurrent with the 2021 IRP analysis, the parameters of current DR programs are being reevaluated to align the programs with the highest risk hours on Idaho Power's system, as described in Chapter 6. In addition to the refinement of the current program, additional DR was selected as a cost-effective means to meet growing energy demand.

Test—To ensure the appropriate amount of DR is being selected by the model, the model was tested with more DR in earlier years to determine if the addition would result in a lower-cost portfolio.

Result—Additional DR placed earlier in the plan results in increased portfolio costs, as expected.

Energy Efficiency

Background—Cost-effective energy efficiency measures, as determined in the Potential Assessment, are included as part of the IRP. Additional measures were grouped into buckets and selectable within the model to meet increasing demand and fill the gap when generation resources are exited. Some of these buckets were selected as part of the Preferred Portfolio late in the plan (3 MW in 2039 and 9 MW in 2040).

Test—The lowest-cost bundles of energy efficiency selectable within the model were added early in the plan timeframe.

Result—The earlier implementation of the energy efficiency measures beyond those determined to be cost-effective in the Potential Assessment did not result in a lower-cost portfolio.

Natural Gas Generation and Solar Plus Storage

Background—Wind, solar, and storage were primarily selected in the Preferred Portfolio and other portfolios. Natural gas generation was not.

Test—A natural gas generator was placed in the model in year 2028 to replace the capacity previously provided by the Bridger units instead of the solar and storage selected by the model.

Result—Replacing solar and storage with natural gas does not result in reduced resource costs.

Bridger Natural Gas Conversion (Units 1 and 2)

Background—Given a relatively low cost to convert Bridger units 1 and 2 to natural gas operation, the conversion was consistently selected as economical by the model with a 2034 depreciable life exit date.

Test—Various modeling tests were performed to determine if it is more economical to either exit Bridger units 1 and 2 or delay the natural gas conversion of Unit 2.

Result—Exiting the units rather than converting to natural gas operation increased the cost of the portfolio. Delaying the conversion also resulted in additional costs.

Bridger Coal Exit Dates (Units 3 and 4)

Background—Bridger units 3 and 4 have identified exits in 2025 and 2028 in the Preferred Portfolio. That is earlier than the exits identified in the 2019 IRP (2028 and 2030, respectively).

Test—These dates were adjusted earlier (2025 and 2027) and later (2028 and 2030) and the portfolio was tested to determine if shifting the coal exit dates resulted in a reduced cost portfolio.

Result—Shifting the exit dates for Bridger units 3 and 4 does not result in a lower portfolio cost.

Geothermal and Biomass

Background—Geothermal and biomass resources were not selected in portfolio and scenario studies.

Test—Geothermal and biomass were each added to the Preferred Portfolio in the place of a selected flexible resource. The portfolio was then costed to determine if resource costs would decrease.

Result—The shift to geothermal or biomass generation increased overall portfolio costs as expected.

Valmy

Background—Idaho Power is scheduled to exit Valmy Unit 2 by the end of 2025.

Test—Sensitivities were studied to determine if it is more economical to exit the unit earlier (year-end 2023 or 2024).

Result—An earlier exit from Valmy Unit 2 increases portfolio costs.

B2H Robustness—Purpose: Test Capacity Sensitivities, Cost Risks, and Timing

The B2H robustness and sensitivity studies are represented by the black boxes in Figure 9.2. The B2H project is a key component of the company's 2021 IRP. The company models B2H as providing 500 MW of peak capacity toward meeting the company's planning margin requirements. The capacity sensitivity tests looked at B2H providing various amounts of planning margin capacity: 1) 350 MW, 2) 400 MW, 3) 450 MW, and 4) 550 MW.

As an approximately 300-mile high-voltage transmission line, the cost of the project also requires evaluation for risk. The cost-sensitivity tests looked at the cost of B2H with: 1) a 10% contingency; 2) a 20% contingency; and 3) a 30% contingency.

Idaho Power anticipates it will receive a B2H permit in 2022, however, additional delays are possible. To test the impact of a delay, the company evaluated a 2027 in-service date as a sensitivity.

Regulation Reserves

The 2020 VER Study provided the rules to define hourly reserves needed to reliably operate the system based on current and future quantities of solar and wind generation and load forecasted by season and time of day. The reserves are defined separately, incorporating their combined diversity benefits dynamically in the modeling. The reserve rules applied in the 2021 IRP include defining hourly reserve requirements for "Load Up," "Load Down," "Solar Up," "Solar Down," "Wind Up," and "Wind Down."

For the 2021 IRP analysis, Idaho Power developed approximations for the VER study's regulating reserve rules. These approximations are necessary because a 20-year period is simulated for the IRP (as opposed to the single year of a VER study), and to allow the evaluation of portfolios containing varying amounts of VER generating capacity (i.e., the VER-caused regulating reserve requirements are calculable). The approximations express the up and down regulation reserve requirements as dynamic and monthly percentages of hourly load, wind production, and solar production. The approximations used for the IRP are given in Table 9.2. For each hour of the AURORA simulations, the dynamically determined regulating reserve is the sum of that calculated for each individual element.

Table 9.2 Regulation reserve requirements—percentage of hourly load MW, wind MW, and solar MW

Month	Load Up	Load Down	Wind Up	Wind Down	Solar Up	Solar Down
1	8.2%	1.7%	19.6%	19.6%	51.9%	57.6%
2	8.3%	1.6%	15.9%	21.2%	32.1%	39.3%
3	8.3%	1.7%	21.4%	22.1%	59.3%	59.3%
4	8.2%	1.7%	20.3%	26.0%	45.9%	50.6%
5	8.2%	1.6%	25.4%	34.5%	45.6%	53.7%
6	8.1%	1.6%	27.4%	21.7%	43.1%	29.3%
7	8.2%	1.4%	19.4%	22.0%	36.0%	24.6%
8	8.2%	1.5%	18.8%	23.8%	42.5%	31.9%
9	8.5%	1.8%	29.9%	29.9%	42.5%	40.5%
10	8.3%	1.6%	21.0%	31.8%	49.2%	51.4%
11	8.4%	1.8%	18.3%	29.2%	87.8%	71.8%
12	8.1%	1.6%	20.5%	39.3%	65.9%	73.3%

It is emphasized that the regulating reserve levels used in the 2021 IRP are approximations intended to reflect generally the amount of set-aside capacity needed to balance load and wind and solar production while maintaining system reliability. The precise definition of regulating reserve levels is more appropriately the focus of a study designed specifically to assess the impacts and costs associated with integrating VERs.

Natural Gas Price Forecasts

Idaho Power used the long-term Platts 2021 Henry Hub natural gas price forecast as the planning case forecast in the 2021 IRP. Idaho Power tested portfolios under an additional (high) natural gas price forecast, EIA's Low Oil & Gas Supply forecast from their *Annual Energy Outlook 2021.*[32] For more details and discussion on the planning natural gas price forecast, see Chapter 8.

Carbon Price Forecasts

Idaho Power developed portfolios under three carbon price scenarios for the 2021 IRP shown in Figure 9.3:

1. Zero Carbon Costs—assumes there will be no federal or state legislation that would require a tax or fee on carbon emissions.
2. Planning Case Carbon Cost—is based on the California Energy Commission's 2020 *Integrated Energy Policy Report (IEPR) Preliminary Green House Gas Allowance Price*

[32] EIA Annual Energy Outlook 2021, February 2021: www.eia.gov/outlooks/aeo/pdf/AEO_Narrative_2021.pdf

Projections[33], Low-price Scenario. The carbon cost forecast assumes a price of roughly $20 per ton beginning in 2023 and increases to nearly $68 per ton by the end of the IRP planning horizon.

3. High Carbon Costs—is based on a federal interagency working group Technical Support Document: *Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990.*[34] The carbon cost forecast assumes a price of approximately $53 per ton beginning in 2021 that increases to more than $105 per ton (nominal dollars) by the end of the IRP planning horizon.

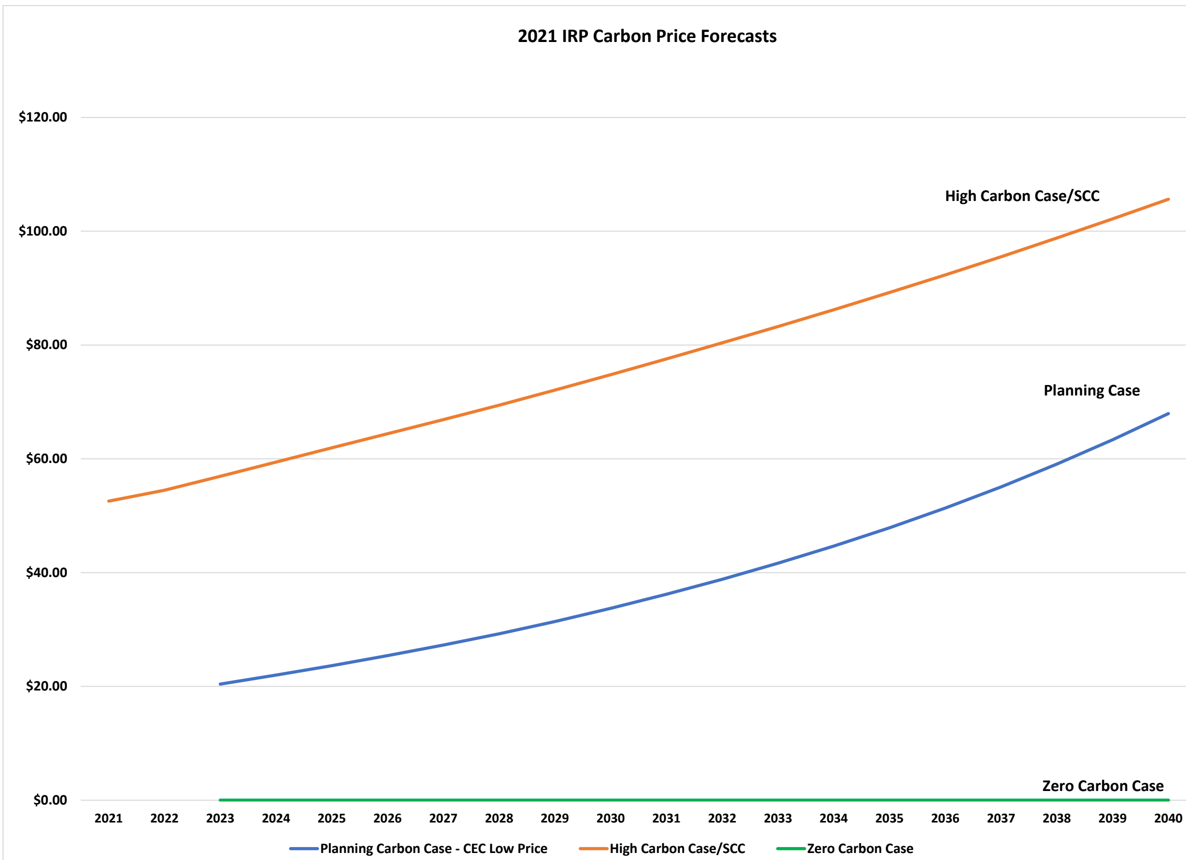

Figure 9.3 Carbon price forecast

[33] 2020 California Energy Commission's *IEPR Preliminary Green House Gas Allowance Price Projections*, Low-price Scenario. Energy Assessment Division (August 13, 2020)

[34] Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990. Interagency Working Group and Social Cost of Greenhouse Gases, United States Government. February 2021. Accessed 9/1/2021 https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

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IRP REPORT:

MODELING ANALYSIS

10. MODELING ANALYSIS

Portfolio Cost Analysis and Results

Once the portfolios are created using the LTCE model, Idaho Power uses the AURORA electric market model as the primary tool for modeling resource operations and determining operating costs for the 20-year planning horizon. AURORA modeling results provide detailed estimates of wholesale market energy pricing and resource operation and emissions data. It should be noted that the Portfolio Cost Analysis is a step that occurs *following* the development of the resource buildouts through the LTCE model; the Portfolio Cost Analysis utilizes the resource buildouts from the LTCE model as an input. The LTCE and Portfolio Cost analyses are performed sequentially.

The AURORA software applies economic principles and dispatch simulations to model the relationships between generation, transmission, and demand to forecast market prices. The operation of existing and future resources is based on forecasts of key fundamental elements, such as demand, fuel prices, hydroelectric conditions, and operating characteristics of new resources. Various mathematical algorithms are used in unit dispatch, unit commitment, and regional pool-pricing logic. The algorithms simulate the regional electrical system to determine how utility generation and transmission resources operate to serve load.

Portfolio costs are calculated as the NPV of the 20-year stream of annualized costs, fixed and variable, for each portfolio. Financial variables used in the analysis is shown in Table 10.1. Each resource portfolio was evaluated using the same set of financial variables.

Table 10.1 Financial assumptions

Financial Variable	Value
Discount rate (weighted average capital cost)	7.12%
Composite tax rate	25.74%
Deferred rate	21.30%
General O&M escalation rate	2.30%
Annual property tax rate (% of investment)	0.47%
B2H annual property tax rate (% of investment)	0.64%
Property tax escalation rate	3.00%
B2H property tax escalation rate	0.68%
Annual insurance premium (% of investment)	0.049%
B2H annual insurance premium (% of investment)	0.004%
Insurance escalation rate	3.00%
B2H insurance escalation rate	3.00%
AFUDC rate (annual)	7.45%

Each of the portfolios designed under the AURORA LTCE process, that are in contention for the Preferred Portfolio, were evaluated through three different hourly simulations shown in Table 10.2.

Table 10.2 AURORA hourly simulations

	Zero Carbon	Planning Carbon	High Carbon
Planning Gas	X	X	
High Gas			X

The three combinations include the planning case scenarios as well as the bookends for natural gas and carbon adder price forecasts.

The purpose of the AURORA hourly simulations is to compare how portfolios perform throughout the 20-year timeframe of the IRP. These simulations include the costs associated with adding generation resources (both supply-side and demand-side) and optimally dispatching the resources to meet the constraints within the model. The results from the three hourly simulations, where only the pricing forecasts were changed, are shown in Table 10.3. These different portfolios and their associated costs can be compared as potential options for a preferred portfolio.

Table 10.3 2021 IRP portfolios, NPV years 2021–2040 ($ x 1,000)

Portfolio	Planning Gas, Planning Carbon	Planning Gas, Zero Carbon	High Gas, High Carbon
Base with B2H	$7,942,428	$7,213,486	$9,858,726
Base B2H PAC Bridger Alignment	$8,021,906	$7,175,514	$9,955,484
Base without B2H	$8,219,281	$7,810,996	$9,501,435
Base without B2H without Gateway West[35]	$8,470,101	-	-
Base without B2H PAC Bridger Alignment	$8,207,893	$7,610,787	$9,675,450
Base with B2H—High Gas High Carbon Test[36]	$8,024,064	-	$9,451,660

[35] The company did not continue further evaluation of this portfolio beyond planning conditions due to the portfolio's inferior performance (high-cost, poor reliability, and poor emissions performance).

[36] All portfolios were optimized with planning conditions. The "Base with B2H—High Gas High Carbon (HGHC) Test" portfolio includes total renewables equivalent to the "Base without B2H" portfolio and was evaluated to test B2H as an independent variable. The results indicate that B2H remains cost effective, independent of gas price and carbon price and that a pivot to even more renewables in a future with a high gas and carbon price would be appropriate.

This comparison, as well as the stochastic risk analysis applied to these portfolios (see the Stochastic Risk Analysis section of this chapter), indicate the Base with B2H portfolio best minimizes both cost and risk and is the appropriate choice for the Preferred Portfolio.

The scenarios listed in Table 10.4 were sensitivities tested on the Preferred Portfolio and are included to show the associated costs. Each was evaluated under planning natural gas and carbon adder forecasts.

Table 10.4 2021 IRP Sensitivities, NPV years 2021–2040 ($ x 1,000)

Sensitivity	Cost
Preferred Portfolio (Base with B2H)	$7,942,428
SWIP-North	$7,914,287
CSPP Wind Renewal Low	$7,919,311
CSPP Wind Renewal High	$7,952,730

The validation and verification tests are listed in Table 10.5. These were modeling simulations performed on the Preferred Portfolio, with changes to the resources identified in the Action Plan window, to ensure the model was optimizing correctly and to test assumptions. More details on the setup and expected outcome of each test are provided in Chapter 9.

Table 10.5 2021 IRP validation and verification tests, NPV years 2021–2040 ($ x 1,000)

Validation & Verification Tests	Cost
Preferred Portfolio (Base with B2H)	$7,942,428
Demand Response	$7,944,368
Energy Efficiency	$8,169,838
Natural Gas in 2028 Rather than Solar and Storage	$8,078,645
Bridger Exit Units 1 & 2 at the End of 2023	$8,077,805
Bridger Exit Unit 2 at the End of 2026	$8,014,305
Bridger Unit 2 Delayed Gas Conversion (2027)	$7,962,665
Bridger Exit Unit 4 in 2027	$7,951,878
Bridger Exit Units 3 and 4 in 2028 and 2030	$7,997,453
Geothermal	$8,000,506
Biomass	$7,994,989
Valmy Unit 2 Exit in 2023	$7,957,116
Valmy Unit 2 Exit in 2024	$7,956,390

Portfolio Emission Results

The company is seeking to execute on the actions identified in the Action Plan window. Therefore, the company evaluated the CO_2 emissions within the Action Plan window for each portfolio in contention for the Preferred Portfolio, along with the SWIP-North portfolio.

Figure 10.1 is a stacked column that shows the year-to-year cumulative emissions for each portfolio's projected generating resources during those first seven years of the IRP (2021-2027; the Action Plan window).

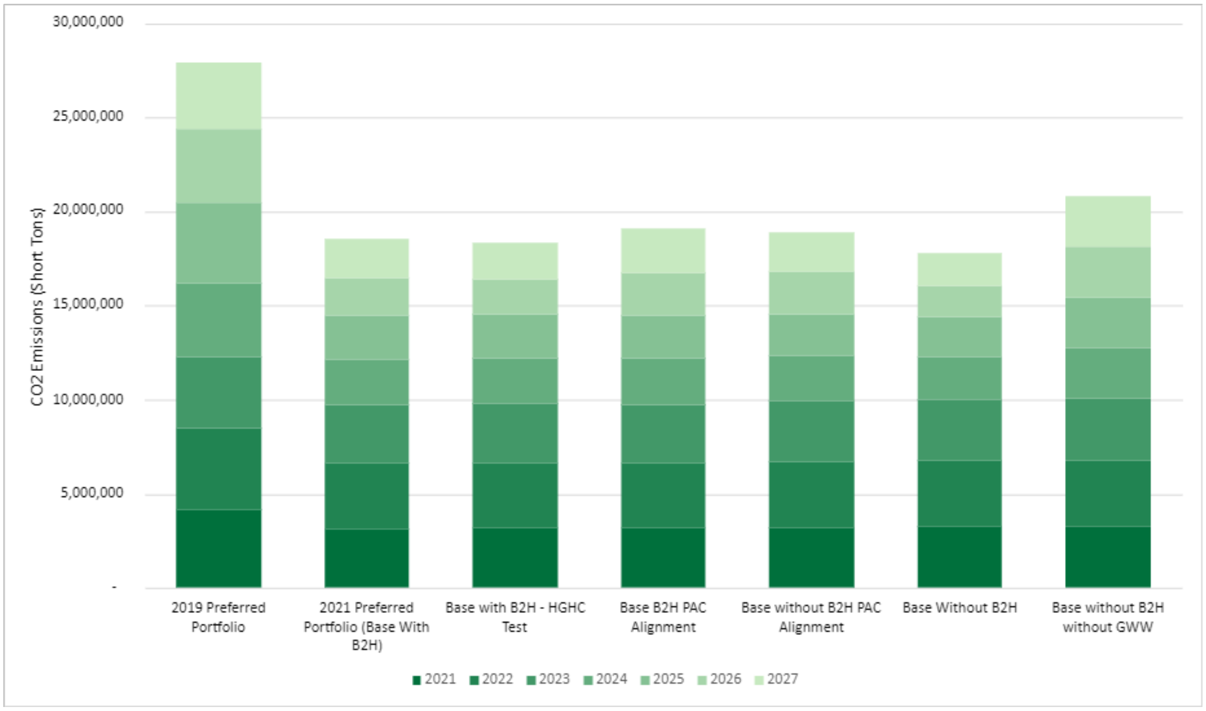

Figure 10.1 Estimated Action Plan window portfolio emissions from 2021–2027

Inspecting the emissions of the Preferred Portfolio in more detail, total emissions reduce from about 3.1 million tons in 2021, to 2 million tons in 2027—representing a 36% reduction over seven years. Additionally, the company is forecasting significant load growth over this seven-year period, so the carbon intensity per MWh is even further reduced. The Preferred Portfolio carbon intensity per MWh reduces from 379 pounds per MWh in 2021, to 209 pounds per MWh in 2027—representing a 45% reduction over seven years. The company believes a 36% reduction in total emissions, and a 45% reduction in emissions intensity, over a seven-year period represents a significant step toward its 100% Clean by 2045 goal.

Figure 10.2 compares the full 20-year emissions of the company's 2019 Preferred Portfolio to the top contending portfolios in the 2021 IRP. In Figure 10.2, the 2019 Preferred Portfolio is on the far left, adjacent to the 2021 Preferred Portfolio on its immediate right. Compared to the 2019 Preferred Portfolio, the 2021 Preferred Portfolio has cumulative emissions reductions of about 21%. As can be seen on Figure 10.2, the other 2021 portfolios each reflect reduced emissions as compared to the 2019 Preferred Portfolio and are sorted by present value portfolio cost from left to right. The costs associated with each portfolio are shown in the yellow highlights. While 2021 IRP portfolios are shown on Figure 10.1 to have relatively similar emissions output during the Action Plan window, three portfolios have lower projected emissions than the 2021 Preferred Portfolio over the full 20-year planning horizon. However, it is important to note that each of those three portfolios present higher expected cost. The information presented on Figures 10.1 and 10.2 demonstrate that Idaho Power's CO_2 emissions can be expected to trend downward over time. Idaho Power will continue to evaluate resource needs and alternatives that balance cost and risk, including the relative potential CO_2 emissions.

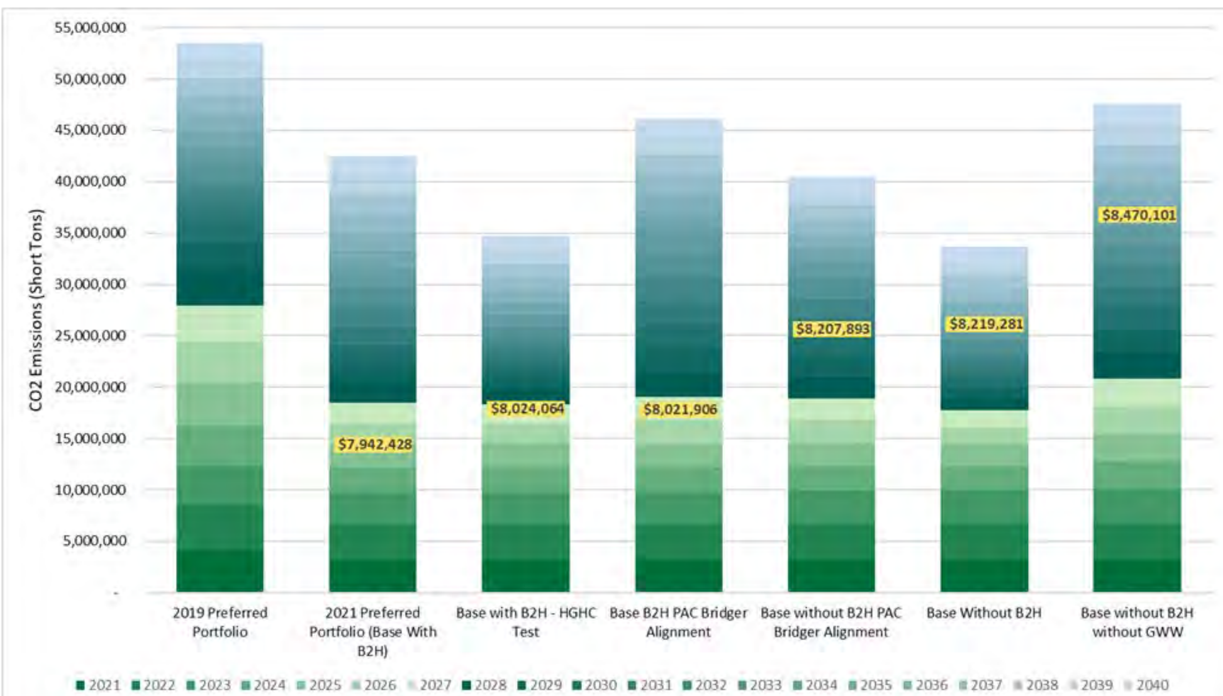

Figure 10.2 Estimated portfolio emissions from 2021–2040

In conclusion, the Preferred Portfolio (Base with B2H) strikes an appropriate balance of cost, risk, and emissions reductions over the Action Plan window. The Preferred Portfolio also lays a cost-effective foundation to build upon for further emissions reductions into the future.

Idaho Power believes that technological advances will continue to occur to allow the company to reliably and cost-effectively achieve our goal of providing 100% clean energy by 2045.

Qualitative Risk Analysis

Major Qualitative Risks

Fuel Supply—All generation and transmission resources require fuel to provide electricity. Different resource types have different fuel supply risks. Renewable resources rely on uncertain future weather conditions to provide the fuel be it wind, sun, or water. Weather can be variable and difficult to forecast accurately. Thermal resources like coal and natural gas rely on fuel supply infrastructure to produce and transport fuel by rail or pipeline and include mining or drilling facilities. Fuel supply infrastructure has several risks when evaluating resources-it is susceptible to outages from weather, mechanical failures, labor unrest, etc. Fuel supply infrastructure can be limited in its existing availability to increase delivery of fuel to a geographic area that limits the amount of new resources dependent on the capacity constrained infrastructure.

Fuel Price Volatility—For plants needing purchased fuel, the fuel prices can be volatile and impact a plant’s economics and usefulness to our customers both in the short and long term. Resources requiring purchased fuels like natural gas have a higher exposure to fuel price risk.

Market Price Volatility—Portfolios with resources that increase imports and/or exports heighten the exposure to a portfolio cost variability brought on by changes in market price and energy availability. Market price volatility is often dependent on regional fuel supply availability, weather, and fuel price risks. Resources, like wind and solar, that cannot respond to market price signals, expose the customer to higher short-term market price volatility.

Market Access—With many utilities including Idaho Power relying more on intermittent resources like wind and solar, the ability to access markets like the Energy Imbalance Market becomes increasingly important. Lack of market access can cause considerable wholesale price fluctuations and high costs as well as present reliability concerns during times of need.

Siting and Permitting—All generation and transmission resources in the portfolios require siting and permitting for the resource to be developed. Siting and permitting processes are uncertain and time-consuming, increasing the risk of unsuccessful or prolonged resource acquisition resulting in an adverse impact on economic planning and operations. Resources that require air and water permits or that have large geographic footprints have a higher risk. All resources considered have some level of this qualitative risk.

Technological Obsolescence—Technological innovation may result in generating resources that are lower cost and have more desirable characteristics. As a result, current technologies may become noncompetitive and strand investments which may adversely impact customers economically.

Partnerships—Idaho Power is a partner in coal facilities and is jointly permitting and siting transmission facilities in anticipation of partner participation in construction and ownership of these facilities. Coordinating partner need and timing of resource acquisition or retirement increases the risk of an Idaho Power timing or planning assumption not being met. Partner risk may adversely impact customers economically and adversely impact system reliability.

Federal and State Regulatory and Legislative Risks—There are many Federal and State rules governing power supply and planning. The risk of future rules altering the economics of new resources or the Idaho Power electrical system composition is an important consideration. Examples include carbon emission limits or adders, PURPA rules governing renewable PPAs, tax incentives and subsidies for renewable generation or other environmental or political reasons. New or changed rules could harm customers economically and impact system reliability.

Each resource possesses a set of qualitative risks that, when combined over the study period, results in a unique and varied qualitative portfolio risk profile. Assessing a portfolio's aggregate risk profile is a subjective process weighing each component resource's characteristics against the potential bad outcomes for each resource and the portfolio of resources in aggregate. Idaho Power considered how qualitative risks affect each resource portfolio. Although the qualitative risk analysis performed is expansive, it is not exhaustive. For brevity, Idaho Power has limited the qualitative risk analysis to those risks that are typical to the power industry and accordingly does not consider exceedingly rare or hypothetical events, like a Sharknado, when performing qualitative risk analysis.

For purposes of risk assessment, each portfolio and risk is assigned a low, medium, or high risk level. Consideration was given to both the likelihood and potential impact of each risk. The results of Idaho Power's qualitative risk assessment are presented in the following table:

Table 10.6 Qualitative risk comparison

Portfolio	Energy Supply	Market Volatility	Access to Markets	Siting and Permitting	Technological Obsolescence	Partnerships	State and Federal Policy
Base with B2H	Medium	Medium	Low	Medium	Low	Medium	Medium
Base B2H PAC Bridger Alignment	Low	Medium	Medium	Medium	Low	Medium	High
Base Without B2H	Medium	Medium	High	High	Medium	Medium	Medium
Base Without B2H Without GWW	Medium	Medium	High	Medium	High	Low	Medium
Base Without B2H PAC Bridger Alignment	Medium	Medium	High	High	Medium	Medium	High

Operational Considerations

System Regulation—Maintaining a reliable system is a delicate balance requiring generation to match load on a sub-hourly time step. Over- and under-generation due to variability in load and generation require a system to have dispatchable resources available at all times to maintain reliability and to comply with FERC rules and Western EIM flexibility requirements. Outages or other system conditions can impact the availability of dispatchable resources to provide flexibility. For example, in the spring, hydro conditions and flood control requirements can limit the availability of hydro units to ramp up or down in response to changing load and non-dispatchable generation. Not having hydro units available to follow load increases the reliance on baseload thermal resources like the Bridger units as the primary flexible resources to maintain system reliability and comply with FERC and EIM rules. Increasing the variability of generation or reducing the availability of flexible resources can adversely impact the customer economically, Idaho Power's ability to comply with environmental requirements, and the reliability of the system.

Stochastic Risk Analysis

The stochastic risk analysis assesses the effect on portfolio costs when select variables take on values different from their planning-case levels. Stochastic variables are selected based on the degree to which there is uncertainty regarding their forecasts and the degree to which they can affect the analysis results (i.e., portfolio costs).

The purpose of the analysis is to help understand the range of portfolio costs across the full extent of stochastic shocks (i.e., across the full set of stochastic iterations) and how the ranges for portfolios differ. It is used to identify the probabilities of various risk and the shape of that risk. To assess stochastic risk, the key drivers of natural gas prices, customer load, and hydroelectric generation are allowed to vary based on their historical variance. A full description of how these variables were modeled in the stochastic analysis can be found in the Stochastic Risk Analysis section of *Appendix C—Technical Report* of the 2021 IRP.

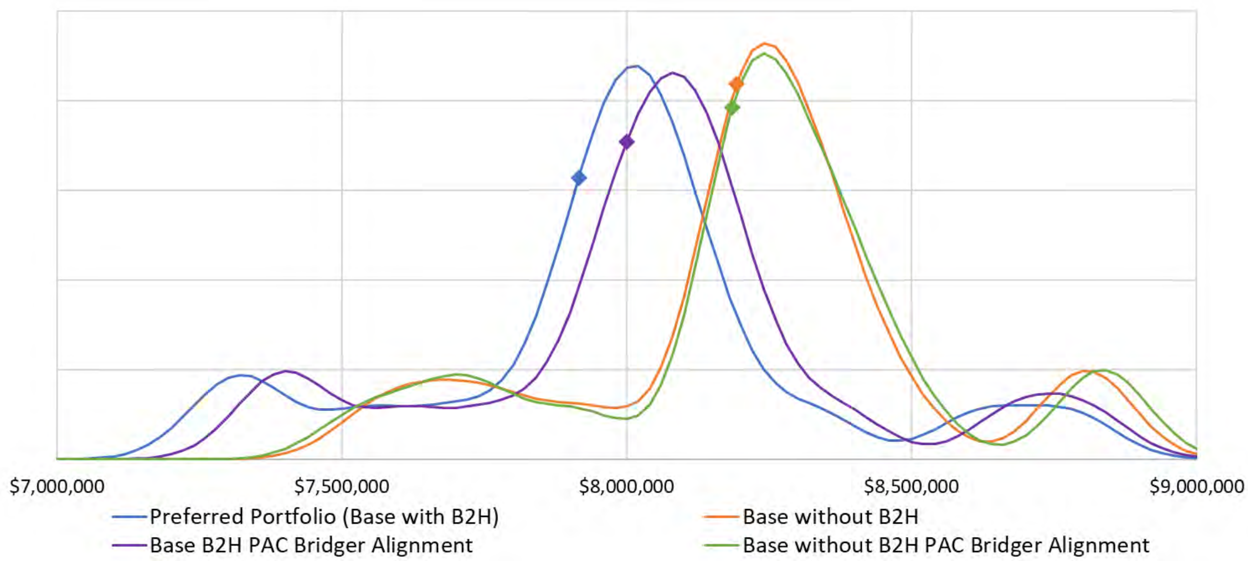

Figure 10.3 NPV stochastic probability kernel (likelihood by NPV [$ x 1,000])

In Figure 10.3, each line represents the likelihood of occurrence by NPV with the diamonds showing the planning conditions NPV. Higher values on the line represent a higher probability of occurrence with values near the horizontal axis representing improbable events. Values that occur toward the left have lower cost while values toward the right have higher cost.

As indicated by the peak of the graph being furthest left, the results of the stochastic analysis show that the Preferred Portfolio (Base with B2H) has the lowest cost given a range of natural gas prices, load forecasts, and hydroelectric generation levels. Next lowest is the Base with B2H PAC Bridger Alignment portfolio indicated by the middle peak. Nearly tied as the most expensive options analyzed using stochastic elements are both Base without B2H portfolios regardless of PAC Bridger Alignment.

Loss of Load Evaluation of Portfolios

As a post-processing reliability evaluation, Idaho Power calculated the LOLE of various AURORA-produced portfolios, on an annual basis, to ensure the selected portfolios achieved the 0.05 LOLE minimum reliability threshold. This was an important evaluation because the company utilized static ELCC values for each resource type modeled, whereas resource ELCCs can vary depending on the total resource makeup of a portfolio. For example, if a portfolio consisted only of large amounts of storage, there would eventually be issues with obtaining enough energy to charge the storage. Diverse resources, such as solar coupled with storage, address that issue as a good resource pairing. Evaluating the LOLE of portfolios on an annual basis is necessary to ensure each selected portfolio meets the reliability threshold.

The portfolio LOLE was obtained by calculating the probability that the generation would not be able to meet the demand at any given hour over the planning horizon. An in-depth discussion of the LOLE methodology and calculations can be found in the Loss of Load Expectation section of *Appendix C—Technical Report*.

Idaho Power used four test years to ensure the selected portfolios were reliable; using a test year ensured the relationship was maintained between variable resources and load. The test years were created using historical data from 2017–2020. The solar output of the selected portfolios was a scaled-up version of the test year's measured PV output. For wind, model data was used instead of measured data because new wind plants will have a significantly different output profile due to the hub height and improvements in wind technology in the last decade. The load profile in each of the test years was created by scaling up each month of test year measured data to match the peak load in that month of the load forecast.

The LOLE of each of the four test years was then averaged to obtain a portfolio LOLE for every year of the planning horizon. In the case where any of the years in a given portfolio were above the threshold, the company determined the generator size required that would be sufficient to allow the portfolio to meet the reliability LOLE threshold of 0.05 days per year.

LOLE Results of Selected Portfolios

The annual LOLE values were calculated for the following portfolios:

- Preferred Portfolio (Base with B2H)
- Base without B2H
- Base with B2H PAC Bridger Alignment
- Base without B2H PAC Bridger Alignment
- SWIP-North

The average LOLE values for the Preferred Portfolio are shown below in Figure 10.4; this figure shows the Preferred Portfolio remaining under the reliability threshold until 2036 (excluding 2021 and 2022 due to the 2021 IRP transition from an LOLE of 1 in 10 days per year to 1 in 20 days per year). In 2037, a generator was added to the LOLE tool to keep the Preferred Portfolio under the reliability threshold.

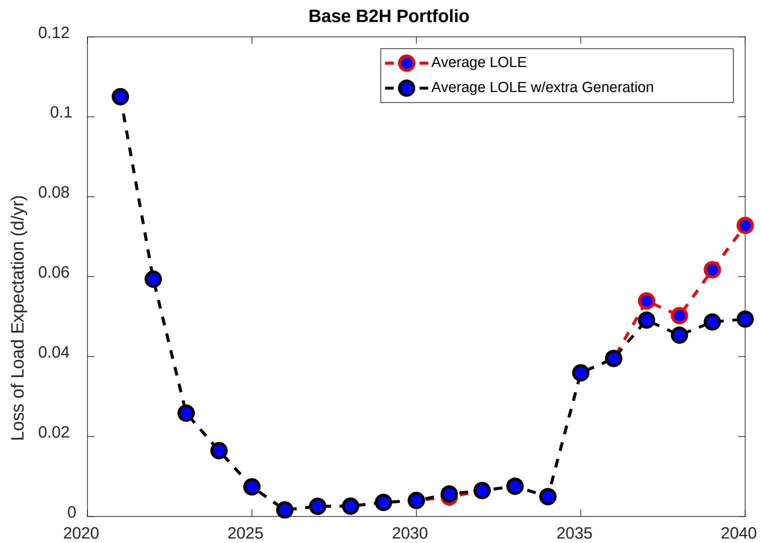

Figure 10.4 Annual loss of load expectation for the Preferred Portfolio

An in-depth discussion of the reliability LOLE calculation process and results for selected portfolios can be found in the Loss of Load Expectation section of *Appendix C—Technical Report*.

Capacity Planning Margin

Idaho Power calculated the capacity planning margin resulting from the resource needs identified in the Preferred Portfolio (Base with B2H). The peak hour capabilities of solar, wind, battery, and DR resources were adjusted based on the calculated ELCCs determined from the LOLE analysis. Resource capacities were also adjusted to account for Effective Forced Outage Rates (EFOR). For hydroelectric generation, expected case (50^{th} percentile) water conditions were used.

The generation from existing resources also includes expected firm purchases from regional markets. Transmission capacity internally set aside with a corresponding reservation on neighboring systems were considered for these expected firm purchases from regional markets. These firm purchases from regional markets are designated as third-party secured transmission. The addition of B2H in 2026 increases transfer capability from the Mid-C market in the northwest. The B2H project will also come with a new corresponding transmission service reservation from the Mid-C market hub to the Longhorn terminal of B2H. Therefore, the new B2H transmission capacity is also considered third-party secured. Transmission import capacity held for emergency use (capacity benefit margin [CBM]) is also included in the capacity planning margin.

The resource total is then compared with the expected-case (50th percentile) peak-hour load, with the excess resource capacity designated as the planning margin. The calculated planning margin provides another view of the adequacy of the Preferred Portfolio. A load and resource balance table with a calculated planning margin is shown in Table 10.7 for the peak load months of July. The target 15.5% planning reserve margin is closely followed by the Preferred Portfolio. A full load and resource balance table showing all months in the 20-year planning period is included in the *Appendix C—Technical Report* of the 2021 IRP.

Table 10.7 July peak hour load and resource balance

	Jul-21	Jul-22	Jul-23	Jul-24	Jul-25	Jul-26	Jul-27	Jul-28	Jul-29	Jul-30	Jul-31	Jul-32	Jul-33	Jul-34	Jul-35	Jul-36	Jul-37	Jul-38	Jul-39	Jul-40
Peak-Hour (50th+15.5%) w/Energy Efficiency	(4,161)	(4,226)	(4,301)	(4,385)	(4,508)	(4,620)	(4,724)	(4,816)	(4,859)	(4,904)	(4,944)	(4,989)	(5,029)	(5,080)	(5,133)	(5,187)	(5,244)	(5,304)	(5,361)	(5,421)
Existing Demand Response Capacity	66	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176
Peak-Hour (50th+15.5%) w/DR and Energy Efficiency	**(4,096)**	(4,050)	(4,126)	(4,210)	(4,332)	(4,445)	(4,548)	(4,640)	(4,684)	(4,729)	(4,769)	(4,813)	(4,854)	(4,905)	(4,957)	(5,011)	(5,069)	(5,129)	(5,185)	(5,246)
Existing Resources																				
Bridger	663	663	663	663	663	663	663	663	663	663	663	663	663	663	663	663	663	663	663	663
Valmy	121	121	121	121	121	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Coal	**784**	**784**	**784**	**784**	**784**	**663**	**663**	**663**	**663**	**663**	**663**	**663**	**663**	**663**	**663**	**663**	**663**	**663**	**663**	**663**
Langley Gulch	270	306	306	306	306	306	306	306	306	306	306	306	306	306	306	306	306	306	306	306
Total Gas Peakers	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365
Total Gas	**636**	**671**	**671**	**671**	**671**	**671**	**671**	**671**	**671**	**671**	**671**	**671**	**671**	**671**	**671**	**671**	**671**	**671**	**671**	**671**
Hydro (50th) HCC	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060
Hydro (50th) Other	295	295	295	295	295	294	294	294	294	294	294	293	293	293	293	292	292	292	292	292
Total Hydroelectric (50)	**1,355**	**1,355**	**1,355**	**1,355**	**1,355**	**1,355**	**1,355**	**1,354**	**1,354**	**1,354**	**1,354**	**1,354**	**1,354**	**1,353**	**1,353**	**1,353**	**1,353**	**1,352**	**1,352**	**1,352**
CSPP (PURPA)																				
Solar CSPP (PURPA)	197	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199
Wind CSPP Capacity	93	93	93	93	93	91	91	91	85	81	60	57	38	38	38	38	23	23	23	23
Other CSPP	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
Total CSPP	**420**	**422**	**422**	**422**	**422**	**420**	**420**	**420**	**414**	**410**	**389**	**387**	**367**	**367**	**367**	**367**	**352**	**352**	**352**	**352**
Elkhorn	15	15	15	15	15	15	15	-	-	-	-	-	-	-	-	-	-	-	-	-
Raft River Geothermal	8	8	8	8	8	8	8	8	8	8	8	8	-	-	-	-	-	-	-	-
Neal Hot Springs Geothermal	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	-	-	-
Jackpot Solar	-	-	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Clatskanie Exchange	11	11	11	11	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total PPAs	**42**	**42**	**82**	**82**	**82**	**71**	**71**	**56**	**56**	**56**	**56**	**56**	**48**	**48**	**48**	**48**	**48**	**40**	**40**	**40**
Available Transmission w/Third- Party Secured	**200**	**300**	**380**	**379**	**377**	**375**	**374**	**373**	**372**	**371**	**370**	**370**	**370**	**370**	**370**	**370**	**370**	**370**	**370**	**370**
Emergency Transmission (CBM)	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**	**330**
Existing Resource Subtotal	**3,767**	**3,904**	**4,025**	**4,023**	**4,021**	**3,885**	**3,883**	**3,867**	**3,861**	**3,856**	**3,833**	**3,830**	**3,803**	**3,802**	**3,802**	**3,802**	**3,787**	**3,780**	**3,780**	**3,780**
Monthly Surplus/ Deficit	**(329)**	(146)	(101)	(186)	(311)	(560)	(665)	(773)	(823)	(873)	(935)	(983)	(1,051)	(1,102)	(1,155)	(1,210)	(1,282)	(1,349)	(1,406)	(1,466)
2021 IRP Capacity Resources																				

	Jul-21	Jul-22	Jul-23	Jul-24	Jul-25	Jul-26	Jul-27	Jul-28	Jul-29	Jul-30	Jul-31	Jul-32	Jul-33	Jul-34	Jul-35	Jul-36	Jul-37	Jul-38	Jul-39	Jul-40
New Transmission–B2H	-	-	-	-	-	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
New Resource–EE Bundles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	5
New Resource–DR	-	-	7	7	14	14	14	14	14	14	14	14	14	14	14	14	14	22	29	36
New Resource–Battery–4Hr	-	-	101	105	109	109	114	162	298	346	394	442	529	573	753	757	849	853	901	949
New Resource–Battery–4Hr–Removals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(101)	(105)	(109)
New Resource–Battery–8Hr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49	49	97	97	97
New Resource–Solar + Storage 1:1 (Solar)	-	-	-	-	10	10	10	10	20	20	20	20	20	31	41	41	41	51	51	51
New Resource–Solar + Storage 1:1 (Storage)	-	-	-	-	87	87	87	87	174	174	174	174	174	260	347	347	347	434	434	434
New Resource–Solar	-	-	-	-	20	42	68	80	80	80	80	80	80	80	80	80	80	80	80	80
New Resource–WY Wind	-	-	-	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
New Resource–ID Wind	-	-	-	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
New Resource–Gas Conversion (Exit 2034)	-	-	-	334	334	334	334	334	334	334	334	334	334	334	-	-	-	-	-	-
Early Bridger Coal Exits	-	-	-	(334)	(334)	(497)	(497)	(497)	(663)	(663)	(663)	(663)	(663)	(663)	(663)	(663)	(663)	(663)	(663)	(663)
New Resource Subtotal	**0**	**0**	**108**	**190**	**319**	**678**	**708**	**768**	**835**	**883**	**932**	**980**	**1,067**	**1,208**	**1,150**	**1,203**	**1,295**	**1,351**	**1,404**	**1,458**
Monthly Surplus/Deficit	**(329)**	**(146)**	**7**	**4**	**8**	**118**	**44**	**(4)**	**12**	**10**	**(4)**	**(3)**	**16**	**106**	**(5)**	**(7)**	**13**	**2**	**(2)**	**(8)**
Planning Margin	**6.4%**	**11.5%**	**15.7%**	**15.6%**	**15.7%**	**18.5%**	**16.6%**	**15.4%**	**15.8%**	**15.7%**	**15.4%**	**15.4%**	**15.9%**	**17.9%**	**15.4%**	**15.3%**	**15.8%**	**15.5%**	**15.5%**	**15.3%**

SWIP-North Opportunity Evaluation

The SWIP-North opportunity evaluation tests whether Idaho Power customers would potentially benefit from Idaho Power's involvement in the project. Based on the NPV cost results detailed in Table 10.4, the SWIP-North project appears to be worth further exploration.

- Preferred Portfolio (Base with B2H) NPV—$7,942,428
- SWIP-North Portfolio NPV—$7,914,287

In this opportunity evaluation, the company made assumptions about SWIP-North, and its cost and capacity benefits, which are detailed more in Chapter 7. The company is not familiar with any current partnership arrangements associated with the project, whether there are opportunities to participate in the project, or the feasibility of the project in general and its associated in-service date. Given the possible benefits to Idaho Power customers, the company will engage the SWIP-North project developer and look to perform a more detailed evaluation of SWIP-North in future IRPs.

B2H Robustness Testing

The company evaluated B2H assuming five different planning margin contributions, four different costs (various contingency amounts), and two different in-service dates to consider the robustness of the B2H project.

B2H Capacity Evaluation

When the B2H project is placed into service, currently scheduled for pre-summer 2026, the company will have access to as much as 550 MW of summer capacity. In recent IRPs, the company has planned to utilize 500 MW of B2H capacity to access the Mid-C markets and purchase power.

As part of the 2021 IRP, the company looked at portfolio costs assuming the company can access 350 MW, 400 MW, 450 MW, 500 MW (the Preferred Portfolio), and 550 MW of capacity. The sensitivities with capacity amounts less than 500 MW are set up to evaluate risk related to reduced market access. The 550 MW capacity amount sensitivity quantifies potential benefits associated with leveraging additional market purchases to avoid the need for a new resource. To evaluate the impact of different B2H capacity levels, the company added or subtracted comparable capacity in the form of battery storage (the least-cost alternative to providing sufficient amounts of capacity) to maintain an adequate planning margin, while maintaining the same cost of B2H (i.e., B2H capacity's contribution toward the planning margin is reduced with no offsetting cost reduction). The resulting total portfolio costs are detailed in Table 10.8.

Table 10.8 B2H capacity sensitivities

	Portfolio NPV	Potential Offsetting Costs Not Included (NPV)
Base B2H Portfolio—350 MW Planning Contribution	$8,069 million	$51 million
Base B2H Portfolio—400 MW Planning Contribution	$8,019 million	$34 million
Base B2H Portfolio—450 MW Planning Contribution	$7,979 million	$17 million
Base B2H Portfolio (500 MW)	$7,942 million	$0
Base B2H Portfolio—550 MW Planning Contribution	$7,911 million	$0
Base without B2H PAC Bridger Alignment Portfolio (for comparison)	$8,208 million	N/A

Table 10.8 shows that even with a substantially reduced planning margin contribution, B2H portfolios remain cost effective. Additionally, if the company is able to access an additional 50 MW from the Mid-C market, that may present a cost-saving opportunity for customers.

The "Potential Offsetting Costs Not Included" column represents the possibility of selling wheeling service utilizing the B2H capacity that is not being utilized by the company in the given scenario. This offsetting cost is not factored into the portfolio NPV.

B2H Cost Risk Evaluation

A transmission line such as B2H requires significant planning, organization, labor, and material over a multi-year process to complete and place in-service. Evaluating cost risks to ensure cost-effectiveness (i.e., a tipping point analysis) is an important consideration when planning for such a project. Table 10.9 details the cost of the B2H project with 0%, 10%, 20%, and 30% cost contingencies.

Table 10.9 B2H cost sensitivities

	B2H Cost Idaho Power Share TOTAL	B2H Cost 2021 IRP NPV
B2H 0% Contingency	$485 million	$159.6 million
B2H 10% Contingency	$526 million	$178.4 million
B2H 20% Contingency	$566 million	$197.2 million
B2H 30% Contingency	$607 million	$216.1 million

Utilizing the numbers in Table 10.8 and comparing them to the difference between the Preferred Portfolio (Base with B2H) and the Base without B2H PAC Bridger Alignment portfolio, the B2H project would have to increase significantly beyond a 30% contingency before the project would no longer be cost-effective. While this is already a significant margin, it should be noted that there are other unquantified benefits to the B2H project that if quantified, would further widen this gap. These items will be discussed in more detail in the forthcoming

Appendix D–Transmission Supplement, which is anticipated to be filed in the first quarter of 2022.

B2H In-Service Date Risk Evaluation

The current planned in-service date for B2H is prior to the summer of 2026. This date is necessary to meet the peak demand growth needs, as well as fill in for the Valmy Unit 2 exit occurring at the end of 2025, and to facilitate the exit of Bridger Unit 3, as recommended as part of the Preferred Portfolio.

Should the B2H in-service date slip to 2027 due to a delay in receiving a permit, supply chain constraints, or other unforeseen issues, the exit of Bridger Unit 3 will certainly be delayed, and other new resources will be required in 2026. Table 10.10 details the cost change of B2H adjusting to 2027, and the new comparison to the Base without B2H PAC Bridger Alignment portfolio (the best B2H-excluded portfolio).

Table 10.10 B2H 2027 portfolio costs, cost sensitivities ($ x 1,000)

	Portfolio Costs	Portfolio Cost Compared to B2H 2027 Portfolio
Preferred Portfolio (Base with B2H)	$7,942,428	-$69,090
Base with B2H in 2027	$8,011,517	-
Base without B2H PAC Alignment	$8,207,893	$196,375

Slippage in the schedule from 2026 to 2027 would not be ideal for Idaho Power customers. However, B2H remains the most cost-effective long-term resource.

Regional Resource Adequacy

Northwest Seasonal Resource Availability Forecast

Idaho Power experiences its peak demand in late June or early July while the regional adequacy assessments suggest potential capacity deficits in late summer or winter. In the case of late summer, Idaho Power's demand has generally declined substantially; Idaho Power's irrigation customer demand begins to decrease starting in mid-July. For winter adequacy, Idaho Power generally has excess resource capacity to support the region.

The assessment of regional resource adequacy is useful in understanding the liquidity of regional wholesale electric markets. For the 2021 IRP, Idaho Power reviewed the *Pacific Northwest Loads and Resources Study* by the BPA (White Book). For illustrative purposes, Idaho Power also downloaded FERC 714 load data for the major Washington and Oregon Pacific Northwest entities to show the difference in regional demand between summer and winter.

The most recent BPA adequacy assessment report was released in October 2020 and evaluates resource adequacy from 2021 through 2030.[37] BPA considers regional load diversity (i.e., winter- or summer-peaking utilities) and expected monthly production from the Pacific Northwest hydroelectric system under the critical case water year for the region (1937). Canadian resources are excluded from the BPA assessment. New regional generating projects are included when those resources begin operating or are under construction and have a scheduled online date. Similarly, retiring resources are removed on the date of the announced retirement. Resource forecasts for the region assume the retirement of the following coal projects over the study period:

Table 10.11 Coal retirement forecast

Resource	Retirement Date
Centralia 1	December 1, 2020
Boardman	January 1, 2021
Valmy 1	January 1, 2022
Colstrip 1	June 30, 2022
Colstrip 2	June 30, 2022
Centralia 2	December 1, 2025
Valmy 2	January 1, 2026

[37] BPA. 2019 Pacific Northwest loads and resources study (2019 white book). Technical Appendix, Volume 2: Capacity Analysis. https://www.bpa.gov/p/Generation/White-Book/wb/2019-WBK-Technical-Appendix-Volume-2-Capacity-Analysis.pdf. Accessed November 24, 2021.

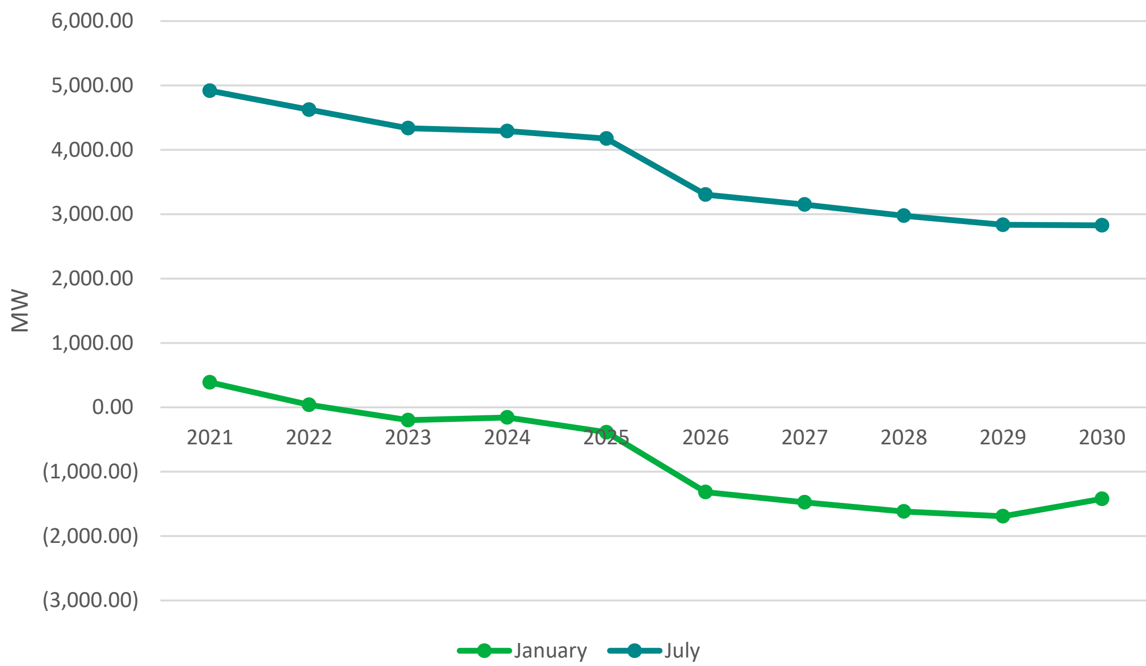

Figure 10.5 BPA white book PNW surplus/deficit one-hour capacity (1937 critical water year)

For illustrative purposes, Idaho Power downloaded peak load data reported through FERC Form 714 for the major Pacific Northwest entities in Washington and Oregon: Avista, BPA, Chelan County PUD, Douglas County PUD, Eugene Water and Electric Board, Grant County PUD, PGE, Puget Sound Energy, Seattle City Light, and Tacoma (PacifiCorp West data was unavailable). The coincident sum of these entities' total load is shown in Figure 10.6.

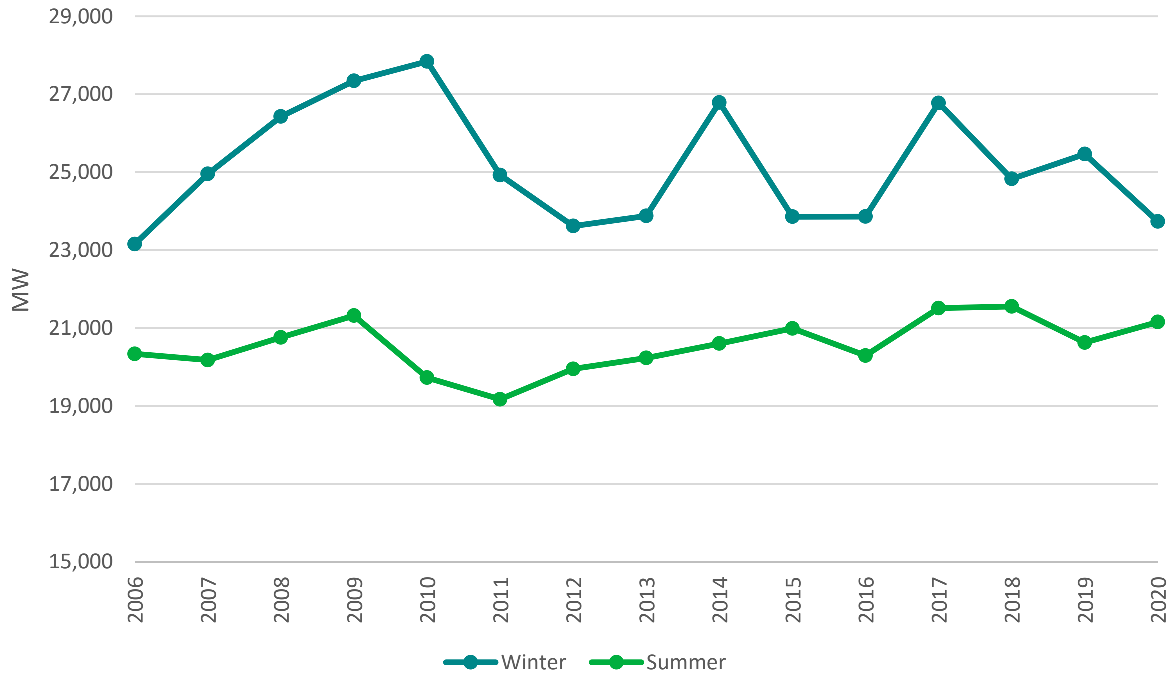

Figure 10.6 Peak coincident load data for most major Washington and Oregon utilities

Figure 10.6 illustrates a wide difference between historical winter and summer peaks for the Washington and Oregon area. Other considerations, not depicted, include:

- Canada's similar winter- to summer-peak load ratio
- The increased ability of the Pacific Northwest hydro system in late June through early July compared to the hydro system's capability in the winter
- The reducing cost of solar and storage, which aligns very well with summer peak, but most be scaled up significantly to meet winter-peak needs.

Overall, each of these assessments includes very few new energy resources; any additions to the resource portfolio in the Pacific Northwest will only increase the surplus available during Idaho Power's peak operating periods. The regional resource adequacy assessments are consistent with Idaho Power's view that expanded transmission interconnection to the Pacific Northwest (i.e., B2H) provides access to a market with capacity for meeting its summer load needs and abundant low-cost energy, and that expanded transmission is critical in a future with automated energy markets such as the Western EIM and high penetrations of VERs.

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IRP REPORT:

PREFERRED PORTFOLIO AND ACTION PLAN

11. PREFERRED PORTFOLIO AND ACTION PLAN

Preferred Portfolio

The portfolio development process for Idaho Power's 2021 IRP relies on an LTCE model first used in the 2019 IRP. The portfolio development process is explained in detail in Chapter 9.

In summary, for the 2021 IRP, the company developed a branching scenario analysis strategy to ensure that it had reasonably identified an optimal solution specific to Idaho Power and its customers. The company first identified six core resource portfolios with resource composition driven by the presence of B2H or Gateway West in each portfolio, and assumptions related to Jim Bridger exit dates. Once resource portfolios were generated, to evaluate future cost risks, the company performed cost analysis for the core resource portfolios under three different assumptions: planning case conditions for natural gas price and carbon cost, planning gas and no carbon cost, and higher-cost gas and carbon, as shown in Table 11.1.

Table 11.1 AURORA hourly simulations

	Planning Carbon	High Carbon	Zero Carbon
Planning Gas	X		X
High Gas		X	

The company also evaluated the qualitative risks, performed a stochastic risk analysis, and evaluated the reliability of each of the core portfolios (see Chapter 10).

Using the Preferred Portfolio (Base with B2H), the company developed additional portfolios to do the following:

1. Evaluate risk associated with different futures (discussed later in this Chapter)
2. Evaluate risk associated with different sensitivities
3. Evaluate the SWIP-North 500 kV project
4. Perform validation and verification tests on the Preferred Portfolio
5. Perform robustness sensitivities, cost tests, and timing tests on the B2H project

The Preferred Portfolio (Base with B2H) follows.

Table 11.2 Preferred Portfolio additions and coal exits (MW)

	Base B2H (MW)								
Year	Gas	Wind	Solar	Storage	Trans.	DR	Coal Exits	EE Forecast	EE Bundles
2021	0	0	0	0	0	0	0	23	0
2022	0	0	0	0	0	300	0	24	0
2023	0	0	120	115	0	20	-357	24	0
2024	357	700	0	5	0	0	0	25	0
2025	0	0	300	105	0	20	-308	27	0
2026	0	0	215	0	500	0	0	28	0
2027	0	0	250	5	0	0	0	27	0
2028	0	0	120	55	0	0	-175	27	0
2029	0	0	100	255	0	0	0	26	0
2030	0	0	0	55	0	0	0	24	0
2031	0	0	0	55	0	0	0	24	0
2032	0	0	0	55	0	0	0	23	0
2033	0	0	0	100	0	0	0	22	0
2034	-357	0	100	150	0	0	0	21	0
2035	0	0	100	305	0	0	0	20	0
2036	0	0	0	55	0	0	0	16	0
2037	0	0	0	105	0	0	0	14	0
2038	0	0	100	155	0	20	0	12	0
2039	0	0	0	55	0	20	0	11	3
2040	0	0	0	55	0	20	0	10	9
Subtotal	0	700	1,405	1,685	500	400	-841	428	12
Total	**4,289**								

The following items are included in Table 11.2:

- The 300 MW of DR showing in 2022 represents 380 MW of existing programs adjusted to the new program parameters to enhance their effectiveness. It is anticipated the program adjustments may result in some attrition.
- The addition of 1,405 MW of solar generation, including Jackpot Solar (120 MW) in 2023 and 785 MW of solar phased in from 2025 to 2028 to support the energy needs of large load customers.
- The conversion of Bridger units 1 and 2 (a combined 357 MW) is shown as a coal exit in 2023 and a gas addition in 2024. These units are exited at the end of their depreciable life in 2034. The 308 MW coal exit identified in 2025 includes both Valmy Unit 2 at 134 MW and Bridger Unit 3 at 174 MW.

- In addition to large storage projects, the Storage column includes 17 selections of 5 MW grid-located storage projects intended to defer transmission and distribution investments in addition to meeting system resource needs.
- The B2H transmission line is represented in the Trans. column as 500 MW in 2026.
- The Bridger Unit 4 coal exit is identified in 2028. At year-end 2028, Idaho Power will no longer have ownership of coal generation facilities. This is two years earlier than indicated in the 2019 IRP.
- The EE Forecast column shows a total of 428 MW of cost-effective energy efficiency measures that will be added to Idaho Power's system to meet growing energy demand. These energy efficiency measures were identified in the energy efficiency Potential Assessment.
- In addition to the cost-effective energy efficiency measures shown in the EE Forecast column, additional bundles of energy efficiency were selected in the last two years of the plan. These are shown in the EE Bundles column.

Preferred Portfolio Compared to Varying Future Scenarios

Rapid Electrification

A rapid path towards electrification will require additional electrical infrastructure and resources to meet the increased demand for electricity. While the portfolio costs more overall, the cost per MWh served increases by less than 2%.

The differences between the Preferred Portfolio and the Rapid Electrification scenario can be seen in Table 11.3. Helpful insights can be gained by comparing the types and quantities of resources selected by each scenario and the timing of the selected resources.

Primarily, the first several years of the plan remain unchanged, with the exception of an additional 100 MW of wind generation identified in 2024. As the rapid electrification ramp becomes more significant, the Bridger Unit 4 exit is delayed one year, and additional resources are required to meet demand in the following years. Two sub-segments of Gateway West (shown in the table as GW1 and GW2) are also required to incorporate the additional renewable resources in the Rapid Electrification scenario. The comparison of the Preferred Portfolio and the Rapid Electrification scenario illustrates that small course corrections can be made along the way to adjust to a steep ramp towards electrification.

Table 11.3 Preferred Portfolio and Rapid Electrification scenario comparison

	Preferred Portfolio (MW)								Rapid Electrification (MW)							
Year	Gas	Wind	Solar	Storage	Trans.	DR	Exits	EE	Gas	Wind	Solar	Storage	Trans.	DR	Exits	EE
2021	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	23
2022	0	0	0	0	0	300	0	24	0	0	0	0	0	300	0	24
2023	0	0	120	115	0	20	-357	24	0	0	120	115	0	20	-357	38
2024	357	700	0	5	0	0	0	25	357	800	0	5	0	0	0	25
2025	0	0	300	105	0	20	-308	27	0	0	300	105	0	0	-308	27
2026	0	0	215	0	500	0	0	28	0	0	215	0	500	0	0	28
2027	0	0	250	5	0	0	0	27	0	0	250	5	0	0	0	27
2028	0	0	120	55	0	0	-175	27	0	0	120	105	0	0	0	27
2029	0	0	100	255	0	0	0	26	0	100	0	55	0	0	-175	26
2030	0	0	0	55	0	0	0	24	0	300	0	205	GW1	0	0	24
2031	0	0	0	55	0	0	0	24	0	0	100	105	0	0	0	24
2032	0	0	0	55	0	0	0	23	0	0	0	55	0	0	0	23
2033	0	0	0	100	0	0	0	22	0	0	0	55	0	0	0	22
2034	-357	0	100	150	0	0	0	21	-357	0	100	105	0	0	0	21
2035	0	0	100	305	0	0	0	20	0	0	100	405	0	20	0	20
2036	0	0	0	55	0	0	0	16	0	0	0	55	0	0	0	16
2037	0	0	0	105	0	0	0	14	0	0	0	105	0	0	0	20
2038	0	0	100	155	0	20	0	12	0	0	100	205	0	20	0	12
2039	0	0	0	55	0	20	0	14	0	0	0	55	0	20	0	11
2040	0	0	0	55	0	20	0	19	0	200	100	5	GW2	40	0	10
Subtotal	0	700	1,405	1,685	500	400	-841	440	0	1,400	1,505	1,745	500	420	-841	448
Total	**4,289**								**5,178**							

Climate Change

Like the Rapid Electrification scenario, additional resources will be required to meet increased demand for electricity in the Climate Change scenario. In this scenario, the company modeled consistent demand (high) and water variability extremes (low water). These extremes are modeled for all years into the future and increase the need for more resources.

Additional renewable resources and battery storage are required to meet the requirements of the Climate Change scenario. The climate change modeling adjustments impact resource selections early in the plan with 100 MW of additional storage in 2023 and 200 MW of additional wind and solar in 2024. The comparison of the Preferred Portfolio and the Climate Change scenario illustrates that large additional quantities of resources (shown in the portfolio as wind and solar, paired with some storage) are required to meet system requirements if facing climate change related extremes on an annual basis.

Table 11.4 Preferred Portfolio and Climate Change scenario comparison

	Preferred Portfolio (MW)								Climate Change (MW)							
Year	Gas	Wind	Solar	Storage	Trans.	DR	Exits	EE	Gas	Wind	Solar	Storage	Trans.	DR	Exits	EE
2021	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	23
2022	0	0	0	0	0	300	0	24	0	0	0	0	0	300	0	24
2023	0	0	120	115	0	20	-357	24	0	0	120	215	0	20	-357	54
2024	357	700	0	5	0	0	0	25	357	900	400	5	0	20	0	25
2025	0	0	300	105	0	20	-308	27	0	0	400	105	0	0	-308	27
2026	0	0	215	0	500	0	0	28	0	0	215	5	500	0	0	28
2027	0	0	250	5	0	0	0	27	0	0	250	5	GW1	0	0	27
2028	0	0	120	55	0	0	-175	27	0	300	120	5	0	0	-175	27
2029	0	0	100	255	0	0	0	26	0	0	200	255	GW2	0	0	26
2030	0	0	0	55	0	0	0	24	0	100	100	5	0	0	0	24
2031	0	0	0	55	0	0	0	24	0	0	100	105	0	0	0	24
2032	0	0	0	55	0	0	0	23	0	0	0	5	0	0	0	23
2033	0	0	0	100	0	0	0	22	0	0	100	150	0	0	0	22
2034	-357	0	100	150	0	0	0	21	-357	0	100	105	0	0	0	21
2035	0	0	100	305	0	0	0	20	0	0	100	305	0	0	0	20
2036	0	0	0	55	0	0	0	16	0	0	0	55	0	0	0	16
2037	0	0	0	105	0	0	0	14	0	0	100	105	0	0	0	14
2038	0	0	100	155	0	20	0	12	0	0	100	255	0	0	0	18
2039	0	0	0	55	0	20	0	14	0	0	0	55	0	0	0	17
2040	0	0	0	55	0	20	0	19	0	0	100	55	0	0	0	19
Subtotal	0	700	1,405	1,685	500	400	-841	440	0	1,300	2,505	1,795	500	340	-841	478
Total	**4,289**								**6,078**							

100% Clean by 2035

With increasing urgency to move quickly to clean energy resources and at the request of the IRP Advisory Council, a 100% Clean by 2035 scenario was considered. Model studies were set up to compare the Preferred Portfolio to a resource selection that adhered to a 100% clean energy constraint by 2035.

Table 11.5 Preferred Portfolio and 100% Clean by 2035 scenario comparison

	Base B2H (Base IPC Optimization)								100% Clean By 2035 (MW)								
Year	Gas	Wind	Solar	Storage	Trans.	DR	Exits	EE	Gas	Wind	Solar	Storage	Nuclear	Trans.	DR	Exits	EE
2021	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0	23
2022	0	0	0	0	0	300	0	24	0	0	0	0	0	0	300	0	24
2023	0	0	120	115	0	20	-357	24	0	0	120	115	0	0	20	-357	24
2024	357	700	0	5	0	0	0	25	357	900	0	0	0	0	0	0	25
2025	0	0	300	105	0	20	-308	27	0	0	400	205	0	0	0	-308	27
2026	0	0	215	0	500	0	0	28	0	0	515	305	0	500	0	0	28
2027	0	0	250	5	0	0	0	27	0	0	250	105	0	GW1	0	-175	27
2028	0	0	120	55	0	0	-175	27	0	200	320	205	0	0	20	0	27
2029	0	0	100	255	0	0	0	26	0	100	0	50	0	0	0	0	26
2030	0	0	0	55	0	0	0	24	-45	100	0	55	0	GW2	0	0	24
2031	0	0	0	55	0	0	0	24	-45	0	0	55	77	0	0	0	24
2032	0	0	0	55	0	0	0	23	-164	0	0	55	0	0	0	0	23
2033	0	0	0	100	0	0	0	22	-171	0	0	105	154	0	0	0	22
2034	-357	0	100	150	0	0	0	21	-693	0	100	155	154	0	0	0	21
2035	0	0	100	305	0	0	0	20	0	0	100	300	308	0	0	0	20
2036	0	0	0	55	0	0	0	16	0	0	0	55	0	0	20	0	16
2037	0	0	0	105	0	0	0	14	0	0	0	100	0	0	0	0	20
2038	0	0	100	155	0	20	0	12	0	0	0	150	0	0	20	0	18
2039	0	0	0	55	0	20	0	14	0	0	0	50	0	0	40	0	14
2040	0	0	0	55	0	20	0	19	0	0	0	50	0	0	20	0	19
Subtotal	0	700	1,405	1,685	500	400	-841	440	-762	1,300	1,805	2,115	693	500	440	-841	451
Total	**4,289**								**5,702**								

100% Clean by 2045

Idaho Power set a goal to provide 100% clean energy by 2045. A comparison of resources selected in the Preferred Portfolio compared to the resource selection that adheres to emission constraints that linearly lead to the goal is shown below. The path to clean energy may not be linear and these assumptions were made to create a comparison scenario.

Because of the linear emission constraints imposed on the model in this scenario, additional solar is added early in the plan (compare solar in year 2025). The additional infusion of solar allows for an exit of Valmy Unit 2 one year earlier. This early increase in the quantity of solar ultimately requires an increase in access to renewables through the Gateway West transmission line.

Because existing natural gas generation resources are decreasingly utilized in the 100% Clean by 2045 scenario, approximately 400 MW of additional clean energy resources are selected (see the *Wind*, *Solar*, and *Storage* columns). While the more rapid replacement of carbon-emitting resources with flexible clean resources is not cost effective based on resource pricing forecasts produced today, it is the company's position that advances in technology will enable the cost-effective transition to meet this goal.

Achieving an earlier clean energy date includes the early addition of wind, solar, and storage, and the addition of nuclear as a flexible clean energy source later in the plan.

Table 11.6 Preferred Portfolio and 100% Clean by 2045 scenario comparison

	Preferred Portfolio (MW)								100% Clean By 2045 (MW)							
Year	Gas	Wind	Solar	Storage	Trans.	DR	Exits	EE	Gas	Wind	Solar	Storage	Trans.	DR	Exits	EE
2021	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	23
2022	0	0	0	0	0	300	0	24	0	0	0	0	0	300	0	24
2023	0	0	120	115	0	20	-357	24	0	0	120	115	0	20	-357	24
2024	357	700	0	5	0	0	0	25	357	700	0	5	0	0	-134	25
2025	0	0	300	105	0	20	-308	27	0	0	900	200	0	0	-174	27
2026	0	0	215	0	500	0	0	28	0	0	215	0	500	0	0	28
2027	0	0	250	5	0	0	0	27	0	0	250	5	GW1	0	-175	27
2028	0	0	120	55	0	0	-175	27	0	0	220	105	0	0	0	27
2029	0	0	100	255	0	0	0	26	0	0	0	55	0	0	0	26
2030	0	0	0	55	0	0	0	24	0	0	100	105	0	0	0	24
2031	0	0	0	55	0	0	0	24	0	0	0	5	0	0	0	24
2032	0	0	0	55	0	0	0	23	0	0	0	55	0	20	0	23
2033	0	0	0	100	0	0	0	22	0	0	0	55	0	20	0	22
2034	-357	0	100	150	0	0	0	21	-357	0	0	155	0	20	0	21
2035	0	0	100	305	0	0	0	20	0	0	100	305	0	20	0	20
2036	0	0	0	55	0	0	0	16	0	0	0	55	0	20	0	16
2037	0	0	0	105	0	0	0	14	0	0	0	105	0	20	0	14
2038	0	0	100	155	0	20	0	12	0	0	0	155	0	20	0	12
2039	0	0	0	55	0	20	0	14	0	0	0	55	0	20	0	20
2040	0	0	0	55	0	20	0	19	0	0	0	55	0	20	0	19
Subtotal	0	700	1,405	1,685	500	400	-841	440	0	700	1,905	1,590	500	500	-841	446
Total	**4,289**								**4,800**							

CSPP Wind Renewal Low

The planning forecast for CSPP wind includes a renewal rate of 25% for contracts that will expire during the IRP timeframe. The CSPP Wind Renewal Low scenario assumes that none of the contracts renew. This increases the number or quantity of resources that must be acquired to meet increasing energy demand.

The focus of this comparison is on the Action Plan window (years 2021–2027) which holds very constant. The only identified difference is an additional 5 MW of storage in 2026. Later in the plan there are some bigger shifts as resources are selected to cover the loss of existing wind energy contracts. These shifts, first occurring in 2032, can be more effectively analyzed in later IRPs when more is known about whether the contracts will renew.

Table 11.7 Preferred Portfolio and CSPP Wind Renewal Low scenario comparison

	Preferred Portfolio (MW)								CSPP Wind Renewal Low (MW)							
Year	Gas	Wind	Solar	Storage	Trans.	DR	Exits	EE	Gas	Wind	Solar	Storage	Trans.	DR	Exits	EE
2021	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	23
2022	0	0	0	0	0	300	0	24	0	0	0	0	0	300	0	24
2023	0	0	120	115	0	20	-357	24	0	0	120	115	0	20	-357	24
2024	357	700	0	5	0	0	0	25	357	700	0	5	0	0	0	25
2025	0	0	300	105	0	20	-308	27	0	0	300	100	0	20	-308	27
2026	0	0	215	0	500	0	0	28	0	0	215	5	500	0	0	28
2027	0	0	250	5	0	0	0	27	0	0	250	5	0	0	0	27
2028	0	0	120	55	0	0	-175	27	0	0	120	55	0	0	-175	27
2029	0	0	100	255	0	0	0	26	0	0	100	250	0	0	0	26
2030	0	0	0	55	0	0	0	24	0	0	0	50	0	0	0	24
2031	0	0	0	55	0	0	0	24	0	0	100	105	0	0	0	24
2032	0	0	0	55	0	0	0	23	0	100	0	5	0	0	0	23
2033	0	0	0	100	0	0	0	22	0	0	0	105	0	0	0	22
2034	-357	0	100	150	0	0	0	21	-357	0	0	155	0	0	0	21
2035	0	0	100	305	0	0	0	20	0	0	100	305	0	20	0	20
2036	0	0	0	55	0	0	0	16	0	0	0	55	0	0	0	16
2037	0	0	0	105	0	0	0	14	0	0	0	105	0	0	0	14
2038	0	0	100	155	0	20	0	12	0	0	100	155	GW1	0	0	21
2039	0	0	0	55	0	20	0	14	0	100	0	55	0	0	0	11
2040	0	0	0	55	0	20	0	19	0	100	0	50	0	0	0	16
Subtotal	0	700	1,405	1,685	500	400	-841	440	0	1,000	1,405	1,680	500	360	-841	443
Total	**4,289**								**4,547**							

CSPP Wind Renewal High

The planning forecast for CSPP wind includes a renewal rate of 25% for contracts that are expiring during the IRP timeframe. The CSPP Wind Renewal High scenario assumes that all wind contracts renew. The resource composition is different as the model selected more renewables, especially in the final year of the plan, and less storage in this scenario.

The focus of this comparison is on the Action Plan window (years 2021–2027), which is very similar across the portfolios. Differences show up in small increments in storage (see years 2024 and 2027) and demand response (see years 2024 and 2025). Both shifts are viewed as inconsequential as they represent less than 1% of the identified resource changes in the Action Plan. Later in the plan there are some bigger shifts identified. There is a decrease in storage that is replaced primarily with additional wind and solar resources. These shifts, first occurring in 2028 and 2029, can be reviewed in later IRPs when more is known about whether the contracts will renew.

Table 11.8 Preferred Portfolio and CSPP Wind Renewal High scenario comparison

	Preferred Portfolio (MW)								High Wind Renewal (MW)							
Year	Gas	Wind	Solar	Storage	Trans.	DR	Exits	EE	Gas	Wind	Solar	Storage	Trans.	DR	Exits	EE
2021	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	23
2022	0	0	0	0	0	300	0	24	0	0	0	0	0	300	0	24
2023	0	0	120	115	0	20	-357	24	0	0	120	115	0	20	-357	24
2024	357	700	0	5	0	0	0	25	357	700	0	0	0	20	0	25
2025	0	0	300	105	0	20	-308	27	0	0	300	105	0	0	-308	27
2026	0	0	215	0	500	0	0	28	0	0	215	0	500	0	0	28
2027	0	0	250	5	0	0	0	27	0	0	250	0	0	0	0	27
2028	0	0	120	55	0	0	-175	27	0	0	120	100	0	0	-175	27
2029	0	0	100	255	0	0	0	26	0	0	0	200	0	0	0	26
2030	0	0	0	55	0	0	0	24	0	0	0	55	0	0	0	24
2031	0	0	0	55	0	0	0	24	0	100	0	50	0	0	0	24
2032	0	0	0	55	0	0	0	23	0	0	0	50	0	0	0	23
2033	0	0	0	100	0	0	0	22	0	0	0	50	0	0	0	22
2034	-357	0	100	150	0	0	0	21	-357	0	100	150	0	0	0	21
2035	0	0	100	305	0	0	0	20	0	100	100	300	0	0	0	20
2036	0	0	0	55	0	0	0	16	0	0	0	55	0	20	0	16
2037	0	0	0	105	0	0	0	14	0	0	0	105	0	0	0	14
2038	0	0	100	155	0	20	0	12	0	0	100	150	GW1	0	0	12
2039	0	0	0	55	0	20	0	14	0	0	0	50	0	0	0	11
2040	0	0	0	55	0	20	0	19	0	200	300	5	0	20	0	10
Subtotal	0	700	1,405	1,685	500	400	-841	440	0	1,100	1,605	1,540	500	380	-841	428
Total	**4,289**								**4,712**							

Action Plan (2021–2027)

The 2021 IRP Action Plan is the culmination of the IRP process distilled down into actionable near-term items. The items identify milestones to successfully position Idaho Power to provide reliable, affordable, clean energy to our customers into the future.

The included resources will increase reliability on Idaho Power's electrical system to handle high-temperature events and operational contingencies.

The Action Plan associated with the Preferred Portfolio is driven by its core resource actions through 2027. These core resource actions include:

- Cost-effective energy efficiency measures in every year (2021–2027)
- The existing demand response programs redesign (2022)
- 120 MW of added solar PV capacity (2023)
- 100 MW of 4-hour Li-ion storage (2023)
- Distributed storage in 5 MW increments, 15 MW added in 2023, and 5 MW added in 2024, 2025, and 2027 for a total of 30 MW in the four identified years (2023, 2024, 2025, 2027)
- Two 20-MW increases in demand response, totaling 40 MW (2023, 2025)
- The conversion of the Bridger Coal units 1 and 2 to natural gas generation (2024)
- 700 MW of added wind (2024)
- An exit from Valmy Unit 2 and Bridger Unit 3 (2025)
- 100 MW of solar plus storage (2025)
- Additional solar to support large load customer energy needs
- B2H online (2026)

Action Plan (2021–2027)

Table 11.9 Action Plan (2021–2027)

Year	Action
2022	Conduct ongoing B2H permitting activities. Negotiate and execute B2H partner construction agreements. Once the agreements are in place, file for a certificate of public convenience and necessity with state commissions.
2022	Discuss partnership opportunities related to SWIP-North with the project developer for more detailed evaluation in future IRPs.
2022–2023	Jackpot Solar is contracted to provide 120 MW starting December 2022. Work with the developer to determine, if necessary, mitigating measures if the project cannot meet the negotiated timeline.
2022–2024	Plan and coordinate with PacifiCorp and regulators for conversion to natural gas operation with a 2034 exit date for Bridger units 1 and 2. The conversion is targeted before the summer peak of 2024.
2022–2025	Issue a Request for Proposal (RFP) to procure resources to meet identified deficits in 2024 and 2025.
2022–2025	Plan and coordinate with PacifiCorp and regulators for the exit/closure of Bridger Unit 3 by year-end 2025 with Bridger Unit 4 following the Action Plan window in 2028.
2022–2025	Redesign existing DR programs then determine the amount of additional DR necessary to meet the identified need.
2022–2026	Conduct preliminary construction activities, acquire long-lead materials, and construct the B2H project.
2022–2027	Implement cost-effective energy efficiency measures each year as identified in the energy efficiency potential assessment.
2022–2027	Work with large-load customers to support their energy needs with solar resources.
2022–2027	Finalize candidate locations for distributed storage projects and implement where possible to defer T&D investments as identified in the Action Plan.
2025	Exit Valmy Unit 2 by December 31, 2025.
2025–2026	Subject to coordination with PacifiCorp, and B2H in-service prior to summer 2026, exit Bridger Unit 3 by December 31, 2025.

Resource Procurement

Idaho Power's capacity deficits identified for 2023, 2024, and 2025 described in previous sections of the IRP will require incremental generating capacity that exceeds the 80 MW applicability threshold for the OPUC's Resource Procurement Rules. To meet its resource needs in a timely manner and continue to provide reliable service, the company has requested relief[38] from the OPUC's Resource Procurement[39] requirements and for authorization to move forward with capacity resource procurements using an alternative acquisition method to meet the identified deficits in 2023, 2024, and 2025. The OPUC Resource Procurement Rules also contain an exception to their applicability based on the OPUC acknowledging an alternative acquisition method in the utility's IRP, which this section addresses.[40]

[38] In Idaho, IPC-E-21-41. In Oregon, UM 2210.

[39] The OPUC's Resource Procurement requirements are found in Division 89 of the Oregon Administration Rules.

[40] OAR 860-089-0100(3)(c).

Urgent Capacity Resource Need

Idaho Power's request for relief from resource procurement requirements is based on the company's rapid shift from resource sufficient to resource deficient—a change that came quickly and iteratively as the company received new information over the spring and summer of 2021. While Idaho Power's *Second Amended 2019 IRP* did not show a first capacity deficit until the summer of 2028, the 2021 IRP identifies capacity deficits beginning in 2023 and growing each year until 2026—when B2H is expected to be operational. Several factors have contributed to the notable change in the load and resource balance, including significant current third-party transmission constraints limiting wholesale market import purchases at peak, the ability of DR programs to meet peak load hours, planning margins and methodology modernization, and load growth exceeding previously forecasted expectations.

Changes in the Load and Resource Balance Since the 2019 IRP

Following development of the *Second Amended 2019 IRP*, the company conducted focused system reliability and economic analyses to assess the appropriate timing of a Valmy Unit 2 exit between 2022 and 2025. The result of the reliability and economic evaluations demonstrated that coal-fired operations Valmy Unit 2 through the end of 2025 is the most reliable and economic path forward.

The Valmy Unit 2 analysis, for reasons explained in further detail later, involved adjustment of the load and resource balance used in the *Second Amended 2019 IRP*. At this time, the 2021 IRP development was well underway, and the company updated the load and resource balance in the new IRP to include modifications to existing resource availability, as is standard when developing the load and resource balance as part of the IRP process. First, the company identified changes to its market purchase assumptions due to third-party transmission constraints. Additionally, the existing resource availability was revised to include updated thermal capacity and reduced DR capacity determined through the refinement of the planning margin calculation. The net change between the *Second Amended 2019 IRP* and the updated load and resource balance is a reduction of over 500 MW in available capacity each July during the 2022 through 2025 period. As a result of these changes known in May 2021, the company anticipated a capacity deficit of approximately 78 MW in 2023, assuming Valmy Unit 2 operations continue through 2025.

Detailed next are the factors leading to the initially identified capacity deficit of 78 MW in 2023.

Transmission Market Shifts and Constraints

In the *Second Amended 2019 IRP*, the company assumed Valmy Unit 2 could be replaced with capacity purchases from the south. However, market conditions have changed dramatically because of ripple effects stemming from the August 2020 energy emergency event in California. During this event, the west experienced a heat wave, increasing the demand for energy and causing several balancing authorities across the Western Interconnection to declare energy emergencies. Generation was insufficient to meet demand in California, and transmission capacity was strained, limiting the ability to import energy. As a result, CAISO was required to shed firm load to maintain the reliability and security of the bulk power system. Ultimately, the transmission constraints impacted Idaho Power's ability to use third-party transmission to import energy and meet load deficits.

Understanding the importance of transmission availability during times of high electricity demand, third-party marketing firms began reserving unprecedented amounts of firm transmission capacity just outside the border of Idaho Power's service area, significantly limiting the company's access to market hubs. Soon after the event, Idaho Power's own transmission service queue was flooded with multi-year requests totaling more than 1,000 MW, as of April 2021, looking to move energy from the Mid-C across Idaho Power's transmission system to the south.

While the company is able to reserve its own transmission for use by its customers, the transmission service requests just outside of Idaho Power's service area have added constraints to an already constrained market, limiting the company's access to capacity at Mid-C. Idaho Power tested the market availability with an RFP issued April 26, 2021, which ultimately validated the existence of these transmission system constraints. The RFP requested a market purchase with delivery at Idaho Power's border; however, no bids were received at any price point, further emphasizing the difficulty of importing energy under a constrained transmission system.

As a result of these recent and significant market changes, for the years 2023 through 2025, Idaho Power has reduced the transmission availability within the load and resource balance from approximately 900 MW in the 2019 IRP to approximately 700 MW in the 2021 IRP during the peak-load month of July.

Planning Margin Adjustments

As detailed in *Appendix C* of this report, Idaho Power modernized its planning margin approach and is using probabilistic methods (the "LOLE method") in the 2021 IRP to determine system needs and ensure reliability for all hours of the day on the company's system.

The LOLE method evaluates the capability of existing resources to meet peak demand through the determination of the ELCC. Use of the ELCC resulted in a change to the peak-serving capability of Idaho Power's existing resources, most notably the peak capacity contribution of DR. When analyzing the company's system on an hour-by-hour basis, the results indicate the ability of DR programs to meet peak-load hours under the changing dynamics of Idaho Power's system is significantly lower than previously assumed. This is primarily the result of increased solar resources on Idaho Power's system pushing net peak-load hours outside the current DR program window. The company has filed a request for modifications to its DR programs that, while making the programs more effective at meeting system needs, may result in lower DR participation.

Load Forecast Increases

Migration into Idaho Power's service area has exceeded forecasts, both during and after the recession; as customer additions were approximately 30% higher than prior expectations. In addition, several industrial customers, both existing and new, have made a sufficient and significant binding investment and/or interest indicating a commitment to locating or expanding operations in the company's service area. These drivers predict that Idaho Power's peak capacity by 2023 will grow faster than previously forecasted expectations.

Load and Resource Balance in the 2021 IRP

The load and resource balance used in the 2021 IRP (Table 10.7) incorporates the most up-to-date resource and load inputs. On the resource side, Idaho Power has applied the adjusted transmission assumptions, as well as the LOLE and ELCC methods described above. On the load side, Idaho Power has also included higher load growth expectations. The resulting capacity deficiency (approximately 101 MW in 2023, 186 MW in 2024, and 311 MW in 2025) clearly demonstrates the need for new capacity to meet those capacity deficits prior to the addition of B2H in 2026.

While these estimates reflect Idaho Power's best available information at the time of this IRP, the company's forecast capacity deficit beginning in 2023 could grow further. On November 9, 2021, the developers of Jackpot Solar informed Idaho Power that that global supply chain disruptions have raised concerns regarding Jackpot Solar's ability to achieve commercial operation by the dates identified in the approved agreement. If the Jackpot Solar project is delayed beyond summer 2023, or not built, Idaho Power will need approximately 40 MW of incremental peak capacity to meet projected customer demands.

2021 RFP

In order to meet its obligation to reliably serve customer load, and given the extremely short turnaround to construct a resource to meet deficits identified in 2023, 2024, and 2025, the company is currently conducting a competitive solicitation through an RFP seeking to acquire up to 80 MW of wind, solar, and storage combinations to meet the initially identified 78-MW capacity deficit in 2023.[41] The 2021 RFP seeks projects that can achieve commercial operation by June of 2023.

[41] The Oregon Procurement Rules do not apply to resources below 80 MW.

In the Spring of 2021, recognizing the urgency of the capacity deficit, the company assembled an interdisciplinary team to develop and process an RFP for 2023 peak capacity resources (RFP evaluation team). Idaho Power also retained a consultant, Black & Veatch Management Consulting, LLC, to assist the RFP evaluation team with development of the RFP and to provide guidance and evaluation support of the company's RFP process. The RFP evaluation team developed detailed criteria and a methodology for evaluating both price and qualitative attributes of a proposed resource. On June 30, 2021, the RFP evaluation team issued a formal request for competitive proposals for up to 80 MW of electric generating capacity.

A public Notice of Intent was released on May 20, 2021, to industry developers and media outlets and was posted to Idaho Power's website noticing Idaho Power's intent to release the RFP. Interested developers responded with an Intent to Bid by June 11, 2021. The "2021 All Source Request for Proposals for Peak Capacity Resources" was issued June 30, 2021, and solicited directly to the 38 developers who responded to the Intent to Bid. The RFP solicitation identified the purpose, key product specifications, proposal format, qualitative and quantitative evaluation criteria, template draft form term sheet, technical specifications, and additional requirements necessary to submit a qualifying proposal. The RFP solicitation also focused on the importance of having a project in service by June 2023. Thirteen proposals were submitted by third-party developers on August 11, 2021. The RFP evaluation process assesses both price and non-price attributes. Price attributes were weighted at 60% of the total valuation and non-price attributes were given a 40% weighting.

Once a winning bidder is selected and contractual documents are executed, the company, as it has done in the past, will bring the proposed generation acquisition to the IPUC for review in a Certificate of Public Convenience and Necessity (CPCN) proceeding to establish both the need and expected cost of the procurement. The required Idaho CPCN process, as well as the subsequent rate-making proceedings in both Idaho and Oregon, will provide considerable oversight of the procurement process, and ensure low-cost, reliable resource acquisitions for customers—as Idaho Power has done for the company's more than 100-year history.

Because the 2021 RFP seeks resources that are not more than 80 MW, the RFP is not subject to the Oregon Resource Procurement rules.[42] Idaho Power is also, in parallel, investigating different configurations of company-owned and constructed battery storage systems, modifications to existing DR programs, and pursuing other short-term market solutions to meet the forecasted capacity deficits. However, these efforts will not be enough to meet the rapidly evolving and dynamic forecasted capacity deficits. Indeed, since issuing the 2021 RFP earlier

[42] OAR 860-089-0100(1)(a)

this year, the expected capacity deficit for 2023 has increased from 78 MW to 101 MW—the number that is now included in the 2021 IRP.

2022 All Source RFP

Given the revised load and resource balance that is used in the 2021 IRP, Idaho Power will be issuing another RFP seeking generation resources to meet the additional capacity deficits identified for 2024 and 2025. The proposed acquisitions are necessary and required in a dynamic energy landscape in order to continue to provide reliable and adequate electric service to Idaho Power's customers starting in the summer of 2024 and into the future. There is insufficient time to complete a procurement process contemplated by the Oregon Resource Procurement process that will meet the identified deficits in 2024 and 2025.
Although Idaho Power has requested a waiver of the OPUC's competitive billing rules to allow the company to conduct a more expedited process, the proposed RFP will be conducted in substantially the same manner as that used for the 2021 RFP and will result in a fair, objective, and transparent procurement process.

Alternative Acquisition Method

Idaho Power will conduct an RFP to obtain competitive pricing and identify the best resource(s) to ensure adequate, reliable, and fair-priced service to its customers. To provide an opportunity for contemporaneous oversight of the upcoming RFP, the company also proposes to submit a filing at the conclusion of the RFP that will allow the IPUC, OPUC, and stakeholders to review the procurement process and results. Idaho Power's proposed filing in Oregon would be akin to the CPCN process that will be used in Idaho[43] to authorize the company to move forward with the acquisition of the resource(s) selected in the RFP. The company's filing would present the results of the RFP to the commissions for independent evaluation and request acknowledgment of the selected resource(s).

Idaho Power's proposal recognizes the value of commission and stakeholder participation in and review of the company's procurement process but will not compromise the expedited timeline required to ensure that the resource(s) selected in the RFP will be in-service and capable of meeting Idaho Power's resource needs beginning in 2023.

[43] Notably, the state of Oregon does not have a corresponding requirement for the issuance of a CPCN for supply-side or generation resources like Idaho. *Idaho Code* § 61-526.

Conclusion


Idaho Power linemen install upgrades.

The 2021 IRP provides guidance for Idaho Power as its portfolio of resources evolves over the coming years. The B2H transmission line continues in the 2021 IRP analysis to be a top performing resource alternative, providing Idaho Power access to affordable and clean energy in the Pacific Northwest wholesale electric market. From a regional perspective, the B2H transmission line, and high-voltage transmission in general, is critical to achieving cost-effective clean energy objectives, including Idaho Power's goal of 100% clean energy by 2045.

The cost competitiveness of wind, PV solar, and storage is another notable theme of the 2021 IRP. The Preferred Portfolio for the 2021 IRP includes a total of 700 MW of wind, 1,405 MW of solar, and 1,685 MW of storage. Idaho Power's IRP analysis indicates these resources allow access to cost-competitive energy and further positions the company well to achieve its long-term clean energy goals.

The 2021 IRP indicates favorable economics associated with the conversion of Bridger Coal units 1 and 2 from coal to natural gas operation, as well as the exit from two of the remaining three coal generating units by the end of 2025. The exit from the remaining unit at the Jim Bridger facility was determined to be economical and achievable by the end of 2028. This strategy is consistent with Idaho Power's long-term clean energy goals and transition from coal generation. The B2H transmission line is critical to enabling the exit from coal generation.

Idaho Power has an important obligation to deliver reliable and affordable electricity to customers, which cannot be compromised as it strives to achieve its clean energy goals. That obligation also underscores the need to continue to evaluate coal units' value in providing flexible capacity necessary to successfully integrate high penetration of VERs. Furthermore, the company recognizes the evaluation of flexible capacity, and the possibility of flexibility deficiencies arising because of coal-unit exits, may require the Preferred Portfolio's flexible capacity resources to be online sooner than planned.

Idaho Power strongly values public involvement in the planning process and thanks the IRPAC members and the public for their contributions throughout the 2021 IRP process. The IRPAC discussed many technical aspects of the 2021 resource plan, along with a significant number of political and societal topics at the meetings. Idaho Power's resource plan is better because of the contributions from IRPAC members and the public.

Idaho Power prepares an IRP every two years. The next plan will be filed in 2023. The energy industry is expected to continue undergoing substantial transformation over the coming years, and new challenges and questions will be encountered in the 2023 IRP. Idaho Power will continue to monitor trends in the energy industry and adjust as necessary.

BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON

Docket PCN 5

In the Matter of

IDAHO POWER COMPANY'S
PETITION FOR CERTIFICATE OF PUBLIC CONVENIENCE
AND NECESSITY

Attachment 15

B2H Phase 2 Study Report – WECC Rating Process

September 30, 2022

IDAHO POWER
An IDACORP Company

Idaho – Northwest Up-rate

Hemingway – Boardman 500 kV Transmission Project

Project Review Group Phase II Rating Report

Submitted to:

The Hemingway – Boardman 500 kV Transmission Project Review Group

Submitted by:

Idaho Power Company

August 21, 2012

Table of Contents

1. Executive Summary

This document is written following the methodology established in the WECC Overview of Policies and Procedures for Project Coordination Review, Project Rating Review, and Progress Reports.

The Hemingway – Boardman 500 kV project is a 300 mile, 500 kV transmission line from Hemingway substation, to a new substation in north-central Oregon. The northwest terminus options are: (1) the Grassland 500 kV substation, or (2) the Longhorn 500 kV substation.

The Hemingway – Boardman 500 kV transmission project will be treated as an addition to the Idaho – Northwest (Path 14) WECC rated path. Idaho Power is requesting an increase to the Idaho – Northwest Path 14 WECC Accepted Rating upon completion of the Hemingway-Boardman 500 kV transmission project. Below are the proposed ratings in the west-to-east direction and the east-to-west direction:

Table 1: Proposed ratings for Idaho-Northwest (Path 14) and Hemingway-Boardman 500 kV

WECC Path Name	Proposed Rating West-to-East	Proposed Rating East-to-West
Idaho-Northwest (Path 14)	2250	3400

In order to prove the proposed ratings are acceptable, this report studied Idaho-Northwest (Path 14) at its proposed ratings simultaneous with other relevant similarly situated Phase 2 projects, Phase 3 projects, and existing WECC rated paths at their proposed ratings. The following simultaneous interaction studies have been completed:

Table 2: Simultaneous Interaction Studies Completed

		Simultaneous Path		
Idaho-Northwest (Path 14)	Hemingway-Boardman 500 kV	Path Name	Path #	Simultaneous Path Flow
W-E, 2250 MW	W-E, 1407 MW	COI, N-S	66	4800 MW
W-E, 2250 MW	W-E, 1407 MW	Idaho-Sierra, N-S	16	500 MW
W-E, 2250 MW	W-E, 1407 MW	Montana-Idaho, N-S	18	337 MW
W-E, 2250 MW	W-E, 1407 MW	Montana Southeast, N-S	80	660 MW
W-E, 2250 MW	W-E, 1407 MW	North of John Day	73	7800 MW
W-E, 2250 MW	W-E, 1407 MW	PDCI, N-S	65	3100 MW
W-E, 2250 MW	W-E, 1301 MW	West of Hatwai	6	3400 MW
W-E, 2250 MW	W-E, 1407 MW	MSTI & SWIP, N-S	II-5, II-11	1500 MW, 1950 MW
E-W. 3400 MW	E-W, 1284 MW	Alturas Project, S-N	76	300 MW
E-W. 3400 MW	E-W, 1111 MW	Idaho-Sierra, N-S	16	500 MW
E-W. 3400 MW	E-W, 1284 MW	Montana-Idaho. S-N	18	256 MW
E-W. 3400 MW	E-W, 1284 MW	Montana-Northwest, E-W	8	2200 MW
E-W. 3400 MW	E-W, 1284 MW	Montana Southeast, S-N	80	600 MW
E-W. 3400 MW	E-W, 1284 MW	PG&E-Sierra, E-W	24	150 MW
E-W. 3400 MW	E-W, 1284 MW	TOT 2B1, N-S	78	560 MW
E-W. 3400 MW	E-W, 1284 MW	TOT 2C, N-S	35	600 MW

In addition to simultaneous interaction studies, several sensitivity studies were completed. These sensitivity studies are listed below:

Table 3: Sensitivity Studies Completed in Phase II

Idaho-Northwest (Path 14)	Hemingway-Boardman 500 kV	Sensitivity Name
W-E, 2250 MW	W-E, 1323 MW	Hemingway-Boardman Stand Alone
W-E, 2250 MW	W-E, 1374 MW	Walla Walla Area, 100 % Wind
W-E, 2250 MW	W-E, 1449 MW	High West of McNary & West of Slatt
W-E, 2250 MW	W-E, 1418 MW	Longhorn Terminus
W-E, 2250 MW	W-E, 1390 MW	NV Energy Updates

The simultaneous interaction studies prove that the Idaho-Northwest path does not have an interaction with any other studied paths. The sensitivity studies prove that the Idaho-Northwest path can be operated to its proposed rating regardless of the system configuration or northwestern terminus.

Additional information about the Idaho-Northwest Up-rate, Hemingway-Boardman 500 kV Transmission Project, and the study results are documented in the sections that follow.

2. Introduction

2.1 Project Description

The Hemingway-Boardman 500 kV Transmission Project website is:

http://www.boardmantohemingway.com/

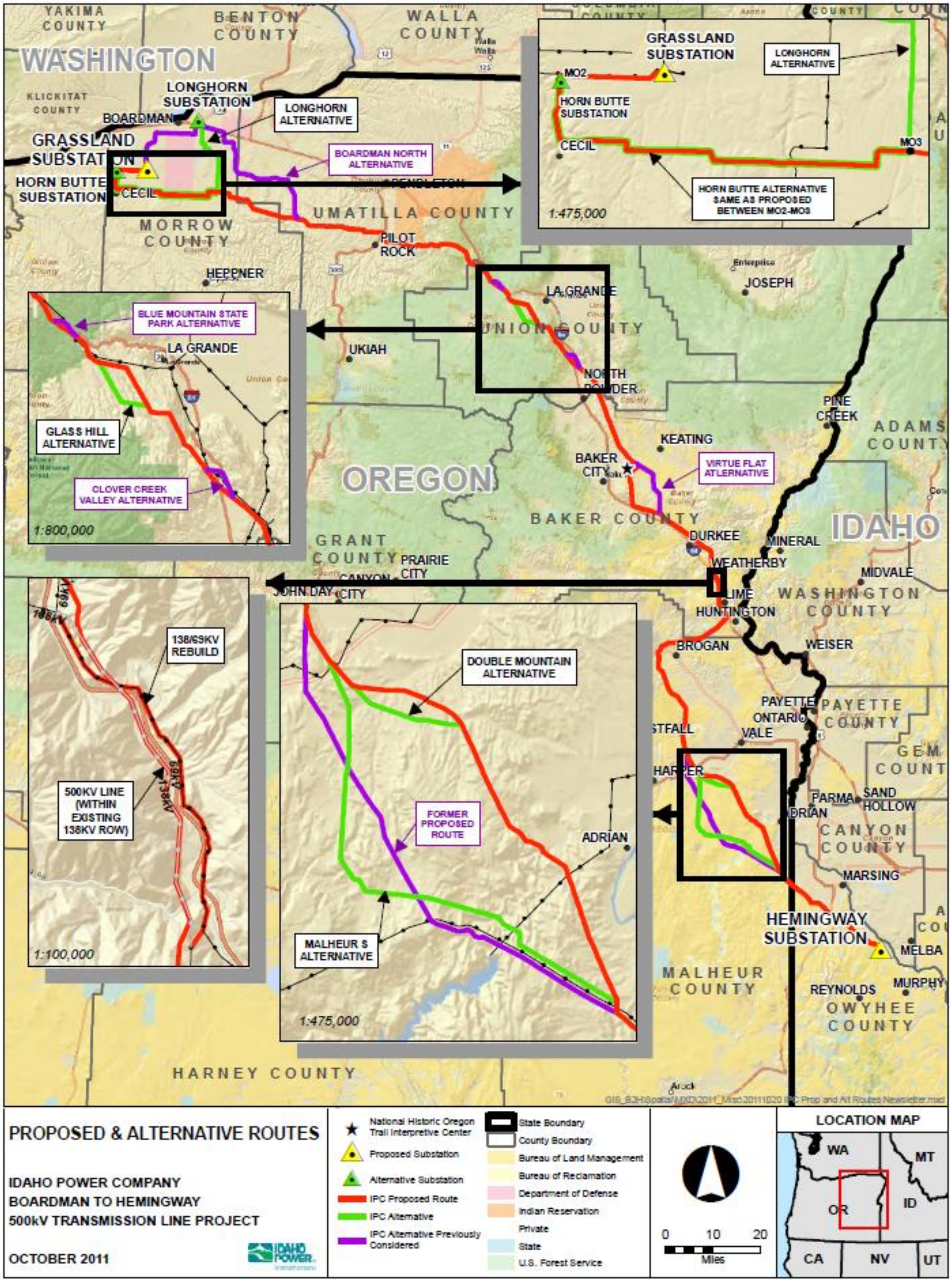
The project website has a great deal of information including a Project Overview, an "About the Project" page, and maps showing the proposed route of the Hemingway-Boardman 500 kV transmission line.

The Hemingway station is the southwestern Idaho transmission hub of the Gateway West Project and will be integrated into the Boise area 230 kV transmission system, as described in the Treasure Valley Electric Plan. Idaho Power's partial ownership of the Boardman Power Plant, access to other Northwest resources, the coordination of northwest transmission projects, and the potential to combine multiple transmission needs into one project compelled Idaho Power to choose the Boardman area for the Oregon termination.

The Hemingway – Boardman 500 kV project is a 300 mile, 500 kV transmission line from Hemingway substation, to a new substation in north-central Oregon. The northwest terminus options are: (1) the Grassland 500 kV substation, or (2) the Longhorn 500 kV substation.

See Figure 1, on the following page, for a map showing proposed and alternate routes for the Hemingway-Boardman 500 kV transmission line.

Figure 1: Proposed & Alternate Routes for the Hemingway-Boardman 500 kV Transmission Project



2.2 Project Background

The Hemingway-Boardman 500 kV project achieved Phase II status in March 2009. The Phase I Comprehensive Progress Report demonstrated the ratings indicated in the table below.

Table 4: Phase I Ratings for Hemingway-Boardman 500 kV project

Hemingway-Boardman	Idaho-Northwest	Notes
1300 MW west-to-east	2050 MW west-to-east	without Gateway West
800 MW east-to-west	2600 MW east-to-west	without Gateway West
1400 MW east-to-west	3600 MW east-to-west	with Gateway West

The Phase I Comprehensive Progress Report focused on a solo-rating for the Hemingway-Boardman 500 kV Transmission Project. Recently, WECC revised the Overview of Policies and Procedures for Project Coordination Review, Project Rating Review, and Progress Reports to include a section on determining whether a new line is a subset of an existing path. Inserting the Hemingway-Boardman 500 kV line into a case with Idaho-Northwest stressed to its current 1200 MW rating resulted in ~70% of the Idaho-Northwest flow to shift over to the Hemingway-Boardman 500 kV line. This is an overwhelming indication that the Hemingway-Boardman 500 kV line should be added to the Idaho-Northwest path.

2.3 Transfer Capability & Report Objective

The Hemingway – Boardman 500 kV transmission project will be treated as an addition to the Idaho – Northwest (Path 14) WECC rated path. Idaho Power is requesting an increase to the Idaho – Northwest Path 14 WECC Accepted Rating upon completion of the Hemingway-Boardman 500 kV transmission project. Below are the requested ratings:

Table 5: Proposed ratings for Idaho-Northwest (Path 14) and Hemingway-Boardman 500 kV

	Rating West-to-East	Rating East-to-West
Idaho-Northwest (Path 14)	2250	3400

The objective of this Phase II study of the WECC 3-Phase Rating process is to: (1) Propose and confirm a 2250 MW west-to-east rating for the Idaho – Northwest (Path 14) including the Hemingway-Boardman 500 kV Transmission Project, and (2) Confirm the 3400 MW east-to-west rating for the Idaho – Northwest (Path 14) including the Hemingway-Boardman 500 kV Transmission Project. In order to confirm the 2250 MW west-to-east rating and the 3400 MW east-to-west rating, the Idaho-Northwest path was studied at its proposed rating, simultaneous with other paths that may be impacted at their proposed rating (Simultaneous Interaction Studies). Additionally, sensitivity cases were studied to ensure that Idaho-Northwest can be operated to 2250 MW west-to-east regardless of the system configuration or northwestern terminus. Table 2, in the Executive Summary, has a list of simultaneous interaction studies. Table 3, in the Executive Summary, has a list of sensitivity studies.

2.4 Plan of Service

The following is a list of system additions corresponding with the Hemingway-Boardman 500 kV project.

Hemingway – Boardman 500 kV Transmission Project

- 300 mile 500 kV series compensated (~50%) transmission line

Hemingway Substation 500 kV equipment (approximate)

- Two 120 MVAR Shunt Line Reactors on the Hemingway – Boardman 500 kV line
  - One Fixed (includes neutral reactor for single-pole switching)
  - One Switchable
- One 200 MVAr Shunt Capacitor (in addition to the existing 200 MVAr shunt capacitor)
- Series compensation for ~25% of the line reactance between Hemingway and Boardman

Boardman Area Substation 500 kV equipment

- One 150 MVAr shunt capacitor
- Two 120 MVAR Shunt Line Reactors on the Hemingway – Boardman 500 kV line
  - One Fixed (includes neutral reactor for single-pole switching)
  - One Switchable
- Series compensation for ~25% of the line reactance between Hemingway and Boardman

Peterson Substation

- One 31.7 MVAr 230 kV shunt capacitor

The following is a list of the projects added to each of the study cases, unless otherwise noted. These projects are not required to achieve the proposed ratings, with one exception, noted below.

Projects added to the base case:

- Stage One of Gateway West
  - New series compensated 500 kV line from Aeolus to Anticline to Populus
  - New series compensated 500 kV line from Populus to Cedar Hill to Hemingway
    - *Line required to achieve the Idaho-Northwest east-to-west proposed rating*
  - Convert Kinport-Midpoint 345 kV to Kinport-Borah 345 kV & Borah-Midpoint 500 kV
  - New 1500 MVA 500/345 kV transformer at Borah substation
- Bonneville Power Administration's Big Eddy-Knight 500 kV Project
- Cascade Crossings Transmission Project (single circuit)
- McNary-Wallula 230 kV line
- McNary-John Day 500 kV line
- Central Ferry Additions including the Central Ferry-Lower Monumental 500 kV line
- Southwest Intertie Project-South (SWIP South)
- Longhorn Substation & Associated Wind

Hemingway substation is set up to eventually be in a breaker-and-a-half configuration after the addition of more 500 kV lines into the station. Figure 2 depicts how Hemingway substation will look after the addition of the Hemingway-Boardman 500 kV line. Figure 3 depicts how Hemingway substation will look after the addition of the Hemingway-Boardman and Populus-Cedar Hill-Hemingway 500 kV lines.

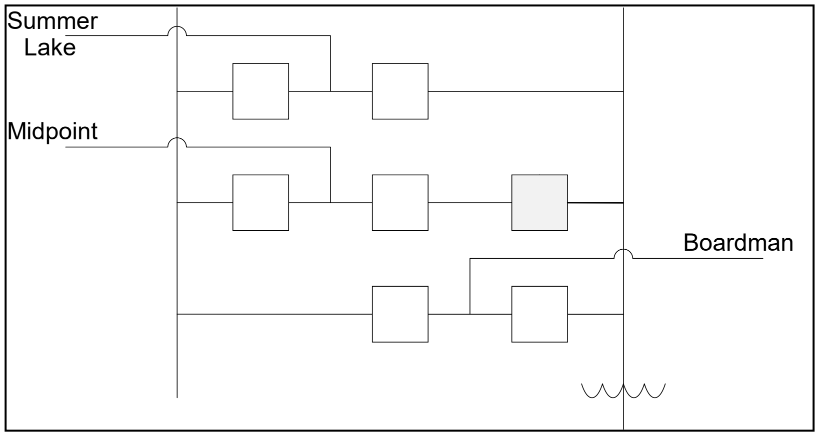


Figure 2: Hemingway 500 kV bus after the Hemingway-Boardman 500 kV line

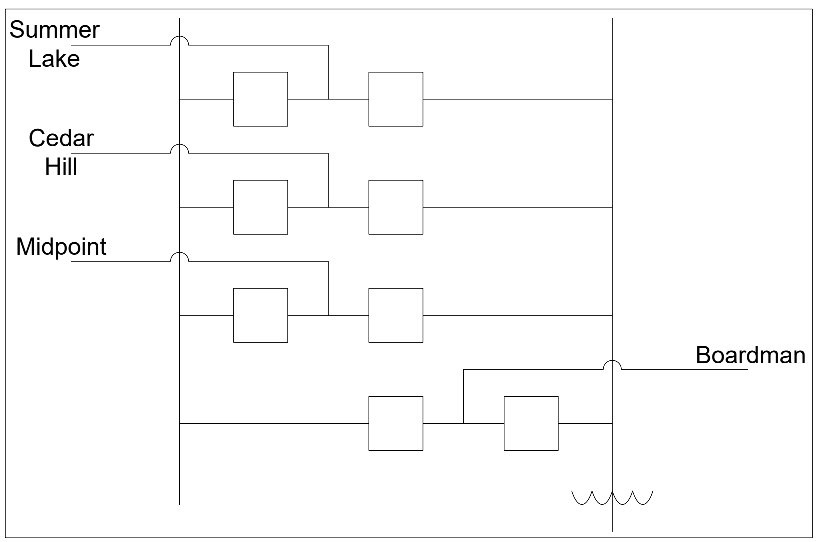


Figure 3: Hemingway 500 kV bus after Hemingway-Boardman & Cedar Hill-Hemingway 500 kV lines

In Figure 2, there is an extra breaker represented (slightly grayed) on the 500 kV rung next to the Midpoint 500 kV line terminal. This breaker is included in the plan of service because a breaker failure that results in the loss of the Midpoint 500 kV line and the Hemingway 500/230 kV transformer is unacceptable prior to the addition of Gateway West. Figure 3 does not depict this breaker after the addition of the Populus-Cedar Hill-Hemingway 500 kV line; a breaker failure that results in the loss of the Midpoint 500 kV line, and the Hemingway 500/230 kV transformer is acceptable, post-Gateway West.

2.5 Planned Operating Date

The Hemingway-Boardman 500 kV Transmission Project's expected in-service date is subject to siting, permitting, regulatory approvals, in-service date requirements of the parties electing to construct the line, the terms of any resulting joint construction agreements, and other conditions. Based on Idaho Power's assessment of those and other factors, as of the date of this report Idaho Power estimates that a project in-service date prior to 2018 is unlikely.

3. Study Methods & Standards

3.1 Steady State Case Stressing

In order to study the Hemingway-Boardman 500 kV Transmission Project and the new Idaho-Northwest path, two WECC base cases were modified to: (1) stress Idaho-Northwest to 2250 MW in the west-to-east direction, and (2) stress Idaho-Northwest to 3400 MW in the east-to-west direction. These cases were then further modified to stress additional paths to study potential simultaneous interactions with the Idaho-Northwest path. Details of how each study base case was developed can be found in the 'Steady State Case Stressing' section of each simultaneous interaction study.

3.2 Post-Transient

The power flow conditions generated above are modeled with single line (N-1) outages, credible double line (N-2) outages, and breaker failure outages to evaluate the NERC/WECC category B, C, and D performance. All modeled system bus voltages and line, transformer, and series capacitor current flows are monitored. Voltage deviations greater than 5% and significant overloaded elements are documented in the appendices associated with each study case.

Post-transient solution assumptions:

a. Generator Voltage Control was set to control the generator terminal busses.
b. Switched VAr Devices set to Disabled except:
    - Bridger 500 kV
    - Keeler 230 kV SVC
    - Maple Valley 230 kV SVC
    - Select SVD or Remedial Action Scheme devices detailed on a case-by-case basis
c. Transformer LTCs locked except:
    - Intermountain 345/230 kV
d. Phase Shifter Control: Disabled.
e. Area Interchange: Disabled.
f. Governor Blocking: Baseload Flag was used.

3.3 Voltage Stability

This study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis). PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. VQ Analysis determines the reactive power margin, following a contingency, at a specific electrical bus on the power system.

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses.

3.4 Transient Stability

Utilizing GE PSLF software, select single line (N-1), double line (N-2) and other outages were studied to evaluate transient stability performance. Relevant bus voltage and violations of the NERC/WECC allowed performance are documented in the appendices associated with each study case.

3.5 Remedial Action Schemes

Consistent with the NERC/WECC standards and WECC criteria, both Category B (single line events) and Category C (double line events including those double line events triggered by a breaker failure) outages are considered. Remedial actions associated with these outages were implemented with guidance from the study group. A list of outages and their associated remedial action schemes are documented in the appendices associated with each study case.

4. Idaho-Northwest, West-to-East Studies

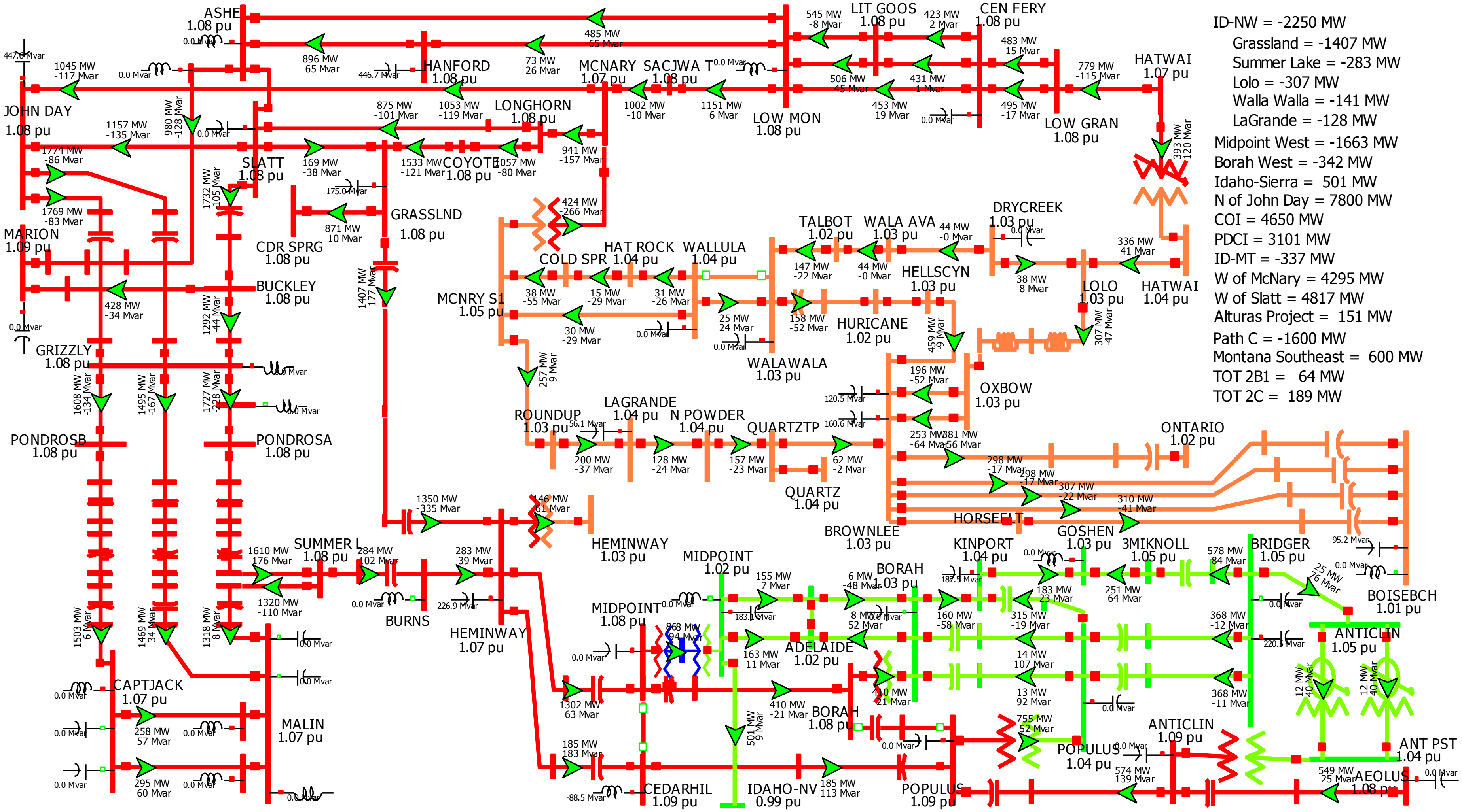


Figure 4: Idaho-Northwest (Path 14) 2250 MW, West to East, Base Case

4.1 Idaho – Northwest, West-to-East (Path 14) Base Case

4.1.1 Background

This is the main base case associated with the study of Idaho-Northwest in the west-to-east direction. In this case, Idaho-Northwest is stressed to its proposed 2250 MW west-to-east limit simultaneous with COI+NW-Sierra at its 4800 MW north-to-south limit, Idaho-Sierra at its 500 MW north-to-south limit, Montana-Idaho at its 337 MW north-to-south limit, Montana Southeast at its 600 MW north-to-south limit, North of John Day at its 7800 MW north-to-south limit, and PDCI at its 3100 MW north-to-south limit.

After completing the majority of the study work, including PV Analysis, QV Analysis, and Transient Stability analysis, a few modeling errors were discovered in this base case on the NV Energy system. A sensitivity case, with these errors corrected is documented in Section 4.14. These modeling errors were slight and made little to no difference on the results of the case.

4.1.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case names for these studies are: 16hs2a_2250idnw_N & 16hs2a_1200idnw_N.

Step-by-step development of the 16hs2a_2250idnw_N base case:

Step 1: Add the transmission facilities described in the Plan of Service (Section 2.4).

> The 16hs2a_2250idnw_N base case includes all of the additions described in Section 2.4.

Step 2: Adjust the COI (Path 66) and PDCI (Path 65) to flow at 4800 MW & 3100 MW, respectively.

> In the original 16hs2a base case downloaded from the WECC.biz website, flows on the COI & PDCI are approximately 3300 MW north-to-south and 2800 MW north-to-south, respectively. In order to increase COI to 4800 MW, and PDCI to 3100 MW, Northwest generation was increased and California generation was reduced. The Northwest hydro system was modified to match the 2011 NOPSG summer case created by BPA. Any additional generation required out of the Northwest came from northwest wind generation or northwest thermal plants. The California Operating Studies Subcommittee (OSS) Handbook was utilized to model the Northern California hydro system.

Step 3: Stress the Idaho-Northwest path to 2250 MW in the west-to-east direction.

The Idaho-Northwest path was stressed to 2250 MW in the west-to-east direction by reducing PacifiCorp East (PACE) and Idaho Power generation and replacing the generation with a schedule from the Northwest. Generation adjustments in the Northwest were limited to northwest wind generation or northwest thermal plants. The hydro system, adjusted in Step 2, was not modified.

Step 4: Stress simultaneous interaction study paths.

The following seven paths were stressed to their transfer limit in the 16hs2a_2250idnw_N base case simultaneous with Idaho-Northwest at 2250 MW west-to-east:

1) **COI (Path 66)+Alturas Project (Path76)** – Adjusted to the 4800 MW north-to-south limit in Step 2 (4650 MW on COI & 150 MW on Alturas).
2) **Idaho-Sierra (Path 16)** – Adjusted to the 500 MW north-to-south limit by reducing generation in Sierra, and increasing generation in Idaho.
3) **Montana-Idaho (Path 18**) – Adjusted to the 337 MW north-to-south limit utilizing the Mill Creek 230 kV phase shifter and the Jefferson 161 kV phase shifter.
4) **Montana Southeast (Path 80)** – Adjusted to 600 MW north-to-south limit by reducing generation at Yellowtail, and adjusting the Billings 230 kV, Rimrock 161 kV, and Crossover 230 kV phase shifters. Miles City DC was adjusted to be a sink, rather than a source.
5) **North of John Day (Path 73)** – Adjusted to 7800 MW north-to-south to match the current North of John Day/COI/PDCI nomogram.
6) **PDCI (Path 65)** – Adjusted to 3100 MW north-to-south.

Step 5: Adjusted other paths of concern.

Path C (Path 20) was stressed to 1600 MW north-to-south and Northern-Southern California (Path 26) was stressed to its 4000 MW north-to-south rating. Path C is not a potential simultaneous interaction, because loss of Hemingway-Boardman 500 kV acts to reduce the flow on Path C. Northern-Southern California is not a potential simultaneous interaction because loss of Hemingway-Boardman 500 kV only increases the path flow by approximately four percent. Although not a concern, these two paths are being studied in a simultaneous manner with Idaho-Northwest.

Step-by-step development of the 16hs2a_1200idnw_N case ("System Today" case):

This case was developed as a comparison/benchmark case to the 16hs2a_2250idnw_N base case for post-transient analysis. The 16hs2a_1200idnw_N base case is meant to represent the system as it is today, with 2016 loads and heavy west-to-east flow on the Idaho-Northwest path. Hemingway-Boardman, Gateway West, Cascade Crossing, and the Longhorn projects are not modeled in this base case.

Step 1: Begin with the 16hs2a_2250idnw_N base case.

Utilize the base case developed earlier in this section of the report.

Step 2: Remove elements from the base case to create a "System Today" case

Remove the following elements from the 16hs2a_2250idnw_N case: (1) Hemingway-Boardman 500 kV, (2) Stage One of Gateway West, (3) Cascade Crossing, and (4) the Longhorn substation & associated wind projects.

Step 3: Reduce Idaho-Northwest transfers to 1200 MW west-to-east.

This is best accomplished by reducing Northwest generation and increasing Idaho area generation. By removing Longhorn, and the associated wind generation, Northwest generation was already reduced significantly. To replace Northwest generation, Idaho area peaking generation was switched in-service and scheduled to the Northwest.

Step 4: Re-stress adjacent paths

COI (Path 66) plus the Alturas Project (Path 76) was stressed to 4800 MW north-to-south (4650 COI, 150 Alturas), North of John Day (Path 73) was stressed to 7800 MW north-to-south to match the current North of John Day/COI/PDCI nomogram, PDCI (Path 65) was stressed to 3100 MW north-to-south and Montana-Idaho was stressed to the 337 MW north-to-south limit.

4.1.3 Post Transient Results

Post-transient contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

This is the limiting contingency for the Idaho-Northwest path in the west-to-east direction. This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 112% of its 1237 Amp nominal rating (99.6% of its 1396 Amp emergency rating). Since the overload is less than the Brownlee-Hells Canyon 230 kV line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 6: Post-transient results – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	112% (1237 Amp Rating)	99.6% (1396 Amp Rating)
Oxbow – Lolo 230 kV	112% (920 Amp SOL)	98% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	101% (800 Amp Rating)	67% (1200 Amp Rating)

A breaker failure at Hemingway significantly stresses the Brownlee-Hells Canyon and Oxbow-Lolo 230 kV lines. Section 2.4 considers different Hemingway 500 kV substation configurations to avoid severe breaker failures, however, at this time this breaker failure is considered to be credible.

In reality, with high north-to-south loading on the COI, loss of Hemingway-Boardman 500 kV depresses the voltage at Malin to a value less than 1.05 pu, resulting in FACRI insertion of the Fort Rock series capacitors. The results above do not include the operation of the FACRI, as a conservative planning assumption. The Fort Rock series capacitors are located in the 500 kV lines south of Grizzly.

Severe Post-Transient Contingency #2-BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kV

The contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 112% of its nominal rating (99.3% of emergency). Since the overload is less than the Brownlee-Hells Canyon 230 kV line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 7: Post-transient results – BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kV

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	112% (1237 Amp Rating)	99.3% (1396 Amp Rating)
Oxbow – Lolo 230 kV	111% (920 Amp SOL)	98% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	117% (800 Amp Rating)	78% (1200 Amp Rating)

The table above is evidence that a breaker failure resulting in loss of the Hemingway to Grassland line and the Grassland-Cedar Springs line (Cascade Crossing Project) at the proposed Grassland station significantly stresses the Brownlee-Hells Canyon and Oxbow-Lolo 230 kV lines to near their emergency limits. Although the system performance is acceptable for this breaker failure contingency in this case, the high West of McNary/high West of Slatt sensitivity study (section 4.12.2) resulted in overloads beyond the emergency ratings for the Brownlee-Hells Canyon 230 kV line and Oxbow-Lolo 230 kV line. The system stressing for this breaker failure contingency for the sensitivity study indicates that the Hemingway-Grassland line and the Grassland-Cedar Springs line should not share a common breaker in a substation. Refer to Section 4.12 of this report for more detail on the overloads for the high West of McNary/high West of Slatt study.

In reality, with high north-to-south loading on the COI, loss of Hemingway-Boardman 500 kV depresses the voltage at Malin to a value less than 1.05 pu, resulting in FACRI insertion of the Fort Rock series capacitors. The results above do not include the operation of the FACRI, as a conservative planning assumption. The Fort Rock series capacitors are located in the 500 kV lines south of Grizzly.

Severe Post-Transient Contingency #3 – BF IPC Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

This is another limiting contingency for the Idaho-Northwest path in the west-to-east direction. This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 111% of its nominal rating (98% of emergency). Since the overload is less than the Brownlee-Hells Canyon 230 kV line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 8: Post-transient results – BF IPC Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	111% (1237 Amp Rating)	98% (1396 Amp Rating)
Oxbow – Lolo 230 kV	110% (920 Amp SOL)	96% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	103% (800 Amp Rating)	69% (1200 Amp Rating)

If COI transfers are heavy in the north-to-south direction, as modeled in this base case, FACRI will trigger the insertion of the Fort Rock series capacitors, significantly improving the Idaho-Northwest path performance for this contingency. Inserting the Fort Rock series capacitors in the Grizzly-Captain Jack, Grizzly-Malin & Grizzly-Summer Lake 500 kV lines is not modeled in this post-transient contingency analysis as a conservative study assumption.

Conclusion

Several of the notable post transient contingencies resulting in more severe system stressing were noted above. All of these contingencies as well as all other post-transient contingencies result in acceptable performance. The results of contingencies associated with potential simultaneous interactions are in the sections that follow. Ultimately, the results indicate that Idaho-Northwest can achieve a 2250 MW west-to-east rating simultaneous with all other paths.

4.1.4 Voltage Stability

The Idaho-Northwest west-to-east base case study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest base case, all contingencies have a post-transient solution with Idaho-Northwest stressed to 2363 MW, 105% of the proposed 2250 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency, at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr)

VQ results for the 16hs2a_2250idnw_N base case can be found in Appendix A. Busses studied utilizing VQ Analysis are: Brownlee 230 kV, Hanford 500 kV, Hemingway 500 kV, Humboldt 345 kV, John Day 500 kV, Malin 500 kV, Marion 500 kV, Mill Creek 230 kV, and Yellowtail 230 kV. The tables below highlight a sample of the reactive margins at Brownlee and Hemingway. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 9: Brownlee 230 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-2: Double Palo Verde	0.84	-613	Worst VQ contingency
BF IPC MIDPOINT-HEM 500 KV & HEM 500/230 XFMR	0.88	-652	Worst VQ related to Idaho Power
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR	0.87	-709	Worst VQ related to Idaho-NW

Table 10: Hemingway 500 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
BUS: SUMMER LAKE 500 KV	0.75	-1835	Worst VQ contingency
BF 4957 SUMMER LAKE-MALIN & SUMMER LAKE-HEM	0.75	-1865	Worst VQ contingency related to Idaho-NW
BF IPC HEM-SUMMER LAKE & HEM 500/230 XFMR	0.71	-1910	Worst VQ contingency related to Idaho Power

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, voltage stability is not an issue for the Idaho-Northwest path.

4.1.5 Transient Stability

Transient stability contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A.

The 16hs2a_2250idnw_N base case was the basis for all transient stability study results for the Idaho-Northwest v COI, Idaho-Sierra, Montana-Idaho, Montana Southeast, North of John Day and PDCI simultaneous interaction studies.

The performance of transient stability contingencies are generally ranked based upon transient voltage dip. The worst N-1 contingency is the loss of the John Day-Grizzly #1 500 kV line. This contingency results in a voltage dip of approximately 13% on the Peterson 69 kV bus. 13% is well within the acceptable limits. The worst multi-element contingency is the N-2 loss of John Day-Grizzly #1 & #2 500 kV lines. This contingency results in a voltage dip of approximately 17% on the Peterson 69 kV bus. Again, 17% is well within the acceptable limits.

4.1.6 Remedial Action Schemes

For the 16hs2a_2250idnw_N base case, each contingency, and the associated switching (RAS), is documented in Appendix A. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

This contingency does not have any associated RAS.

Severe Post-Transient Contingency #2-BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kV

After the loss of these two lines, switched VAr devices modeled at Peterson 230 kV and Quartz 138 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service for this contingency.

Table 11: Shunt Capacitor Switching in BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kV

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Quartz 138 kV (60305)	0 MVAr	22.5 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #3 – BF IPC Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

This contingency does not have any associated RAS.

4.2 Simultaneous Interaction Study: COI, N-S (Path 66)

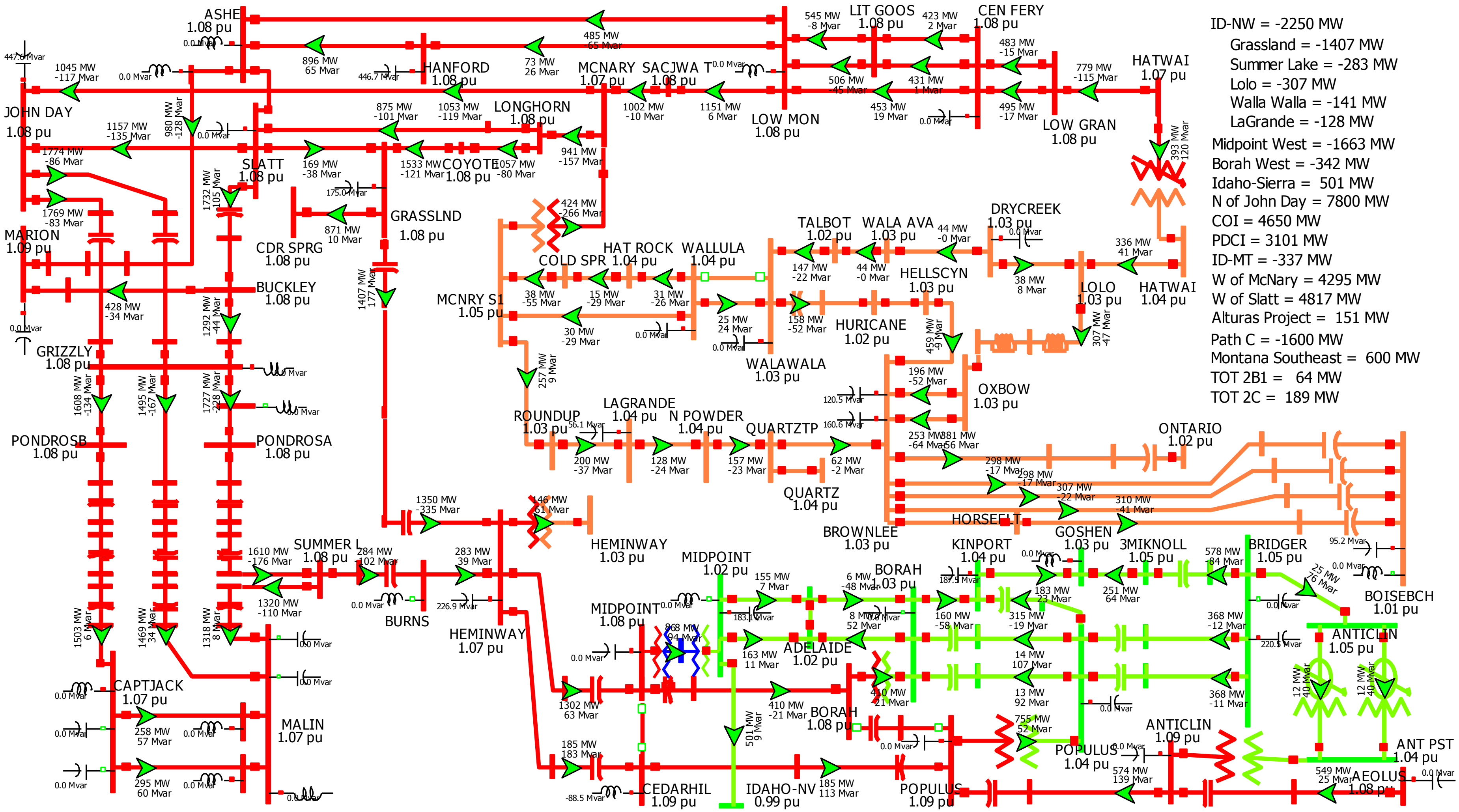


Figure 5: Idaho-Northwest (Path 14) 2250 MW, West to East v. COI (Path 66), North to South, Base Case

4.2.1 Background & Need for Simultaneous Interaction Studies

The COI path (Path 66) is made up of three 500 kV transmission lines, Malin-Round Mtn #1 & #2 and Captain Jack-Olinda. This path has a 4800 MW rating north-to-south.

COI (Path 66), Alturas Project (Path76), North of John Day (Path 73), PDCI (Path 65), and Hemingway-Summer Lake (Path 75) are all interrelated through the North of John Day v COI+Alturas or PDCI nomogram. Historically, with higher west-to-east flow on the Hemingway-Summer Lake 500 kV line, this nomogram has limited the flow south of Malin on the COI/Alturas paths. By stressing COI/Alturas to 4800 MW, North of John Day to 7800 MW, and PDCI to 3100 MW in the same base case, this report will prove that these paths do not have a simultaneous interaction with the Idaho-Northwest path at its proposed 2250 MW west-to-east rating.

4.2.2 Steady State Case Stressing

The study of Idaho-Northwest v COI utilized the 16hs2a_2250idnw_N base case described in Section.4.1.2. Refer to Section 4.1.2 for a discussion on steady state case stressing.

In the base case, COI and Alturas Project path flows are stressed to 4650 MW north-to-south and 150 MW north-to-south, respectively. Combining the two path flow totals 4800 MW of north-to-south flow south of Malin matching the current North of John Day v COI+NW/Sierra or PDCI nomogram.

4.2.3 Post Transient Results

Post-transient contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A. Details for the severe/notable contingencies can be found below.

Contingency #1 – Captain Jack-Olinda 500 kV

This contingency results in overloading the Cotwdwap-OlindaW 230 kV line to 108% of its nominal rating (92% of emergency). Since the overload is less than the emergency rating of the 230 kV line, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 12: Post-transient results – N-1: Captain Jack-Olinda 500 kV

Element	Nominal % Loading	Emergency % Loading
Cotwdwap-OlindaW 230 kV	108.2% (786 Amp Rating)	91.8% (926 Amp Rating)
Malin-Round Mtn 500 kV	103.4% (2442.0 Amp Rating)	78.0% (3236 Amp Rating)
Round Mtn-Table Mtn 500 kV	110.4% (2200 Amp Rating)	74.0% (3281 Amp Rating)
Table Mtn-Vaca Dixon 500 kV	106.0% (2478 Amp Rating)	65.7% (4000 Amp Rating)

Contingency #2 – N-1: Malin-Round Mtn #1 500 kV

This contingency results in overloading the Malin-Round Mtn #2 500 kV line to 130% of its nominal rating (88% of emergency). The overloaded line, Malin-Round Mtn #2, is made of four different line segments: (1) a series capacitor at Malin, (2) a line segment north of the Oregon-California border, (3) a line segment south of the Oregon-California border, and (4) a series capacitor at Round Mtn. The line segment south of the Oregon-California border has the lowest nominal rating (2200 Amps) and the line segment north of the Oregon-California border has the lowest emergency rating (3236 Amps).

The table below compares the system today (Idaho-Northwest stressed to 1200 MW) to the system modeled in the base case (Idaho-Northwest stressed to 2250 MW). The base case includes the Hemingway-Boardman and Gateway West 500 kV lines, whereas the "system today" does not.

Table 13: Post-transient results – N-1: Malin-Round Mtn #1 500 kV

	Existing System (1200 Case)			Future System (2250 Case)		
Element	Pre-Cont. Loading	Post-Cont. Loading	Difference	Pre-Cont. Loading	Post-Cont. Loading	Difference
Malin-Round Mtn #2 500 kV	51.2% 1659 Amps	88.8% 2872 Amps	37.6% 1213 Amps	50.9% 1647 Amps	88.1% 2850 Amps	37.2% 1203 Amps

As can be seen from the table above, the Hemingway-Boardman 500 kV line improves the results of this contingency.

<u>Contingency #3 – N-1: Round Mtn-Table Mtn #1 500 kV</u>

This contingency results in overloading the Round Mtn-Table Mtn #2 500 kV line to 148% of its nominal rating (99% of emergency). Since the overload is less than the emergency rating of the 500 kV line, this contingency results in acceptable performance.

The table below compares the system today (Idaho-Northwest stressed to 1200 MW) to the system modeled in the base case (Idaho-Northwest stressed to 2250 MW). The base case includes the Hemingway-Boardman and Gateway West 500 kV lines, whereas the "system today" does not.

Table 14: Post-transient results – N-1: Round Mtn-Table Mtn #2 500 kV

	Existing System (1200 Case)			Future System (2250 Case)		
Element	Pre-Cont. Loading	Post-Cont. Loading	Difference	Pre-Cont. Loading	Post-Cont. Loading	Difference
RoundMtn-TableMtn #2 500 kV	55.2% 1811 Amps	99.4% 3262 Amps	44.2% 1451 Amps	55.0% 1803 Amps	98.9% 3244 Amps	43.9% 1441 Amps

As can be seen from the table above, the Hemingway-Boardman 500 kV line improves the results of this contingency.

<u>Contingency #4 – N-2: Double Palo Verde</u>

This contingency results in only minor overloads to the two sets of series capacitors in the Grizzly-Summer Lake 500 kV line, and the two Round Mtn-Table Mtn 500 kV lines. Overloads to each of these elements are much less than their respective emergency ratings.

The Hemingway-Boardman 500 kV project coupled with the Gateway West project reduces the impedance of the in-land parallel path, slightly reducing the severity of this contingency on the COI after Northwest generation responds to the 2500+ MW deficiency.

Contingency #5 – Malin-Round Mtn #1 & #2 500 kV

This contingency results in overloading the Captain Jack-Olinda 500 kV line to 140% of its nominal rating (97% of emergency). Since the overload is less than the emergency rating of the 500 kV line, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 15: Post-transient results – N-1: Malin-Round Mtn #1 & #2 500 kV

Element	Nominal % Loading	Emergency % Loading
Captain Jack-Olinda 500 kV	139.7% (2667 Amp Rating)	90.9% (4099 Amp Rating)
Olinda-Maxwell 500 kV	107.0% (2993 Amp Rating)	70.9% (4515 Amp Rating)
Maxwell-Tracy 500 kV	106.0% (2993 Amp Rating)	70.2% (4515 Amp Rating)

Conclusion

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 2250 MW west-to-east rating simultaneous with COI at 4800 MW north-to-south.

4.2.4 Voltage Stability

The Idaho-Northwest v COI study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v COI study, all studied contingencies have a post-transient solution with Idaho-Northwest stressed to 2363 MW, 105% of the proposed 2250 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 2250 MW rating, simultaneous with the COI path flows at 4650 MW north-to-south. Alturas Project flows were at 150 MW in the case. The 4650 MW north-to-south COI flow was established based on the North of John Day v COI+NW/Sierra or PDCI nomogram.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16hs2a_2250idnw_N base case can be found in Appendix A. Busses studied utilizing VQ Analysis are: Brownlee 230 kV, Hanford 500 kV, Hemingway 500 kV, Humboldt 345 kV, John Day 500 kV, Malin 500 kV, Marion 500 kV, Mill Creek 230 kV, and Yellowtail 230 kV. The tables below highlight a sample of the reactive margins at Malin. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 16: Malin 500 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.88	-2002	Worst VQ contingency
N-1: CAPTAIN JACK-OLINDA 500 KV	0.82	-2324	Worst VQ related to COI
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR	0.86	-2377	Worst VQ related to Idaho-NW

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability interaction between the Idaho-Northwest path and the COI path at the flow levels studied.

4.2.5 Transient Stability

Transient stability contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A. A write up of these results can be found in Section 4.1.5. No transient stability violations were observed.

4.2.6 Remedial Action Schemes

For the 16hs2a_2250idnw_N base case, each contingency, and the associated switching (RAS), is documented in Appendix A. Details for the severe/notable contingencies can be found below.

Contingency #1 – Captain Jack-Olinda 500 kV

This contingency does not have any associated RAS.

Contingency #2 – N-1: Malin-Round Mtn #1 500 kV

This contingency does not have any associated RAS.

Contingency #3 – N-1: Round Mtn-Table Mtn #1 500 kV

This contingency does not have any associated RAS.

Contingency #4 – N-2: Double Palo Verde

This contingency depresses the voltage at Malin, resulting in triggering operating of the FACRI. The FACRI RAS includes the insertion of the Fort Rock series capacitors in the 500 kV lines south of Grizzly, and insertion of shunt capacitor banks at Captain Jack 500 kV, Malin 500 kV, Olinda 500 kV, and Table Mtn 500 kV. FACRI will also remove shunt reactors at Captain Jack 500 kV, and Malin 500 kV.

See Appendix A for a list of actions taken in this contingency.

Contingency #5 – Malin-Round Mtn #1 & #2 500 kV

This double line loss is modeled according to the California Operating Studies Subcommittee Handbook.

RAS associated with this contingency includes:

1) Northwest High Gen Drop RAS tripping at least 2400 MW of hydro generation at places such as Chief Jo, Coulee, and John Day.
2) Drop San Luis and CDWR pumps, if pumping.

See Appendix A for a list of actions taken in this contingency.

4.3 Simultaneous Interaction Study: Idaho-Sierra, N-S (Path 16)

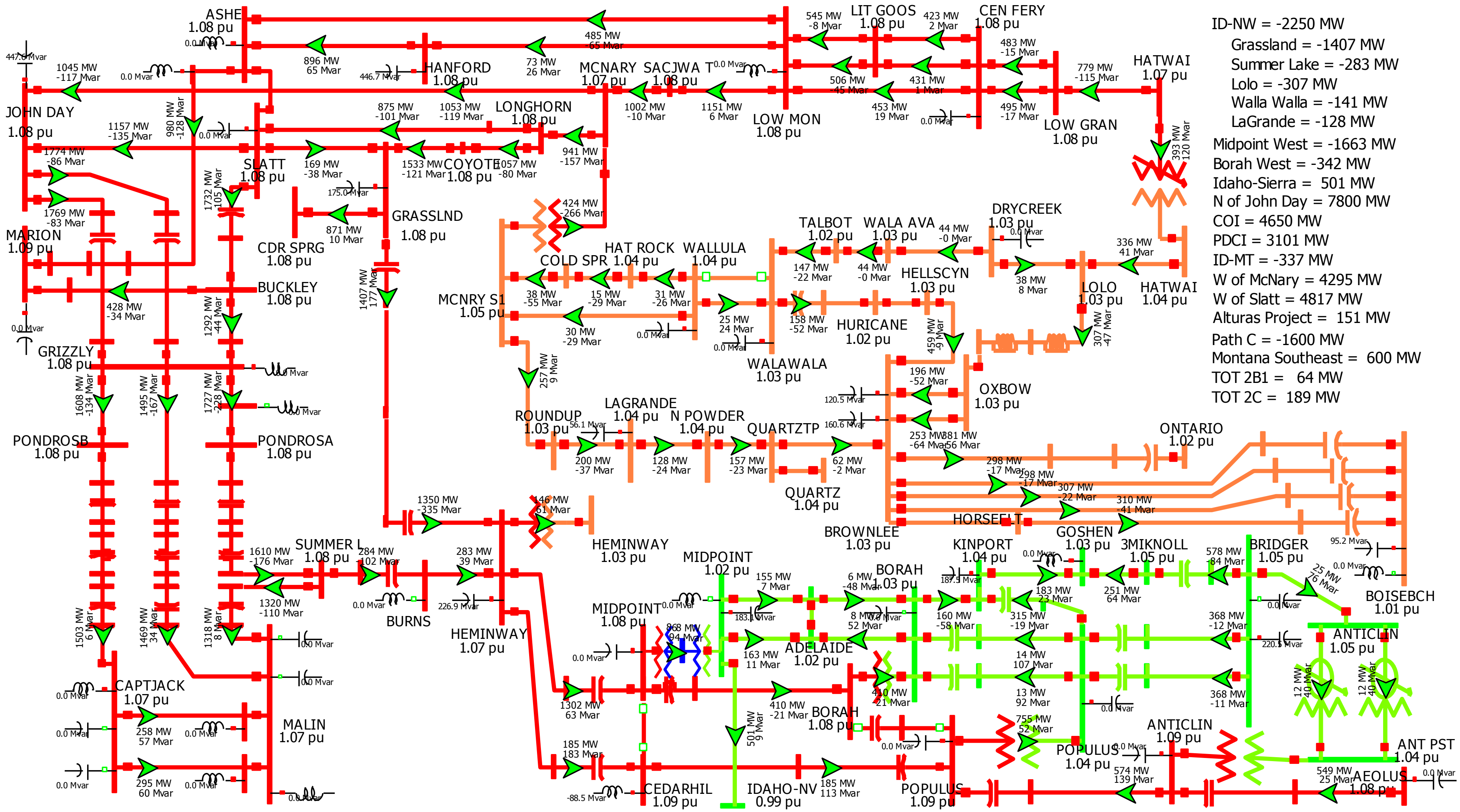


Figure 6: Idaho-Northwest (Path 14) 2250 MW, West to East v. Idaho-Sierra (Path 16), North to South, Base Case

4.3.1 Background & Need for Simultaneous Interaction Studies

The Idaho-Sierra transmission path (Path 16) is made up of single transmission line extending from Midpoint substation in southern Idaho, to Humboldt substation in northern Nevada.

The project review group was concerned that after the addition of the Hemingway-Boardman 500 kV transmission project, N-1 and N-2 contingencies on COI 500 kV lines south of Malin may result in post-transient flow on Idaho-Sierra greater than that seen on the system today. The concern was that this additional flow would cause post-transient overloads on the low-voltage system around Humboldt.

4.3.2 Steady State Case Stressing

The study of Idaho-Northwest v Idaho-Sierra utilized the 16hs2a_2250idnw_N base case. The Idaho-Northwest path is stressed to 2250 MW west-to-east simultaneous with the Idaho-Sierra path stressed to 500 MW north to south. The 16hs2a_2250idnw_N base case is described in Section 4.1.2. See Section 4.1.2 for the discussion on steady state case stressing.

4.3.3 Post Transient Results

Post-transient contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A.

There were not any contingencies that resulted in overloads or post-transient voltage deviation problems related to the Idaho-Sierra (Path 16) transmission path.

The following table illustrates two contingencies of concern in further depth, the N-1: Malin-Round Mtn #1 and the N-2: Malin-Round Mtn #1 & #2.

Table 17: COI contingencies impact on the Idaho-Sierra path

	Post-Transient Increase to Idaho-Sierra Flow	
Contingency Name	Existing System (1200 Case)	Future System (2250 Case)
N-1: Malin-Round Mtn #1	15 MW	16 MW
N-2: Malin-Round Mtn #1 & #2	47 MW	47 MW

A proper operation of the COI RAS is critical for such limited interaction with the Idaho-Sierra path, otherwise, the interaction would substantially increase.

Comparing today's Existing System to the Future System after the addition of the Hemingway-Boardman 500 kV transmission project, the loss of COI 500 kV lines do not result in a more severe impact to the Idaho-Sierra (Path 16) transmission path.

See Section 4.1.3 for more base case post-transient results.

4.3.4 Voltage Stability

The Idaho-Northwest v Idaho-Sierra study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v Idaho-Sierra study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 2363 MW, 105% of the proposed 2250 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 2250 MW rating, simultaneous with the Idaho-Sierra path flows at 500 MW north-to-south.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16hs2a_2250idnw_N base case can be found in Appendix A. The busses studied utilizing VQ Analysis are: Brownlee 230 kV, Hanford 500 kV, Hemingway 500 kV, Humboldt 345 kV, John Day 500 kV, Malin 500 kV, Marion 500 kV, Mill Creek 230 kV, and Yellow Tail 230 kV. The tables below highlight a sample of the reactive margins at Humboldt. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 18: Humboldt 345 kV bus reactive margin results (sample)

Contingency Name	**Voltage @ Qmin**	**Margin (MVAr)**	**Comments**
N-1: HUMBOLDT-COYOTE CK 345 KV	0.70	-208	Worst VQ contingency
BF IPC POPULUS-CHILL-HEMINGWAY 500 KV & HEM 500/230 XFMR	0.70	-457	Worst VQ related to Idaho Power
BF IPC HEMINGWAY-SUMMER L 500 KV & HEM 500/230 XFMR	0.70	-467	Worst VQ related to Idaho-NW

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability type interaction between the Idaho-Northwest path and the Idaho-Sierra path at the flow levels studied.

4.3.5 Transient Stability

Transient stability contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A. A write up of these results can be found in Section 4.1.5. No transient stability violations were observed.

4.3.6 Remedial Action Schemes

For the 16hs2a_2250idnw_N base case, each contingency, and the associated switching (RAS), is documented in Appendix A.

No contingencies resulted in severe or noteworthy overloads or post-transient voltage deviation problems related to the Idaho-Sierra (Path 16) transmission path.

4.4 Simultaneous Interaction Study: Montana-Idaho, N-S (Path 18)

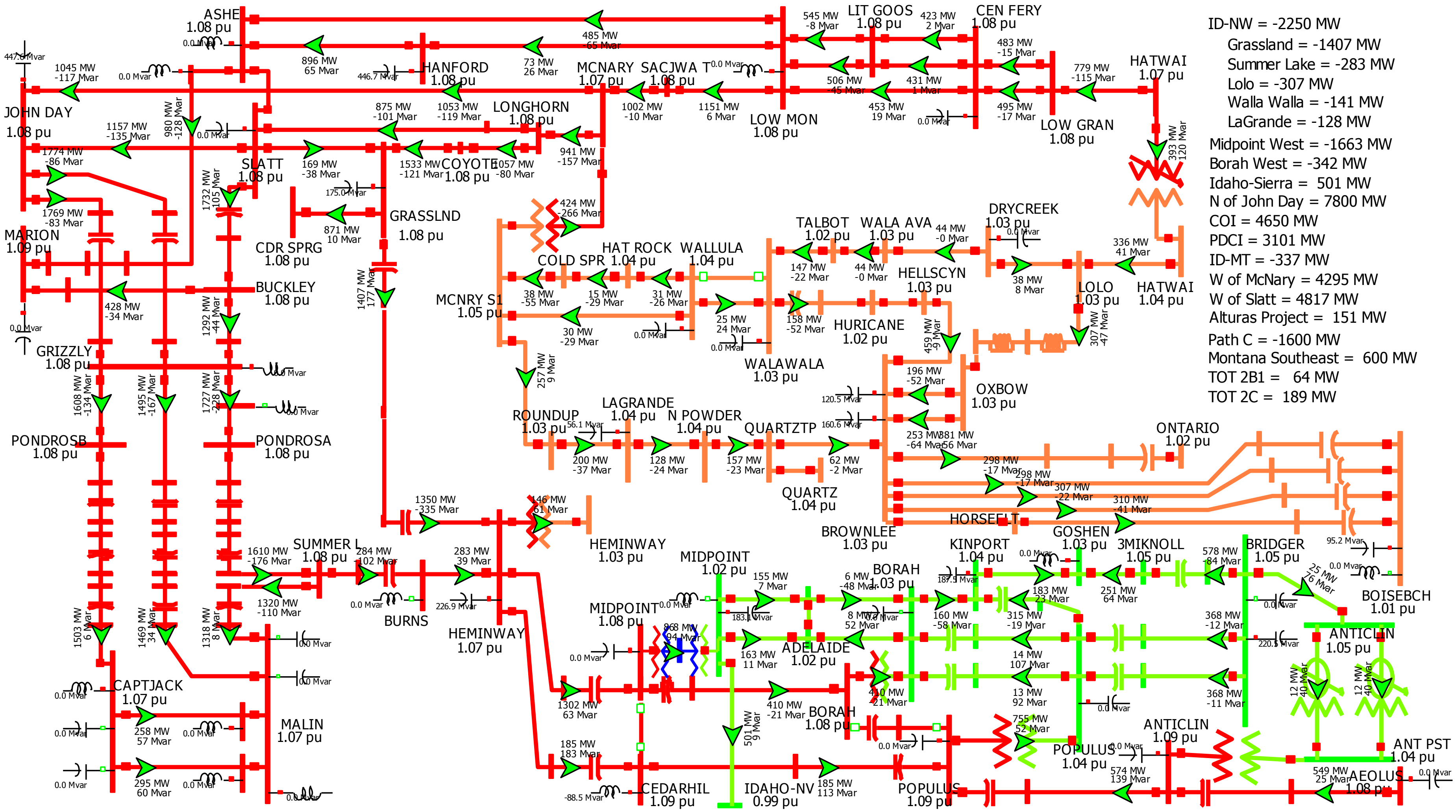


Figure 7: Idaho-Northwest (Path 14) 2250 MW, West to East v. Montana-Idaho (Path 18), North to South, Base Case

4.4.1 Background & Need for Simultaneous Interaction Studies

The Montana-Idaho transmission path (Path 18) is made up of two transmission lines: (1) a 230 kV line that extends between Brady-Antelope-Amps-Peterson-Mill Creek, otherwise known as the “Amps 230 kV line” and (2) a 161 kV line that extends between Jefferson-Big Grassy-Dillon, otherwise known as the “Dillon 161 kV line”. In the 16hs2a_2250idnw_N base case, the Amps 230 kV line is flowing at 250 MW and the Dillon 161 kV line is flowing at 86 MW, pre-contingency. Following the N-1 loss of the Hemingway-Boardman 500 kV, the loading on the Amps 230 kV line increases to 268 MW and the loading on the Dillon line increases to 106 MW, good for an 7.2 % and 23.3% increase, respectively. Due to this sizable increase in path transfers (11% of the total north-to-south path rating), the Idaho-Montana path may have a simultaneous interaction with the Idaho-Northwest path.

4.4.2 Steady State Case Stressing

The study of Idaho-Northwest v Montana-Idaho utilized the 16hs2a_2250idnw_N base case described in Section.4.1.2. In the base case, Montana-Idaho path flows are stressed to 337 MW north-to-south. Refer to Section 4.1.2 for more details on steady state case stressing.

4.4.3 Post Transient Results

Post-transient contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A. Details for the severe/notable contingencies can be found below.

Contingency #1 – N-1: Hemingway-Grassland 500 kV

This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 110% of its nominal rating (98% of emergency). Refer to the table below for additional overloads caused by this contingency. Since all overloads are less than the emergency ratings of the respective element, this contingency results in acceptable performance.

Table 19: Post-transient results – N-1: Hemingway-Grassland 500 kV

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	110% (1237 Amp Rating)	98% (1396 Amp Rating)
Oxbow – Lolo 230 kV	109% (920 Amp SOL)	96% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	103% (800 Amp Rating)	69% (1200 Amp Rating)

This contingency also results in post-transient voltage deviations greater than 5% at Amps and Peterson 230 kV busses. WECC System Performance Criteria does not allow post-transient voltage deviations of greater than 5% for N-1 contingencies. The plan of service for the Hemingway-Boardman 500 kV Transmission project, detailed in Section 2.4, includes a new 31.7 MVAr shunt capacitor connected to the Peterson 230 kV bus to be switched post-contingency (the existing 31.7 MVAr shunt capacitor is in-service pre-contingency). The contingency labeled “N-1: Hemingway-Grassland 500 kV + PTSN Shunt” switches this new Peterson 230 kV shunt capacitor, post-contingency, in response to low voltage on the

Peterson 230 kV bus. The table below details the performance comparison of the N-1: Hemingway-Grassland 500 kV outage with and without switching the additional shunt capacitor at Peterson.

Table 20: Post-transient voltage deviation comparison – N-1: Hemingway-Grassland 500 kV

Bus	N-1: Hemingway-Grassland 500 kV	N-1: Hemingway-Grassland 500 kV + PTSN
Peterson 230 kV	-7.4%	-3.6%
Amps 230 kV	-6.2%	-3.8%

The results indicate that switching a 31.7 MVAr shunt capacitor, post contingency, at Peterson 230 kV bus allows this contingency to meet WECC System Performance Criteria.

<u>Contingency #2 – N-1: Dworshak-Hatwai 500 kV + RAS</u>

This contingency results in post-transient voltage deviations greater than 5% at Peterson 230 kV and 69 kV busses. The table below compares the system today (Idaho-Northwest stressed to 1200 MW) to the system modeled in the base case (Idaho-Northwest stressed to 2250 MW). The base case includes the Hemingway-Boardman and Gateway West 500 kV lines, whereas the "system today" does not.

Table 21: Post-transient voltage deviation – N-1: Dworshak-Hatwai 500 kV + RAS

Bus	1200 Case (System Today) % Voltage Deviation	2250 Case (Future System) % Voltage Deviation
Peterson 230 kV	-5.33%	-5.19%
Peterson 69 kV	-5.49%	-5.31%

The results indicate that system performance improves after the addition of the Hemingway-Boardman 500 kV line. As discussed in Section 2.4, the plan of service for the Hemingway-Boardman 500 kV Transmission project, detailed in Section 2.4, includes a new 31.7 MVAr shunt capacitor connected to the Peterson 230 kV bus to be switched post-contingency (the existing 31.7 MVAr shunt capacitor is in-service pre-contingency). The contingency "N-1: Dworshak-Hatwai 500 kV + RAS + PTSN" demonstrates that switching this new shunt capacitor fixes this pre-existing problem.

<u>Conclusions</u>

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 2250 MW west-to-east rating simultaneous with Montana-Idaho at 337 MW north-to-south.

4.4.4 Voltage Stability

The Idaho-Northwest v Montana-Idaho study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v Idaho-Montana study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 2363 MW, 105% of the proposed 2250 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 2250 MW rating, simultaneous with the Montana-Idaho path at its 337 MW north-to-south rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16hs2a_2250idnw_N base case can be found in Appendix A. The busses studied utilizing VQ Analysis are: Brownlee 230 kV, Hanford 500 kV, Hemingway 500 kV, Humboldt 345 kV, John Day 500 kV, Malin 500 kV, Marion 500 kV, Mill Creek 230 kV, and Yellow Tail 230 kV. The tables below highlight a sample of the reactive margins at Mill Creek. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 22: Mill Creek 230 kV bus reactive margin results (sample)

Contingency Name	**Voltage @ Qmin**	**Margin (MVAr)**	**Comments**
N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.87	-274	Worst VQ contingency
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500 kV	0.80	-422	Worst VQ related to Northwest
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR	0.80	-440	Worst VQ related to Idaho-NW

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability interaction between the Idaho-Northwest path and the Montana-Idaho path at the flow levels studied.

4.4.5 Transient Stability

Transient stability contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A. A write up of these results can be found in Section 4.1.5. No transient stability violations were observed.

4.4.6 Remedial Action Schemes

For the 16hs2a_2250idnw_N base case, each contingency, and the associated switching (RAS), is documented in Appendix A. Details for the notable contingencies can be found below.

Notable Contingency #1 – N-1: Hemingway-Grassland 500 kV

This contingency opens the Hemingway-Grassland 500 kV line. After the loss of this line and transformer, switched VAr devices modeled at Dillon 69 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. On the Hemingway 500 kV bus, a capacitor insertion scheme will switch a 200 MVAr shunt capacitor in service. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 23: Shunt Capacitor Switching in N-1: Hemingway-Grassland 500 kV

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Dillon 69 kV (62345)	15.9 MVAr	27.9 MVAr
Hemingway 500 kV (60155)	200 MVAr	400 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Notable Contingency #2 – N-1: Dworshak-Hatwai 500 kV + RAS

The “+ RAS” designation in the contingency label refers to the RAS action take at Dworshak for this contingency. In this case, a contingency block “RAS Dworshak Open PCB XJ-7” was implemented to open the 13.8 kV breaker at Dworshak, which splits the DWOR 1 and DWOR 2 busses and associated generation at each bus.

The contingency also included the action to open the Garrison #s shunt reactor due to depressed voltages in the area. In reality, additional shunt devices may switch that are not modeled as part of this contingency.

4.5 Simultaneous Interaction Study: Montana Southeast, N-S (Path 80)

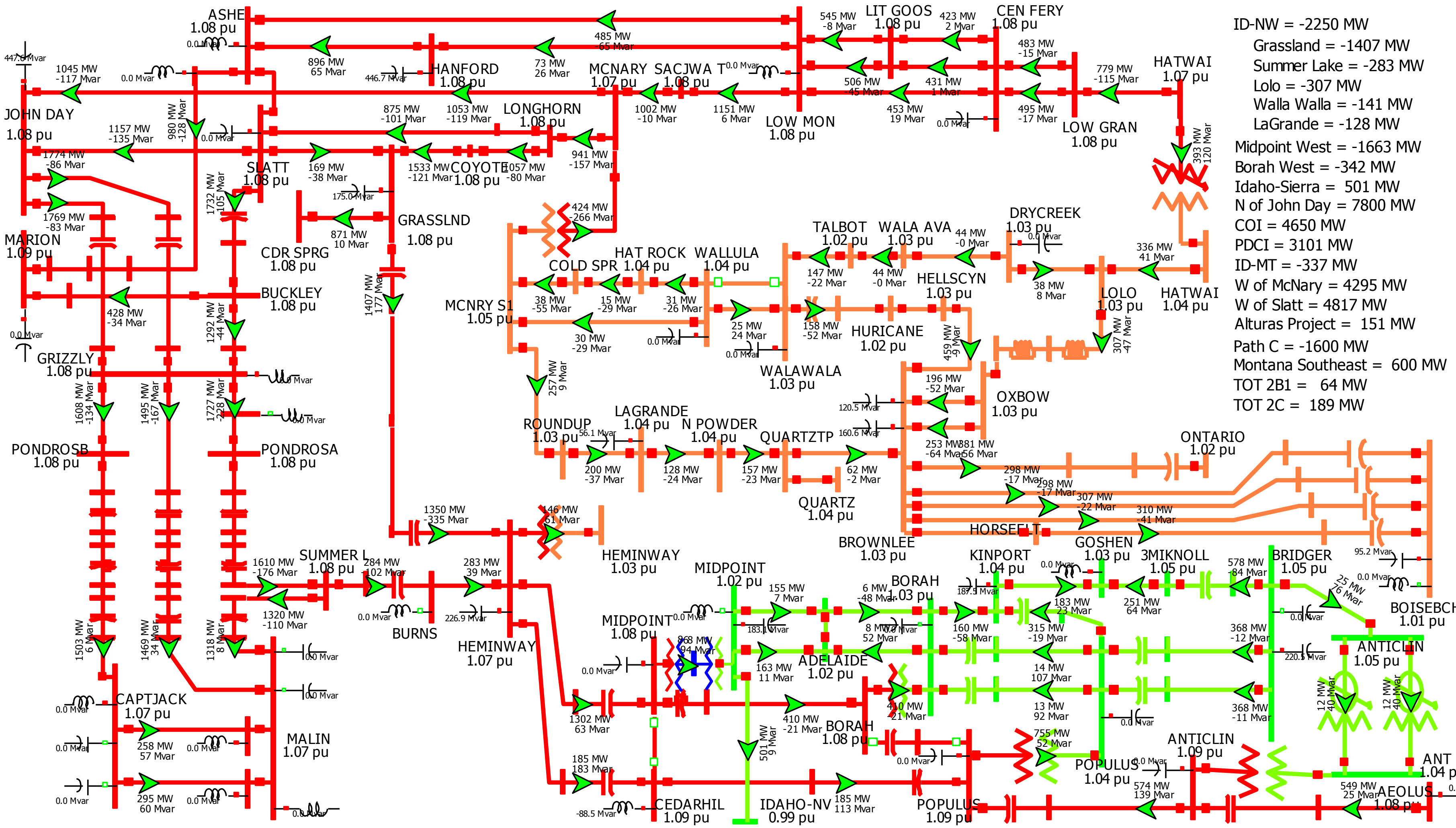


Figure 8: Idaho-Northwest (Path 14) 2250 MW, West to East v. Montana Southeast (Path 80), North to South, Base Case

4.5.1 Background & Need for Simultaneous Interaction Studies

The Montana Southeast path is made up of three 230 kV lines and one 161 kV line connecting the Montana transmission system to the northern Wyoming transmission system. In the 16hs2a_2250idnw_N base case, the flow on the Montana Southeast path is 600 MW north-to-south, pre-contingency. Following the N-1 loss of the Hemingway-Boardman 500 kV, the loading on the Montana Southeast path increases to 683 MW, a 14% increase on the path. Due to this sizable increase in path transfers, the Montana Southeast path may have a simultaneous interaction with the Idaho-Northwest path.

4.5.2 Steady State Case Stressing

The study of Idaho-Northwest v Montana Southeast utilized the 16hs2a_2250idnw_N base case described in Section 4.1.2. In the base case, Montana Southeast path flows are stressed to 600 MW north-to-south. Refer to Section 4.1.2 for more details on steady state case stressing.

4.5.3 Post Transient Results

There were not any contingencies that resulted in overloads or post-transient voltage deviation problems related to the Montana Southeast (Path 80) transmission path.

Some of the studied contingencies, such as the N-1 loss of Hemingway-Boardman 500 kV, did impact the voltage on the 230 kV busses along the Yellowtail-Frannie-Garland-OreBasin 230 kV line (3-4%), but none of the busses had a post-transient voltage deviation greater than 5%.

4.5.4 Voltage Stability

The Idaho-Northwest v Montana Southeast study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v Montana Southeast study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 2363 MW, 105% of the proposed 2250 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its 2250 MW rating, simultaneous with the Montana Southeast path at its 600 MW north-to-south rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16hs2a_2250idnw_N base case can be found in Appendix A. The busses studied utilizing VQ Analysis are: Brownlee 230 kV, Hanford 500 kV, Hemingway 500 kV, Humboldt 345 kV, John Day 500 kV, Malin 500 kV, Marion 500 kV, Mill Creek 230 kV, and Yellow Tail 230 kV. The tables below highlight a sample of the reactive margins at Yellowtail. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 24: Yellowtail 230 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.78	-218	Worst VQ contingency
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.78	-234	Worst VQ related to Northwest
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR	0.78	-239	Worst VQ related to Idaho-NW

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability interaction between the Idaho-Northwest path and the Montana Southeast path at the flow levels studied.

4.5.5 Transient Stability

Transient stability contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A. A write up of these results can be found in Section 4.1.5. No transient stability violations were observed.

4.5.6 Remedial Action Schemes

For the 16hs2a_2250idnw_N base case, each contingency, and the associated switching (RAS), is documented in Appendix A.

No contingencies resulted in overloads or post-transient voltage deviation problems related to the Montana Southeast (Path 80) transmission path.

4.6 Simultaneous Interaction Study: North of John Day (Path 73)

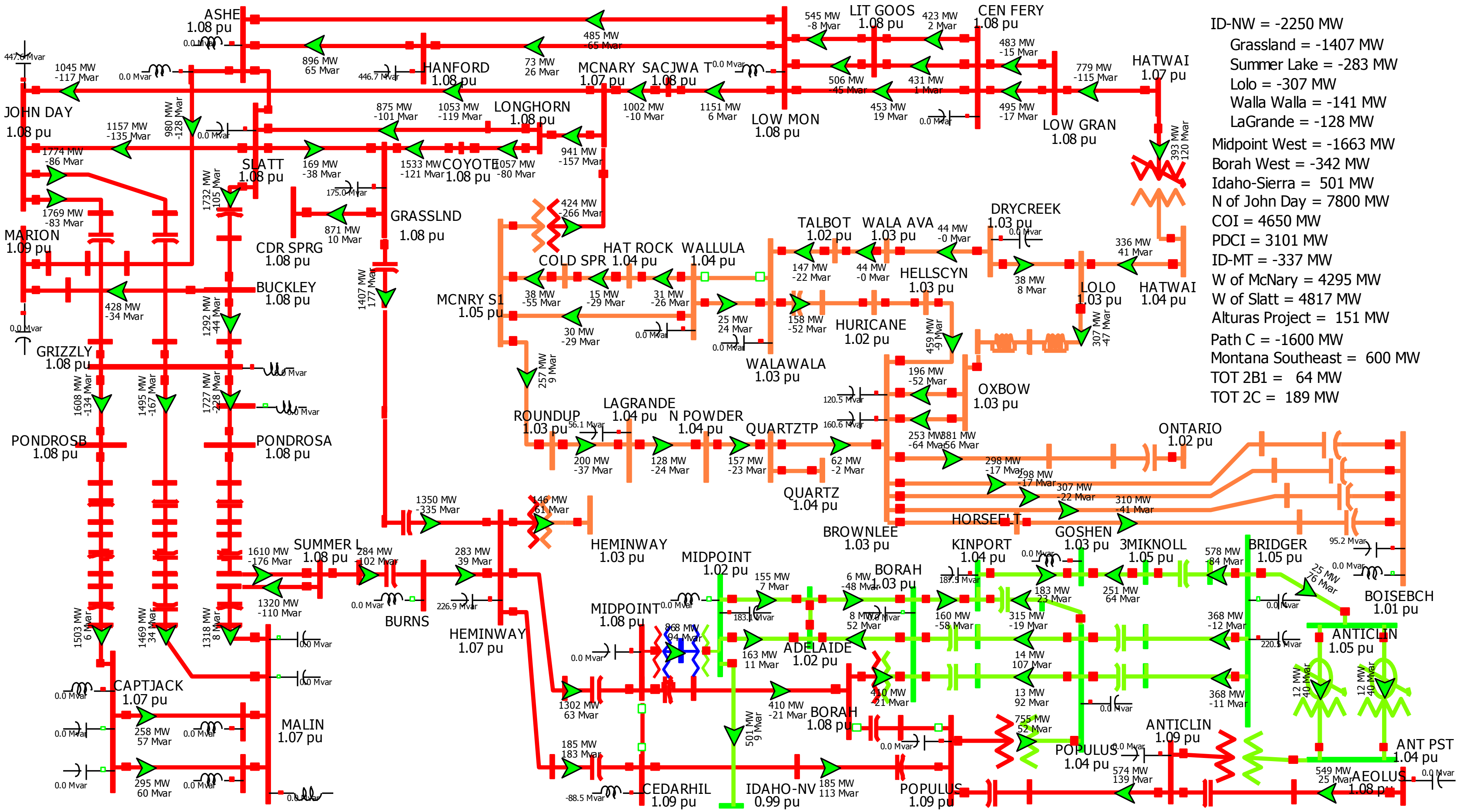


Figure 9: Idaho-Northwest (Path 14) 2250 MW, West to East v. North of John Day (Path 73), Base Case

4.6.1 Background & Need for Simultaneous Interaction Studies

The North of John Day path (Path 73) is made up of six 500 kV transmission lines: Sacajawea Tap-McNary, Ashe-Slatt, Ashe-Marion, Wautoma-Rock Creek, Wautoma-Big Eddy, and Raver-Paul. This path has a 7800 MW north-to-south rating.

COI (Path 66), Alturas Project (Path76), North of John Day (Path 73), PDCI (Path 65), and Hemingway-Summer Lake (Path 75) are all interrelated through the North of John Day v COI+Alturas or PDCI nomogram. Historically, with higher west-to-east flow on the Hemingway-Summer Lake 500 kV line, this nomogram has limited the flow south of Malin on the COI/Alturas paths. By stressing COI/Alturas to 4800 MW, North of John Day to 7800 MW, and PDCI to 3100 MW in the same base case, this report will prove that these paths do not have a simultaneous interaction with the Idaho-Northwest path at its proposed 2250 MW west-to-east rating.

4.6.2 Steady State Case Stressing

The study of Idaho-Northwest v North of John Day utilized the 16hs2a_2250idnw_N base case described in Section 4.1.2. In the base case, North of John Day path flows are stressed to 7800 MW north-to-south. Refer to Section 4.1.2 for more details on steady state case stressing.

4.6.3 Post Transient Results

Post-transient contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A. Details for the notable contingencies can be found below.

<u>Critical Contingency – N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS</u>

This contingency results in overloading the John Day-Grizzly #1 500 kV line to 101% of its nominal and emergency rating. The table below compares the system today (Idaho-Northwest stressed to 1200 MW) to the system modeled in the base case (Idaho-Northwest stressed to 2250 MW). The base case includes the Hemingway-Boardman and Gateway West 500 kV lines, whereas the "system today" does not.

Table 25: Post-transient results – N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS

	Existing System (1200 Case)			Future System (2250 Case)		
Element	Pre-Cont. % Emerg. Rating	Post-Cont. % Emerg. Rating	Difference	Pre-Cont. % Emerg. Rating	Post-Cont. % Emerg. Rating	Difference
John Day-Grizzly #1 500 kV	58%	115%	57%	54%	101%	47%

The performance for this contingency is acceptable since the overload appears to be the result of case stressing, not the addition Hemingway-Boardman 500 kV line. Performance for this contingency will improve (as shown in the table above) after the addition of Hemingway-Boardman; Boardman-Hemingway-Summer Lake acts as an additional parallel path to John Day-Grizzly #1 500 kV that did not exist prior to the addition of Hemingway-Boardman 500 kV.

Conclusions

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 2250 MW west-to-east rating simultaneous with North of John Day at 7800 MW north-to-south.

See Section 4.1.3 for more base case post-transient results.

4.6.4 Voltage Stability

The Idaho-Northwest v North of John Day study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v North of John study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 2363 MW, 105% of the proposed 2250 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 2250 MW rating, simultaneous with the North of John Day path flows at 7800 MW north-to-south.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16hs2a_2250idnw_N base case can be found in Appendix A. The busses studied utilizing VQ Analysis are: Brownlee 230 kV, Hanford 500 kV, Hemingway 500 kV, Humboldt 345 kV, John Day 500 kV, Malin 500 kV, Marion 500 kV, Mill Creek 230 kV, and Yellow Tail 230 kV. The tables below highlight a sample of the reactive margins at Hanford and John Day. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 26: Hanford 500 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-2: DOUBLE PALO VERDE	0.96	-1699	Worst VQ contingency
N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV + RAS	0.94	-1990	Worst VQ related to N of John Day
BF HEM-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.93	-3446	Worst VQ related to Idaho-Northwest

Table 27: John Day 500 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV + RAS	0.99	-1126	Worst VQ contingency
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.98	-1276	Worst VQ related to N of John Day
N-1: HEMINGWAY-GRASSLAND 500 KV	0.98	-1639	Worst VQ related to Idaho-Northwest

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability interaction between the Idaho-Northwest path and the North of John Day path at the flow levels studied.

4.6.5 Transient Stability

Transient stability contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A. A write up of these results can be found in Section 4.1.5. No transient stability violations were observed.

4.6.6 Remedial Action Schemes

For the 16hs2a_2250idnw_N base case, each contingency, and the associated switching (RAS), is documented in Appendix A. Details for the notable contingencies can be found below.

Critical Contingency – N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS

This double line loss results in triggering the "High Gen Drop" remedial action scheme in the Northwest. In this case, High Gen Drop is armed to trip at least 2400 MW of hydro generation at Chief Jo, Coulee, and John Day.

4.7 Simultaneous Interaction Study: PDCI, N-S (Path 65)

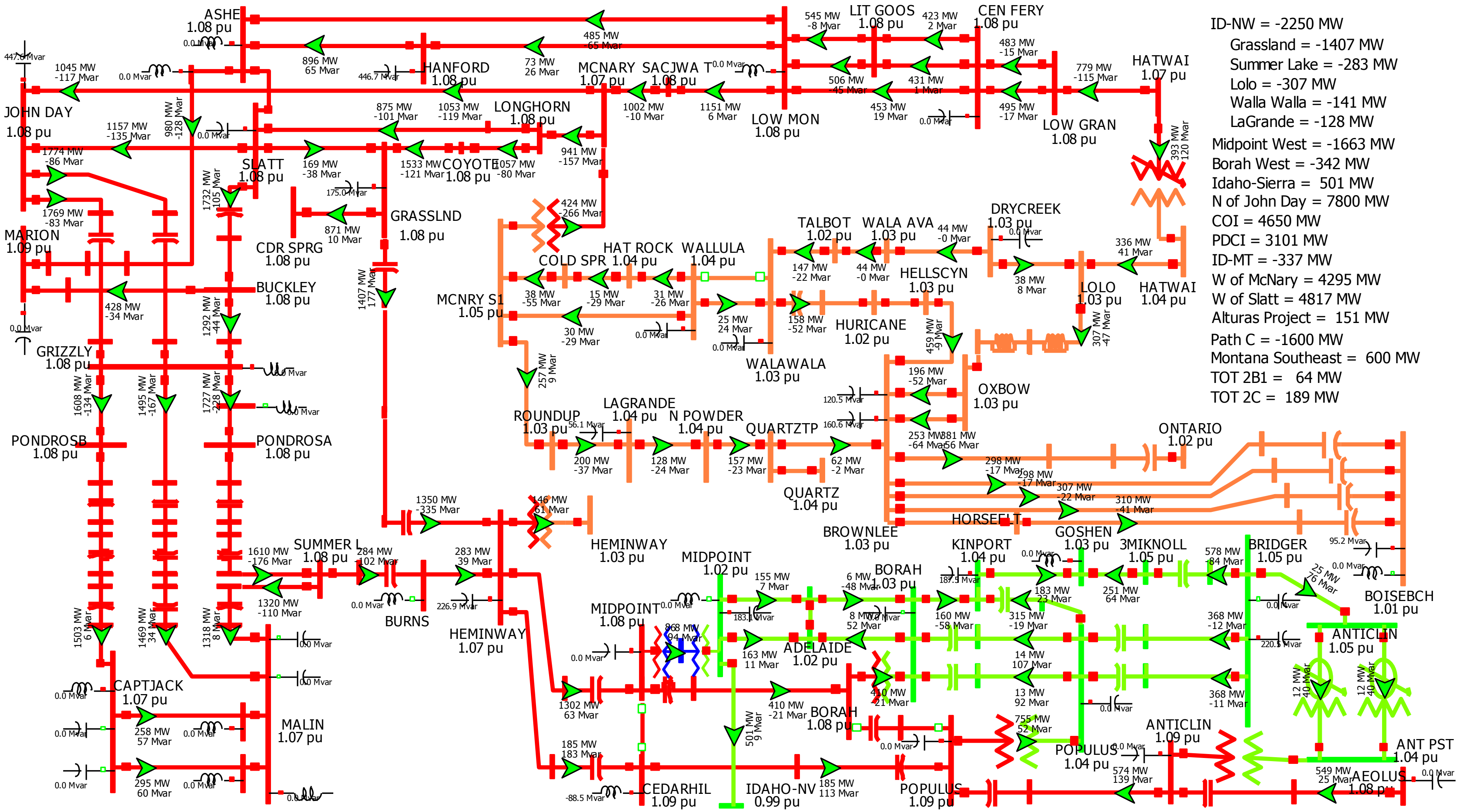


Figure 10: Idaho-Northwest (Path 14) 2250 MW, West to East v. PDCI (Path 65), North to South, Base Case

4.7.1 Background & Need for Simultaneous Interaction Studies

The Pacific DC Intertie (Path 65) is made up of a single +/-500 kV DC transmission line from Celilo substation, near The Dalles, Oregon, to Sylmar substation in the Los Angeles basin.

COI (Path 66), Alturas Project (Path76), North of John Day (Path 73), PDCI (Path 65), and Hemingway-Summer Lake (Path 75) are all interrelated through the North of John Day v COI+Alturas or PDCI nomogram. Historically, with higher west-to-east flow on the Hemingway-Summer Lake 500 kV line, this nomogram has limited the flow south of Malin on the COI/Alturas paths. By stressing COI/Alturas to 4800 MW, North of John Day to 7800 MW, and PDCI to 3100 MW in the same base case, this report will prove that these paths do not have a simultaneous interaction with the Idaho-Northwest path at its proposed 2250 MW west-to-east rating.

4.7.2 Steady State Case Stressing

The study of Idaho-Northwest v PDCI utilized the 16hs2a_2250idnw_N base case described in Section 4.1.2. In the base case, PDCI path flow is stressed to 3100 MW north-to-south. Refer to Section 4.1.2 for more details on steady state case stressing.

4.7.3 Post Transient Results

Post-transient contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A. Details for the notable contingencies can be found below.

Notable Contingency – N-2: DC Bipole

The table below presents the post transient results for the N-2: DC Bipole contingency. This contingency results in overloading the Ponderosa-Summer Lake 500 kV line to 117% of its nominal rating (88% of emergency). The table compares the system today (Idaho-Northwest stressed to 1200 MW) to the system modeled in the base case (Idaho-Northwest stressed to 2250 MW). The base case includes the Hemingway-Grassland and Gateway West 500 kV lines, whereas the “system today” does not.

Table 28: Post-transient results – N-2: DC-Bipole

	Existing System (1200 Case)			Future System (2250 Case)		
Element	Pre-Contingency % Emergency	Post-Contingency % Emergency	Difference	Pre-Contingency % Emergency	Post-Contingency % Emergency	Difference
Ponderosa-Summer Lake 500 kV	62%	99%	38%	54%	88%	34%
Round Mtn-Table Mtn 500 kV #1&#2	55%	74%	19%	55%	74%	19%
Malin-Round Mtn 500 kV #2	51%	71%	21%	50%	71%	21%
Table Mtn - Vaca Dixon 500 kV #1	50%	66%	16%	49%	65%	15%

The results indicate that system performance either remains the same, or improves, after the addition of the Hemingway-Boardman 500 kV line. Since no elements are over their emergency ratings, performance is acceptable for this contingency.

Conclusions

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 2250 MW west-to-east rating simultaneous with PDCI at 3100 MW north-to-south.

4.7.4 Voltage Stability

The study results indicate that the system has sufficient power margin and reactive margin for all contingencies. See the base case results Section 4.1.4, COI results Section 4.2.4, and North of John Day results Section 4.6.4 for voltage stability information related to the northwest.

VQ results for the 16hs2a_2250idnw_N case can be found in Appendix A.

Given the explanation in Sections 4.1.4, 4.2.4, and 4.6.4, there is not a voltage stability interaction between the Idaho-Northwest path and the PDCI path at the flow levels studied.

4.7.5 Transient Stability

Transient stability contingency results for the 16hs2a_2250idnw_N case can be found in Appendix A. A write up of these results can be found in Section 4.1.5. No transient stability violations were observed.

4.7.6 Remedial Action Schemes

For the 16hs2a_2250idnw_N base case, each contingency, and the associated switching (RAS), is documented in Appendix A. Details for the notable contingencies can be found below.

Notable Contingency – N-2: DC Bipole

This contingency opens both poles of the PDCI line. Three contingency blocks, “PDCI LOSS GEN DROP,” “PDCI SCE SWITCHED SHUNT” and “PDCI NW Reactive Insert” were implemented in the contingency. These three contingency blocks were provided as part of the WECC Phase 2 study process to implement as part of this contingency.

The “PDCI LOSS GEN DROP” contingency block was implemented to reduce the injection group “RAS PDCI Gen Drop Units” by an amount associated with COI and PDCI flows, less 300 MW, in generator merit order by tripping. The “RAS PDCI Gen Drop Units” is comprised of 81 units in the Northwest. For this case, based on the given COI and PDCI flows, the RAS action initiated tripping of 2550 MW. The merit order is a generator tripping order established by Colombia Grid and/or BPA and implemented into the load flow software. In this case, all of the generation tripping occurred at Chief Jo and Coulee.

Details about the "PDCI SCE SWITCHED SHUNT", and "PDCI NW Reactive Insert" contingency blocks are detailed in the tables below:

Table 29: "PDCI SCE SWITCHED SHUNT" Actions for N-2: DC Bipole

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Antelope 230 kV (24401)	79 MVAr	158.4 MVAr
Barre 230 kV (24016)	0 MVAr	79.2 MVAr
Chino 230 kV (24025)	0 MVAr	79.2 MVAr
El Nido 230 kV (24040)	0 MVAr	79.2 MVAr
Gould 230 kV (24059)	0 MVAr	79.2 MVAr
Lagubell 230 kV (24076)	0 MVAr	158.4 MVAr
Lcienega 230 kV (24082)	0 MVAr	158.4 MVAr
Mirage 230 kV (24806)	0 MVAr	79.2 MVAr
Miralome 230 kV (25656)	0 MVAr	79.2 MVAr
Miralomw 230 kV (24093)	0 MVAr	79.2 MVAr
Moorpark 230 kV (24099)	0 MVAr	158.4 MVAr
Olinda 230 kV (24100)	0 MVAr	79.2 MVAr
Padua 230 kV (24112)	0 MVAr	158.4 MVAr
Pardee 230 kV (24114)	0 MVAr	79.2 MVAr
Riohondo 230 kV (24126)	0 MVAr	158.4 MVAr
S. Clara 230 kV (24128)	0 MVAr	158.4 MVAr
Sanbrdno 230 kV (24132)	0 MVAr	158.4 MVAr
Valleysc 115 kV (24160)	93.6 MVAr	187.2 MVAr
Villa Pk 230 kV (24154)	0 MVAr	158.4 MVAr
Vincent 230 kV (24155)	0 MVAr	158.4 MVAr
Vsta 230 kV (24901)	0 MVAr	79.2 MVAr
Walnut 230 kV (24158)	0 MVAr	79.2 MVAr

Table 30: "PDCI NW Reactive Insert" Actions for N-2: DC Bipole

Bus	Device	Action
Malin 500 kV c1 & c2 (40687)	Shunt	2 x CLOSE (197.3 MVAr)
Table Mountain 500 kV c1 & c2 (30015)	Shunt	2 x CLOSE (227 MVAr)
CAPPON13 500 kV (90139)-CAPPON14 500 kV (90140)	Series Capacitor	IN SERVICE
GRIMAL23 500 kV (90070)-GRIMAL24 500 kV (90071)	Series Capacitor	IN SERVICE
PONSUM13 500 kV (90101)-PONSUM14 500 kV (90102)	Series Capacitor	IN SERVICE

Table 31: Shunt Capacitor Switching in N-2: DC Bipole

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
BIGEDDY2 230 kV (41342)	166 MVAr	0 MVar
SYLMAR S 230 kV (24147)	1122 MVar	0 MVar
SYLMARLA 230 kV (26094)	1144 MVar	0 MVar

In reality, additional capacitors may switch that are not modeled as part of this contingency.

4.8 Simultaneous Interaction Study: West of Hatwai (Path 6)

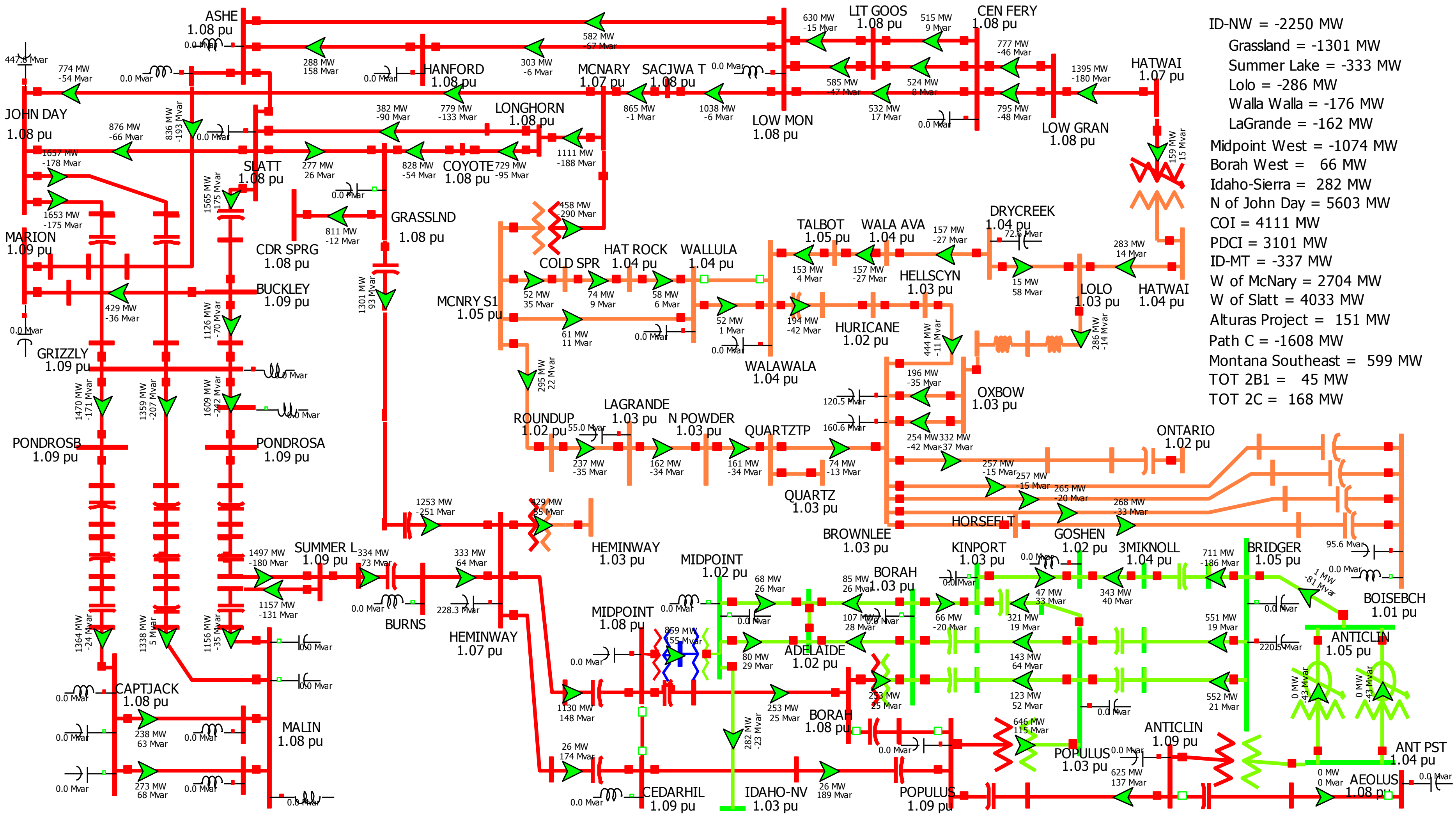


Figure 11: Idaho-Northwest (Path 14) 2250 MW, West to East v. West of Hatwai (Path 6), East to West, Base Case

4.8.1 Background & Need for Simultaneous Interaction Study

Background

The West of Hatwai transmission path (Path 6) is made up of two 500 kV lines, four 230 kV lines, four 115 kV lines, and a 115/69 kV transformer connecting northern Idaho and eastern Washington to the main Northwest system in central Washington and northern Oregon. The West of Hatwai path has an SOL rating of 4250 MW east-to-west year round.

The Idaho-Northwest and the West of Hatwai paths cannot be stressed to their limits simultaneously. When stressing the case, power is scheduled from Montana to the Northwest to stress Montana-Northwest and West of Hatwai paths, and then scheduled from the Northwest into Idaho and Utah to stress Idaho-Northwest path. This power scheduling is effectively causing a very large loop, putting angular pressure on the two other transmission paths out of Montana: Montana-Idaho (Path 18) and Montana Southeast (Path 80). The Montana-Idaho path is what limits the simultaneous capability of the Idaho-Northwest path and the West of Hatwai path. The 161 kV line, phase shifted at Jefferson, becomes the limiting element when 30 degrees is insufficient to hold back flow on the path, and the 161 kV line goes over its 87 MW rating.

Although the Montana-Idaho 161 kV line is the limiting element between the Idaho-Northwest and West of Hatwai paths, flow on West of Hatwai does not have a significant impact on the Montana-Idaho 161 kV line. Flow on the 161 kV line is associated with Idaho-Northwest path flows, and Montana area generation. Any nomogram developed between the Idaho-Northwest and West of Hatwai paths that is related to the Montana-Idaho 161 kV line would be ineffective, due to the lack of a correlation between West of Hatwai flow, and Montana-Idaho flow.

Historical Real-Life Flow Interaction between Idaho-Northwest & West of Hatwai

Since 1998, the West of Hatwai (WoH) path has never exceeded 3600 MW east-to-west. Below is a table illustrating the real-life interaction between the Idaho-Northwest path and the West of Hatwai path.

Table 32: Idaho-Northwest v West of Hatwai, Real-life interaction since 1998

Criteria	ID-NW (E-W)	WoH (E-W)
WoH Maximum	1066	3590
ID-NW Max with WoH>2800 MW	-276	2828
ID-NW Maximum	-1136	827
WoH Maximum with ID-NW>1000 MW	-1004	2048

At the West of Hatwai all-time peak, Idaho-Northwest was flowing 1066 MW east-to-west (not west-to-east as is being studied in this section). When West of Hatwai flows were greater than 2800 MW, Idaho-Northwest reached a maximum value of 276 MW west-to-east. At the Idaho-Northwest maximum, West of Hatwai was only flowing at 827 MW east-to-west. When Idaho-Northwest flows were greater than 1000 MW, West of Hatwai reached a maximum value of 2048 MW.

Since 1998, actual Idaho-Northwest east-to-west flow has ranged between -1136 MW and 2323 MW; actual West of Hatwai flow has ranged between -3590 MW and 1682 MW. The top 1000 hours for Idaho-Northwest range between -1136 MW & -853 MW; for West of Hatwai -3590 MW & -2357 MW. Figure 4 below depicts the top 1000 hours for each path verse the corresponding alternate path (2000 total points). The red square represents the point at which we are studying Idaho-Northwest v West of Hatwai in the benchmark case.

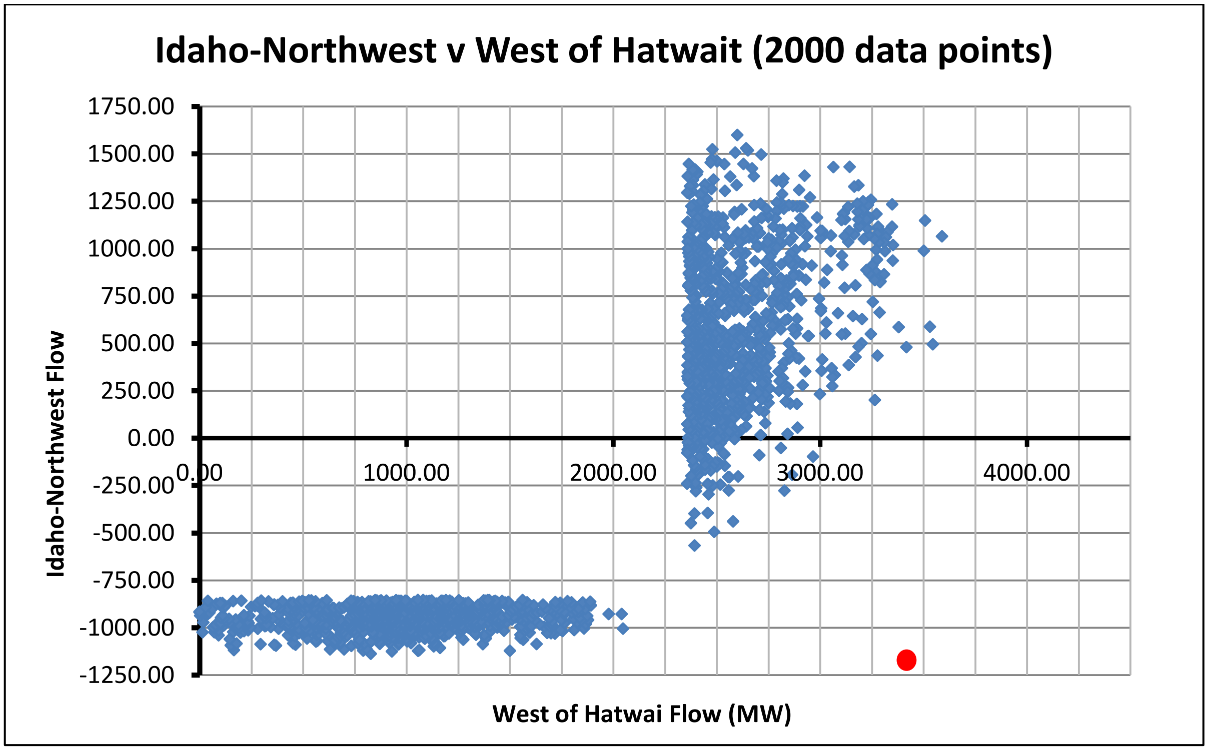


Figure 12: Idaho-Northwest v West of Hatwai, 2000 critical data points (hourly data since 1998)

Need for Simultaneous Interaction Studies

The Hemingway-Boardman 500 kV Project Review Group requested that a simultaneous interaction study be performed between the Idaho-Northwest path and the West of Hatwai path. As mentioned in previous paragraphs, it is not possible to stress Idaho-Northwest to 2250 MW, west-to-east, simultaneous with West of Hatwai at 4250 MW, east-to-west, due to the Montana-Idaho 161 kV line limitation. Historical flow data in Table 29, representing ~14 years of interaction between the paths and Figure 4 above, also indicate that the two paths do not interact in a manner where both paths would be at their simultaneous limit.

This Phase II rating study is required to prove that the Hemingway-Boardman 500 kV line, and the Idaho-Northwest 2250 MW up-rate, does not negatively impact the West of Hatwai path. In order to show that the Hemingway-Boardman 500 kV line improves the interaction between the Idaho-Northwest path, and the West Hatwai path, two cases were developed. The first case represents the system as it is today, with Idaho-Northwest stressed to 1200 MW, west-to-east, and West of Hatwai stressed to 3400 MW, east-to-west. The second case represents the system after the addition of the Hemingway-Boardman 500 kV line, with Idaho-Northwest stressed to 2250 MW, west-to-east, and West of Hatwai stressed to the same 3400 MW, east-to-west.

4.8.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case names for this study are: 16hs2a_3400WoH_2250idnw_N & 16hs2a_3400WoH_1200idnw_N.

Step-by-step development of the 16hs2a_WoH_2250idnw_N base case:

Step 1: Begin with the 16hs2a_2250idnw_N base case.

> Utilize the base case developed in Section 4.1.2 Steady State Case Stressing. The West of Hatwai path is only flowing at 727 MW in this case.

Step 2: Reduce load in the Spokane area.

> West of Hatwai is generally stressed during light load conditions, whereas the Idaho-Northwest path is generally stressed during heavy load (peak summer day) conditions. In order to stress West of Hatwai simultaneous with Idaho-Northwest, the load pattern in the Spokane area will have to match a light load condition, and Idaho/Utah will have to match a heavy load condition. The Avista and Spokane area load was modified to approximately match a 16 light autumn WECC base case (used in the export case).

Step 3: Increase generation in Western Montana, Northern Idaho, and Eastern Washington.

> In order to stress the West of Hatwai path, generation around the Spokane area has to be maximized. Generators in the Avista and Spokane area, including Boundary and Dworshak, are set to their maximum allowable values in the powerflow case.

Step 4: Insert all series reactors into the Oxbow-Lolo 230 kV line.

> Place in-service the Oxbow-Lolo 230 kV line 10 ohm series reactor and a 20 ohm series reactor.

Step 5: Reduce Coulee & Chief Jo Generation.

> Reducing Coulee and Chief Jo generation helps to better spread the loading across the West of Hatwai path. Generation from Oregon and California is scheduled in to replace the central

Washington generation. Moving generation from central Washington to Oregon and California also reduces the angle between the Idaho system and the Montana system. This will allow more generation to be scheduled into the Northwest from Montana in the next step.

Step 6: Schedule power in from Montana.

The last step to stress the West of Hatwai path is to schedule power into the Northwest from Montana. Unfortunately, with Idaho-Northwest stressed to its proposed 2250 MW rating, attempting to stress West of Hatwai by scheduling power into the Northwest from Montana quickly results in overloading the Jefferson 161 kV path even with the Jefferson 161 kV phase shifter at its full 30 degree phase angle, hindering flow. The Jefferson 161 kV path is rated for 87 MW and extends from Mill Creek-Dillon-Big Grassy-Jefferson-Goshen. This line is metered at Big Grassy on the Dillon-Big Grassy section of 161 kV line. The Jefferson 161 kV line is at its rating when the West of Hatwai path reaches 3400 MW east-to-west, simultaneous with Idaho-Northwest at 2250 MW west-to-east.

Step-by-step development of the 16hs2a_WoH_1200idnw_N base case:

This base case was developed as a comparison/benchmark case to the 16hs2a_WoH_2250idnw_N base case. The 16hs2a_WoH_1200idnw_N base case is meant to represent the system as it is today with heavy West of Hatwai east-to-west flow simultaneous with heavy west-to-east flow on the Idaho-Northwest path. Hemingway-Boardman, Gateway West, and Cascade crossing are not modeled in this base case.

Step 1: Begin with the 16hs2a_WoH_2250idnw_N base case.

Utilize the base case developed earlier in this Section of the report.

Step 2: Remove elements from the base case to create a "System Today" case

Remove the following elements from the 16hs2a_WoH_2250idnw_N case: (1) Hemingway-Boardman 500 kV, (2) Stage One of Gateway West, (3) Cascade Crossing, and (4) the Longhorn substation & associated wind projects.

Step 3: Reduce Idaho-Northwest transfers to 1200 MW west-to-east.

This is best accomplished by reducing Northwest generation and increasing Idaho and PacifiCorp East (PACE) area generation. By removing Longhorn, and the associated wind generation, Northwest generation was already reduced significantly. To replace Northwest generation, PacifiCorp East (PACE) and Idaho area peaking generation was switched in-service and scheduled to the Northwest.

Step 4: Re-stress West of Hatwai

By significantly reducing transfers between the Northwest and Idaho in Step 3, West of Hatwai flow increases. Removing the Hemingway-Boardman 500 kV line from service, however, significantly overloads the Jefferson 161 kV phase shifter. Adjusting the West of Hatwai path back to 3400 MW east-to-west (to match the 16hs2a_WoH_2250idnw_N case) and the Idaho-Northwest path to its 1200 MW west-to-east rating, resulted in the same flow through the Jefferson 161 kV line as the 16hs2a_WoH_2250idnw_N base case.

4.8.3 Post Transient Results

Post-transient contingency results for the 16hs2a_WoH_2250idnw_N & 16hs2a_WoH_1200idnw_N base cases can be found in Appendix C. Details for the notable contingencies can be found below.

Severe Post-Transient Contingency #1 – N-1: Hemingway-Grassland 500 kV +PTSN Shunt

This is the worst N-1 contingency associated with the Idaho-Northwest transmission path (Grassland & Boardman are the same substation). This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 106.1% of its nominal rating (94% of emergency). Since the overload is less than the emergency ratings of the Brownlee-Hells Canyon 230 kV line, this contingency results in acceptable performance.

Severe Post-Transient Contingency #2 – BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230

This is the limiting contingency for the Idaho-Northwest path in the west-to-east direction. This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 117% of its nominal rating (104% of emergency). Since the overload is greater than the Brownlee-Hells Canyon 230 kV line's emergency rating, this contingency results in unacceptable performance. This contingency also results in post-transient voltage deviations between 5-10% at Hemingway, LaGrande & Bowmont 230 kV and Bowmont, Chestnut & Happy Valley 138 kV. WECC System Performance Criteria allows for post-transient voltage deviations of up to 10% for N-2 contingencies. Refer to the table below for more information about the overloads caused by this contingency.

Table 33: Post-transient results – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading (Limit A)	Emergency % Loading (Limit B)
Brownlee-Hells Canyon 230 kV	117% (1237 Amp Rating)	104%(1396 Amp Rating)
Oxbow – Lolo 230 kV	108% (920 Amp SOL)	95% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	101% (800 Amp Rating)	67% (1200 Amp Rating)

In order to avoid overloading the Oxbow-Lolo 230 kV line, both series reactors at Copperfield had to be inserted in the base case, pre-contingency. This contingency, resulting in post-transient overloads exceeding the Hells Canyon-Brownlee emergency rating, identifies the need to operate with the Walla Walla 230 kV series capacitor bypassed in this configuration (high West of Hatwai and Idaho-Northwest). Bypassing the Walla Walla series capacitor during spring conditions with high hydro generation in the Northwest is a common occurrence. Rerunning this contingency with the Walla Walla series capacitor bypassed results in acceptable post-transient performance.

<u>Severe Post-Transient Contingency #3 – N-2: DC-BIPOLE</u>

This contingency, after the addition of the Hemingway-Boardman 500 kV line, results in similar performance to the system today. See Section 4.7.3 for a more detailed discussion on this contingency.

<u>Severe Post-Transient Contingency #4 – N-2: Double Palo Verde</u>

This contingency, after the addition of the Hemingway-Boardman 500 kV line, results in similar performance to the system today. See Section 4.2.3 for a more detailed discussion on this contingency

<u>Montana-Northwest & West of Hatwai Contingencies</u>

The Hemingway-Boardman 500 kV project has little effect on the contingencies related to the Montana-Northwest path and the West of Hatwai path. See the results in the Appendix for additional details.

<u>Conclusions</u>

The post transient analysis indicated that a breaker failure at Hemingway substation resulting in loss of the Midpoint-Hemingway 500 kV transmission line and the Hemingway 500/230 kV transformer results in an unacceptable overload on the Hells Canyon-Brownlee 230 kV line. This issue can be solved by operating the system with the Walla Walla series capacitor bypassed (as the system is operated today during most spring seasons).

Aside from the breaker failure contingency at Hemingway substation, historic flow levels and post-transient contingency results do not indicate that the Idaho-Northwest path and the West of Hatwai path have a simultaneous interaction at the flow levels studied.

4.8.4 Voltage Stability

The Idaho-Northwest v West of Hatwai study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v West of Hatwai study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 2362.5MW, 105% of the proposed 2250 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 2250 MW rating simultaneous with West of Hatwai at 3400 MW.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16hs2a_3400WoH_2250idnw_N base case can be found in Appendix C. The busses studied utilizing VQ Analysis are: Bell 500 kV, Brownlee 230 kV, Hatwai 500 kV, Hemingway 500 kV, and

Taft 500 kV. The tables below highlight a sample of the reactive margins at these busses. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 34: 16hs2a_3400WoH_2250idnw_N base case reactive margin results (sample)

	Contingencies	V @ Qmin	Margin (MVAr)	Comments
Bell	N-1: BELL-COULEE 500 KV	0.88	-918	Worst VQ contingency
Bell	N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV + RAS	0.89	-1569	Worst VQ related to Idaho Power
Bell	BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.89	-1671	Worst VQ related to Idaho-NW
Brownlee	BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.89	-350	Worst VQ contingency
Brownlee	BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.89	-491	2nd Worst VQ contingency
Brownlee	BF IPC HEMINGWAY-SUMMER L 500 KV & HEMINGWAY 500/230 XFMR	0.88	-552	3rd Worst VQ contingency
Hatwai	N-2: LOWER GRANITE-CENTRAL FERRY #1 & #2 500 KV + RAS OPEN 69 KV	0.78	-1059	Worst VQ contingency
Hatwai	N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV + RAS	0.85	-1746	Worst VQ related to Idaho Power
Hatwai	BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.85	-1796	Worst VQ related to Idaho-NW
Hemingway	N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV + RAS	0.86	-1193	Worst VQ contingency
Hemingway	BF IPC HEMINGWAY-SUMMER L 500 KV & HEMINGWAY 500/230 XFMR	0.82	-1394	2nd Worst VQ contingency
Hemingway	BUS: SUMMER LAKE 500 KV	0.82	-1441	3rd Worst VQ contingency
Taft	N-2: TAFT-BELL & TAFT-DWORSKAK 500 KV + RAS	0.98	-471	Worst VQ contingency
Taft	N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV + RAS	0.95	-1122	Worst VQ related to Idaho Power
Taft	BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.95	-1152	Worst VQ related to Idaho-NW

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability interaction between the Idaho-Northwest path and the West of Hatwai path at the flow levels studied.

4.8.5 Transient Stability

Transient stability contingency results for the 16hs2a_3400WoH_2250idnw_N case can be found in Appendix C.

The 16hs2a_3400WoH_2250idnw_N base case was the basis for all transient stability study results for this Hemingway-Boardman v West of Hatwai Simultaneous Interaction Study. All contingencies resulted in stable and damped performance with no violations to the WECC Performance Criteria.

4.8.6 Remedial Action Schemes

For the 16hs2a_3400WoH_2250idnw_N case, each contingency, and the associated switching (RAS), is documented in Appendix C. Details for the notable contingencies can be found below.

Severe Post-Transient Contingency #1 – N-1: Hemingway-Grassland 500 kV +PTSN Shunt

After the loss of this line, switched VAr devices modeled at Dillon 69 kV, OreBasin 34.5 kV and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. On the Hemingway 500 kV bus, a capacitor insertion scheme will switch a 200 MVAr shunt capacitor in service. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 35: Shunt Capacitor Switching in N-1: Hemingway-Grassland 500 kV + PTSN Shunt

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Dillon 69 kV (62345)	15.9 MVAr	27.9 MVAr
Hemingway 500 kV (60155)	200 MVAr	400 MVAr
OreBasin 34.5 kV (66146)	0 MVAr	20 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #2 – BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230

After the loss of this line and transformer, switched VAr devices modeled at Peterson 230 kV, Dillon 69 kV, Harney 115 kV, Quartz 138 kV, Midpoint 500 kV and North Powder 34.5 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 36: Shunt Capacitor Switching in BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Dillon 69 kV (62345)	15.9 MVAr	27.9 MVAr
Harney 115 kV (40507)	0 MVAr	13 MVAr
Midpoint 500 kV (60240)	0 MVAr	200 MVAr
North Powder 34.5 kV (60313)	0 MVAr	27 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr
Quartz 138 kV (60305)	0 MVAr	22.5 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #3 – N-2: DC-BIPOLE

See Section 4.7.6 for a write up on the RAS associated with the loss of the PDCI.

Severe Post-Transient Contingency #4 – N-2: Double Palo Verde

This contingency depresses the voltage at Malin, resulting in triggering operating of the FACRI. FACRI includes the insertion of the Fort Rock series capacitors in the 500 kV lines south of Grizzly, and insertion of shunt capacitor banks at Captain Jack 500 kV, Malin 500 kV, Olinda 500 kV, and Table Mtn 500 kV. FACRI will also remove shunt reactors at Captain Jack 500 kV, and Malin 500 kV.

See Appendix C for a list of actions taken in this contingency.

4.9 Simultaneous Interaction Study: MSTI & SWIP (SWIP South – 1500 MW)

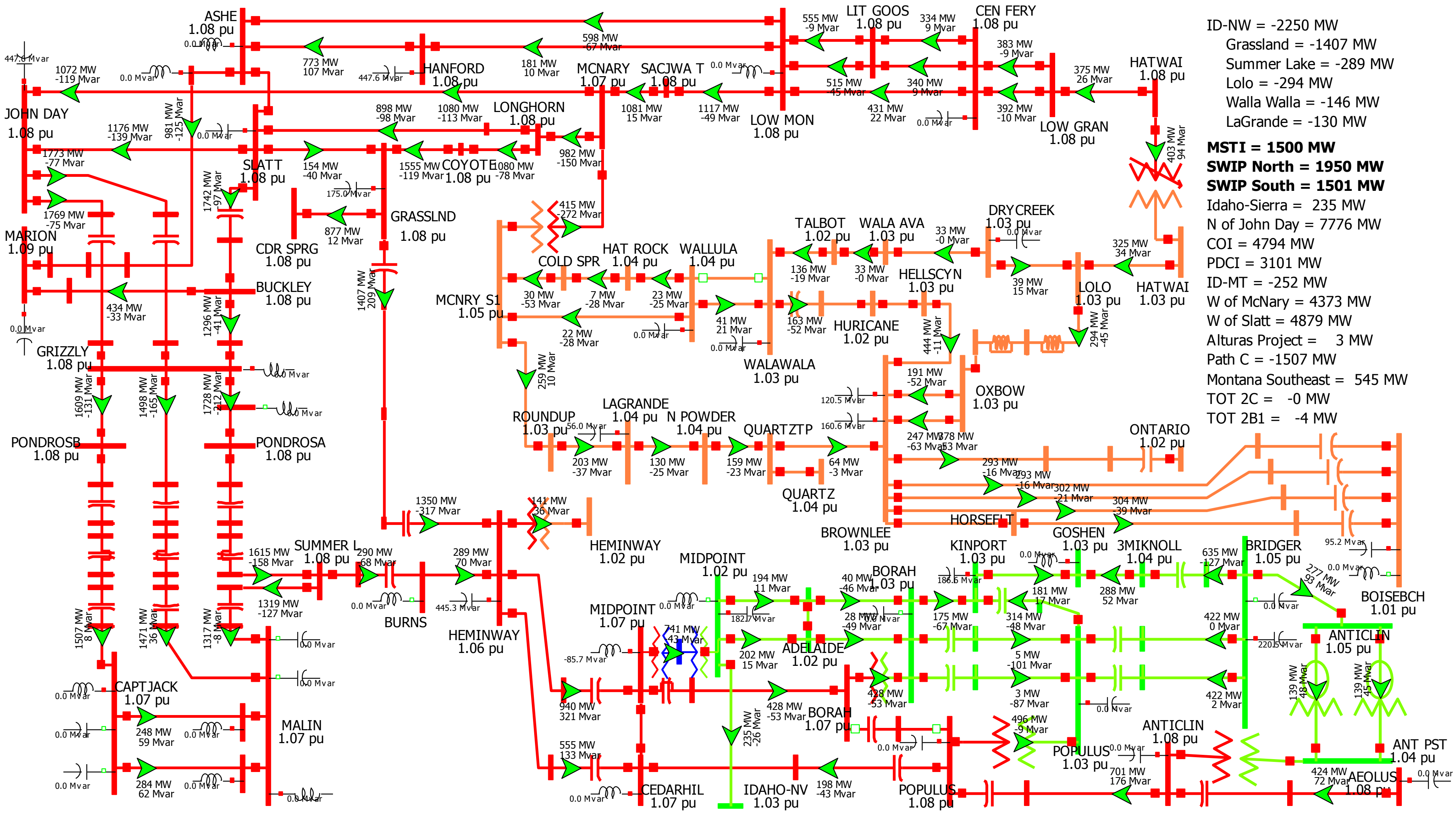


Figure 13: Idaho-Northwest (Path 14) 2250 MW, West to East, MSTI & SWIP Case

4.9.1 Background & Need for Simultaneous Interaction Studies

The Mountain States Transmission Intertie (MSTI) and the Southwest Intertie Project (SWIP) are proposed projects similarly situated in Phase 2 of the WECC path rating process. The MSTI project extends from Townsend substation, in western Montana, to Midpoint substation, in southern Idaho. The SWIP project is made up of a northern segment and a southern segment. SWIP North extends from Midpoint substation to Robinson substation, near Ely, Nevada. SWIP South, otherwise known as the One Nevada Line, extends from Robinson substation to Harry Allen substation in the Las Vegas area. SWIP South is scheduled to be energized in late 2012, and has been modeled in all base cases.

The report assumes that the Idaho terminus of the SWIP North will change to Cedar Hill with the addition of Gateway West and an additional 500 kV line will be constructed from Cedar Hill to Midpoint.

Due to the Hemingway-Boardman, MSTI and SWIP projects being similarly situated in the rating process, and the large impact the MSTI and SWIP projects will have on the Idaho Power transmission system, a simultaneous interaction study between Idaho-Northwest and MSTI/SWIP is prudent and necessary. The MSTI and SWIP North project are not included in any of the other base cases. Absent other projects, such as the Overland DC line, MSTI and SWIP work best when studied together.

4.9.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case names for this study are: 16hs2a_2250idnw_ms.

Step-by-step development of the 16hs2a_2250idnw_ms case:

Step 1: Begin with the 16hs2a_2250idnw_N base case.

Utilize the base case developed in Section 4.1.2 Steady State Case Stressing.

Step 2: Add the MSTI and SWIP projects and stress each line.

MSTI was stressed to its 1,500 MW north-to-south rating, SWIP North was stressed to 1,950 MW north-to-south, and SWIP South was stressed to 1500 MW north-to-south. MSTI & SWIP path flows were modified by increasing generation in Montana and reducing generation in Nevada and Arizona and using the phase shifters at Townsend 500 kV and Robinson 345 kV.

Step 3: Re-stress the Idaho-Northwest path to 2250 MW in the west-to-east direction.

The Idaho-Northwest path was stressed to 2250 MW in the west-to-east direction by reducing southern generation and replacing the generation with a schedule from the Northwest.

4.9.3 Post Transient Results

Post-transient contingency results for the MSTI & SWIP (SWIP South – 1500 MW) case can be found in Appendix D. The case name is 16hs2a_2250idnw_ms. Details for the notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF PGE Grassland-Cedar Sp 500 kV&Grassland-Hem 500 kV

This breaker failure is the most limiting contingency in the study of Idaho-Northwest v MSTI & SWIP. This contingency results in overloading the Townsend 500 kV phase shifter to 112% of its assumed nominal rating (1550 MVA) and 97% of the assumed emergency rating (1782.5 MVA). Refer to the table below for more information about the overloads caused by this contingency.

Table 37: Post-transient results – BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kV

Element	Nominal % Loading	Emergency % Loading
Townsend Phase Shifter 500 kV	111.8% (1790 Amp Rating)	97.2% (2058 Amp Rating)
Brownlee-Hells Canyon 230 kV	106% (1237 Amp Rating)	94% (1396 Amp Rating)
Oxbow – Lolo 230 kV	101% (920 Amp SOL)	89% (1047 Amp Rating)

If COI transfers are heavy in the north-to-south direction, as modeled in this base case, FACRI will trigger the insertion of the Fort Rock series capacitors, significantly improving the Idaho-Northwest path performance for this contingency. Inserting the Fort Rock series capacitors in the Grizzly-Captain Jack, Grizzly-Malin & Grizzly-Summer Lake 500 kV lines is not modeled in this post-transient contingency analysis as a conservative study assumption.

Severe Post-Transient Contingency #2 – N-1: Hemingway-Grassland 500 kV + PTSN Shunt

This is the second most limiting contingency in the study of Idaho-Northwest v MSTI & SWIP. This contingency results in overloading the Townsend 500 kV phase shifter to 111% of its assumed nominal rating (1550 MVA) and 97% of its assumed emergency rating (1782.5 MVA). Refer to the table below for more information about the overloads caused by this contingency.

Table 38: Post-transient results – N-1: Hemingway-Grassland 500 kV + PTSN Shunt

Element	Nominal % Loading	Emergency % Loading
Townsend 500 kV Phase Shifter	111.2% (1528 Amp Rating)	96.7% (1782 Amp Rating)
Brownlee-Hells Canyon 230 kV	104% (1237 Amp Rating)	92% (1396 Amp Rating)

If COI transfers are heavy in the north-to-south direction, as modeled in this base case, FACRI will trigger the insertion of the Fort Rock series capacitors, significantly improving the Idaho-Northwest path performance for this contingency.

Notable Contingency #1 – N-1: Midpoint-Townsend 500 kV (MSTI)

This contingency results in overloading the Oxbow-Lolo 230 kV line to 107.8% of its SOL rating (94.8% of emergency). Refer to the table below for more information about the overloads caused by this contingency.

Table 39: Post-transient results – N-1: Midpoint-Townsend 500 kV (MSTI) + PTSN Shunt

Element	Nominal % Loading	Emergency % Loading
Oxbow – Lolo 230 kV	107.8% (920 Amp SOL)	94.8% (1047 Amp Rating)
Brownlee-Hells Canyon 230 kV	102% (1237 Amp Rating)	90% (1396 Amp Rating)
Midpoint-Hemingway 500 kV	109% (1183 Amp Rating)	80% (1877 Amp Rating)

Switching a new 31.7 MVAr shunt capacitor at Peterson 230 kV is required to avoid post-transient voltage deviation issues.

Notable Contingency #2 – BF IPC Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

This contingency results in overloading the Townsend phase shifting transformer to 111.3% of its assumed nominal rating (96.8% of assumed emergency). Refer to the table below for more information about the overloads caused by this contingency.

Table 40: Post-transient results – BF IPC Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Townsend Phase Shifter 500 kV	111.3% (1528 Amp Rating)	96.8% (1782 Amp Rating)
Brownlee-Hells Canyon 230 kV	105% (1237 Amp Rating)	90% (1396 Amp Rating)

If COI transfers are heavy in the north-to-south direction, as modeled in this base case, FACRI will trigger the insertion of the Fort Rock series capacitors, significantly improving the Idaho-Northwest path performance for this contingency.

Conclusions

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 2250 MW west-to-east rating simultaneous with MSTI at 1500 MW north-to-south, and SWIP at 1950 MW north-to-south.

4.9.4 Voltage Stability

The Idaho-Northwest v MSTI & SWIP study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v MSTI & SWIP study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 2363 MW, 105% of the proposed 2250 MW west-to-east rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 2250 MW rating, simultaneous with the MSTI and SWIP lines at their proposed ratings.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16hs2a_2250idnw_ms case can be found in Appendix D. Busses studied utilizing VQ Analysis are: Brownlee 230 kV, Hanford 500 kV, Hemingway 500 kV, John Day 500 kV, Malin 500 kV, Marion 500 kV, McNary 500 kV, Mill Creek 230 kV and Yellowtail 230 kV. The tables below highlight a sample of the reactive margins at Hemingway, Robinson, and Townsend. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 41: Hemingway 500 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-2: Double Palo Verde	0.86	-1436	Worst VQ contingency
BF IPC HEM-Grassland 500 kV & HEM 500/230 XFMR	0.77	-1990	Worst VQ related to Idaho Power
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.81	-1940	Worst VQ related to Idaho-Northwest

Table 42: Townsend 500 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-2: Double Palo Verde	0.96	-390	Worst VQ contingency
N-2: GARRISON-TAFT #1 & #2 500 KV + RAS	0.93	-431	Worst VQ related to Montana
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.94	-551	Worst VQ related to Idaho-Northwest

Table 43: Robinson 500 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-1: ROBINSON-HARRY ALLEN 500 KV	0.70	-1283	Worst VQ contingency
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR	0.70	-1874	Worst VQ related to Idaho Power
BUS: SUMMER LAKE 500 KV	0.70	-2215	Worst VQ related to Idaho-Northwest

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability interaction between the Idaho-Northwest path and the MSTI or SWIP projects at the flow levels studied.

4.9.5 Transient Stability

Transient stability contingency results for the 16hs2a_2250idnw_ms case can be found in Appendix D.

The 16hs2a_2250idnw_ms base case was the basis for all transient stability study results for this Hemingway-Boardman v MSTI & SWIP Simultaneous Interaction Study. All contingencies resulted in stable and damped performance with no violations to the WECC Performance Criteria.

FACRI was modeled in the base case dynamic data base file and triggered for loss of the Hemingway-Boardman 500 kV line.

4.9.6 Remedial Action Schemes

For the 16hs2a_2250idnw_ms case, each contingency, and the associated switching (RAS), is documented in Appendix D. Details for the notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF PGE Grassland-Cedar Sp 500 kV&Grassland-Hem 500 kV

After the loss of these two lines, switched VAr devices in the area would switch in due to depressed voltages at the busses that the devices would be controlling. The contingency included capacitor switching of 31.7 MVAr at Peterson 230 kV and 22.5 MVAr at Quartz 138 kV. In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #2 – N-1: Hemingway-Grassland 500 kV

After the loss of this line, switched VAr devices modeled at Peterson 230 kV, and Dillon 69 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. On the Hemingway 500 kV bus, a capacitor insertion scheme will switch a 200 MVAr shunt capacitor in service. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 44: Shunt Capacitor Switching in N-1: Hemingway-Grassland 500 kV

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Dillon 69 kV (62345)	15.9 MVAr	27.9 MVAr
Hemingway 500 kV (60155)	200 MVAr	400 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Notable Contingency #1 – N-1: Midpoint-Townsend 500 kV (MSTI)

After the loss of this line, switched VAr devices in Montana, Wyoming and Idaho would switch in due to depressed voltages at the busses that the devices would be controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 45: Shunt Capacitor Switching in N-1: Midpoint-Townsend 500 kV

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Peterson 230 kV (62030)	0 MVAr	31.7 MVAr
Riverton 230 kV (66305)	0 MVAr	32.4 MVAr
Garland 1 34.5 (67147)	0 MVAr	5 MVAr
Garland 2 34.5 (67148)	0 MVAr	5 MVAr
Dillon 69 kV (62345)	12 MVAr	24 MVAr
Big Grassy 69 kV (65156)	19.6 MVAr	29.4 MVAr
Amps 69 kV (65026)	20 MVAr	30 MVAr
Frannie 34.5 kV (67144)	0 MVAr	4 MVAr
Frannie 2 34.5 kV (67145)	0 MVAr	4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Notable Contingency #2 – BF IPC Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

This contingency opens the Hemingway-Grassland 500 kV line and the Hemingway 500/230 kV transformer. This contingency does not have any associated RAS.

4.10 Sensitivity Study: Hemingway-Boardman Stand Alone

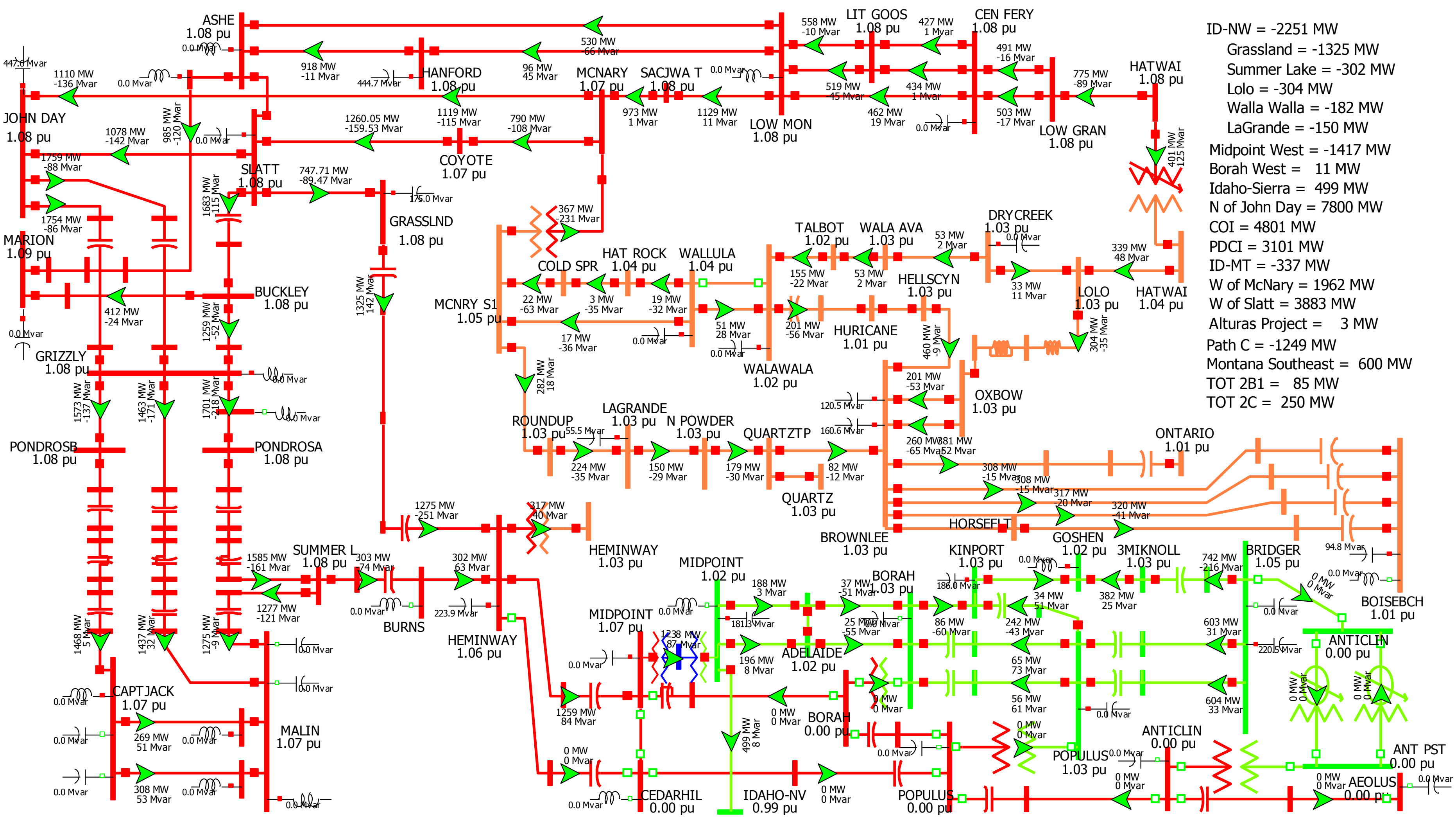


Figure 14: Idaho-Northwest (Path 14) 2250 MW, West to East, Stand Alone Case

4.10.1 Background & Need for Simultaneous Interaction Studies

The Hemingway-Boardman 500 kV transmission project may be constructed and put into service prior to the addition of many of the other projects listed in the Plan of Service (Section 2.4). This sensitivity study will prove that the Idaho-Northwest is capable of 2250 MW in the west-to-east direction without (1) Stage One of Gateway West, (2) the Cascade Crossing Transmission Project, and (3) Longhorn substation & associated wind. Projects listed in Section 2.4, other than the three above, are modeled in the base case due to their certainty; both from a timing prospective and a project complete ability prospective (most have completed permitting and are under construction).

In this case, Idaho-Northwest is studied at its 2250 MW west-to-east rating simultaneous with COI (4800 MW north-to-south), Idaho-Sierra (500 MW north-to-south), Montana-Idaho (337 MW north-to-south), Montana Southeast (600 MW north-to-south), North of John Day (7800 MW north-to-south) and PDCI (3100 MW north-to-south).

4.10.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is: 16hs2a_2250idnw_solo.

Step-by-step development of the 16hs2a_2250idnw_solo base case:

Step 1: Begin with the 16hs2a_2250idnw_N case

Utilize the base case developed in Section 4.1.2 Steady State Case Stressing.

Step 2: Remove elements from the base case to create a "Hemingway-Boardman Stand Alone" case

Remove the following elements from the 16hs2a_2250idnw_N case: (1) Stage One of Gateway West, (2) Cascade Crossing, and (3) the Longhorn substation & associated wind projects.

Step 3: Re-stress the Idaho-Northwest path to 2250 MW.

After removing the elements in Step 2, flow goes up on Idaho-Northwest, west-to-east. In order to reduce Idaho-Northwest flow, Northwest generation was reduced and Idaho area generation was increased.

Step 4: Re-stress the Simultaneous Interaction Study Paths.

Re-stress the following paths: (1) COI to 4800 MW north-to-south, (2) Idaho-Sierra to 500 MW north-to-south, (3) Montana-Idaho to 337 MW north-to-south, (4) Montana Southeast to 600 MW north-to-south, (5) North of John Day to 7800 MW north-to-south and (6) PDCI to 3100 MW north-to-south.

4.10.3 Post Transient Results

Post-transient contingency results for the 16hs2a_2250idnw_solo case can be found in Appendix E. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF IPC Midpoint-Hem & Hem 500/230 kV Xfmr (non-credible)

This contingency is unsolved in the base case.

The Hemingway 500 kV bus will be constructed so that the Midpoint-Hemingway 500 kV line and the Hemingway 500/230 kV transformer do not share a common breaker, otherwise, the rating of the Idaho-Northwest path will have to be reduced. The Hemingway bus will be set up as depicted in the figure below (note the slightly grayed out breaker) if the Hemingway-Boardman 500 kV line is completed prior to the addition of the Populus-Cedar Hill-Hemingway 500 kV line.

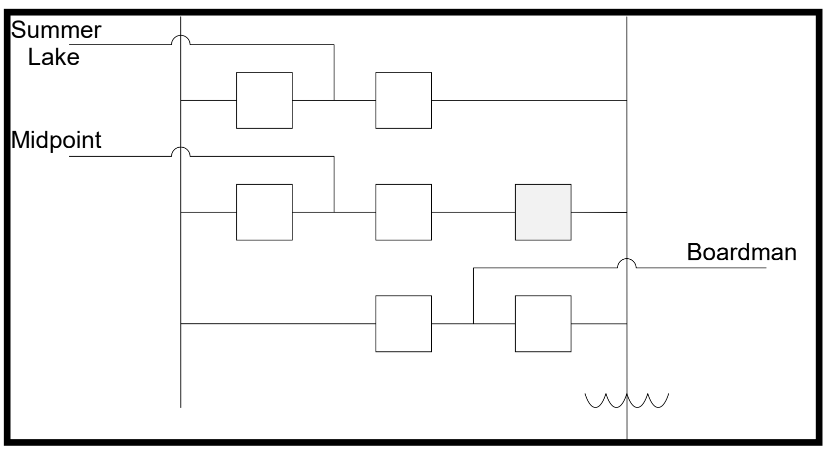


Figure 15: Hemingway 500 kV bus after the Hemingway-Boardman 500 kV line

Severe Post-Transient Contingency #2 – BF IPC Hemingway-Grassland & Hem 500/230 kV Xfmr

This is the limiting contingency for the Idaho-Northwest path in the west-to-east direction in this sensitivity case. This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 113% of its nominal rating (99.7% of emergency). Since the overload is less than the Brownlee-Hells Canyon 230 kV lines emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 46: Post-transient results – BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS

Element	Nominal % Loading (Limit A)	Emergency % Loading (Limit B)
Brownlee-Hells Canyon 230 kV	112.5% (1237 Amp Rating)	99.7% (1396 Amp Rating)
Oxbow-Lolo 230 kV	109.7% (920 Amp SOL)	96.4% (1047 Amp Rating)
Mill Creek-Peterson 230 kV	102.7% (800 Amp Rating)	68.5% (1200 Amp Rating)

If COI transfers are heavy in the north-to-south direction, as modeled in this base case, FACRI will trigger the insertion of the Fort Rock series capacitors, significantly improving the Idaho-Northwest path performance for this contingency. Inserting the Fort Rock series capacitors in the Grizzly-Captain Jack, Grizzly-Malin & Grizzly-Summer Lake 500 kV lines is not modeled in this post-transient contingency analysis as a conservative study assumption.

Severe Post-Transient Contingency #3 – N-1: Midpoint-Hemingway 500 kV

This contingency results in only minor nominal rating overloads on the Brownlee-Hells Canyon 230 kV line, and the Mill Creek-Peterson 230 kV line. The main concern with this contingency is severe post-transient voltage deviations across the Montana-Idaho (Path 18) transmission path at Peterson, an Idaho Power bus, and Amps, a PacifiCorp bus. For this N-1, the Peterson 230 kV bus voltage falls to 0.86 pu, a voltage drop of 9.7% and the Amps 230 kV bus voltage falls to ~0.88 pu, a voltage drop of 8.4%. Peterson and Amps 230 kV busses experience post-transient voltage deviations of ~6% following the loss of the Hemingway-Summer Lake 500 kV line today.

The table below highlights the performance of the voltage at Peterson 230 kV and Amps 230 kV following the loss of the Midpoint-Hemingway 500 kV line for varying levels of shunt capacitor switching.

Table 47: Post-transient voltage deviation results for Peterson & Amps 230 kV busses

Post-Transient Shunt Switching						MVAr Change						Voltage Deviation	
HMWY	Dillon	Ore Basin	PTSN	Borah	Mill Creek	HMWY	Dillon	Ore Basin	PTSN	Borah	Mill Creek	Peterson 230	Amps 230
X	X	X				200	12	20	0	0	0	9.7%	8.4%
X	X	X	X			200	12	20	31.7	0	0	6.1%	6.2%
X	X	X	X	X		200	12	20	31.7	175	0	5.8%	5.6%
X	X	X	X		X	200	12	20	31.7	0	37.5	5.4%	5.8%
X	X	X	X	X	X	200	12	20	31.7	175	37.5	5.3%	5.3%

In all cases, shunt capacitors are inserted post-contingency at Hemingway 500 kV (based on a capacitor insertion scheme at Hemingway), Dillon 69 kV (based on depressed voltages post-contingency at Dillon), and Ore Basin 34.5 kV (based on depressed post-contingency voltages at Ore Basin) totaling 200 MVAr, 12 MVAr, and 20 MVAr, respectively. Inserting the new Peterson 31.7 MVAr capacitor, detailed in the Plan of Service in Section 2.4, results in significantly improved performance approximately matching the performance of the system today. This report assumes that the new Peterson 230 kV shunt capacitor will be sufficient to avoid a simultaneous interaction between the Idaho-Northwest path and the Montana-Idaho path. This contingency is modeled as N-1: Midpoint-Hemingway 500 kV + PTSN Shunt.

If Idaho Power or PacifiCorp require superior performance at Peterson or Amps, shunt capacitors at Borah and/or Mill Creek could be inserted. Idaho Power has an existing remedial action scheme connecting Midpoint and Borah substations that could be utilized to switch the Borah shunt capacitor. At Mill Creek, Northwestern has two shunt capacitors (18.8 MVAr and 18.7 MVAr) connected to the tertiary of their respective 230/161 kV transformers that could potentially be switched based on 230 kV bus voltage levels at Mill Creek.

Severe Post-Transient Contingency #4 – N-1: Hemingway-Grassland 500 kV + PTSN Shunt

This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 109% of its nominal rating (97% of emergency). Since the overload is less than the Brownlee-Hells Canyon 230 kV lines emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 48: Post-transient results – N-1: Hemingway-Grassland 500 kV + PTSN Shunt

Element	Nominal % Loading (Limit A)	Emergency % Loading (Limit B)
Brownlee-Hells Canyon 230 kV	112.5% (1237 Amp Rating)	96.7% (1396 Amp Rating)
Oxbow-Lolo 230 kV	109.7% (920 Amp SOL)	93.0% (1047 Amp Rating)
Mill Creek-Peterson 230 kV	102.7% (800 Amp Rating)	68.6% (1200 Amp Rating)

In reality, with high north-to-south loading on the COI, loss of Hemingway-Boardman 500 kV depresses the voltage at Malin to a value less than 1.05 pu, resulting in FACRI insertion of the Fort Rock series capacitors. The results above do not include the operation of the FACRI, as a conservative planning assumption (the Idaho-Northwest path could be operating at 2250 MW west-to-east, with low flow on the COI). The table below shows the overloads following the loss of Hemingway-Boardman 500 kV with FACRI insertion of the Fort Rock series capacitors.

Table 49: Post-transient results – N-1: Hemingway-Grassland 500 kV + FACRI

Element	Nominal % Loading (LimitA)	Emergency % Loading (LimitB)
Brownlee-Hells Canyon 230 kV	100.6% (1237 Amp Rating)	89.2% (1396 Amp Rating)
Oxbow-Lolo 230 kV	95.6% (920 Amp SOL)	84.0% (1047 Amp Rating)
Mill Creek-Peterson 230 kV	96.2% (800 Amp Rating)	64.1% (1200 Amp Rating)
Grizzly-Summer Lake Fort Rock Series Cap	122.0% (2400 Amp Rating)	91.5% (3199 Amp Rating)

The new Peterson 230 kV shunt capacitor does not switch assuming FACRI operation.

The results show a large reduction to the overloads on the Idaho-Northwest 230 kV lines, however, the Grizzly-Summer Lake line Fort Rock series capacitor overloads to 122% of its nominal rating (92% of emergency). Overall, FACRI improves the performance of this contingency.

Severe Post-Transient Contingency #5 – N-2: Bridger-Populus #1 & #2 345 kV

This contingency results in overloading the Midpoint 500/345 kV transformer to 109% of its nominal 1500 MVA rating (99% of its emergency 1650 MVA rating). Since the overload is less than the Midpoint 500/345 kV transformer's emergency rating, this contingency results in acceptable performance. Post-transient voltage deviations are within WECC System Performance Criteria allowable 10% for N-2 contingencies.

Severe Post-Transient Contingency #6 – N-1: Round Mtn-Table Mtn #1 500 kV

This contingency results in overloading the Round Mtn-Table Mtn #2 500 kV line to 148% of its nominal rating (99% of emergency). Since the overload is less than the emergency rating of the 500 kV line, this contingency results in acceptable performance.

The table below compares the system today (Idaho-Northwest stressed to 1200 MW) to the system modeled in the base case (Idaho-Northwest stressed to 2250 MW). The base case includes the Hemingway-Boardman and Gateway West 500 kV lines, whereas the "system today" does not.

Table 50: Post-transient results – N-1: Round Mtn-Table Mtn #2 500 kV

	Existing System (1200 Case)			Future System (2250 Case)		
Element	Pre-Cont. Loading	Post-Cont. Loading	Difference	Pre-Cont. Loading	Post-Cont. Loading	Difference
RoundMtn-TableMtn #2 500 kV	55.2% 1811 Amps	99.4% 3262 Amps	44.2% 1451 Amps	55.4% 1819 Amps	99.3% 3259 Amps	43.9% 1440 Amps

As can be seen from the table above, the Hemingway-Boardman 500 kV line improves the results of this contingency.

Conclusion

Post transient analysis indicated that a Hemingway substation breaker failure resulting in the loss of the Midpoint-Hemingway 500 kV line and the Hemingway 500/230 kV transformer results in unacceptable system performance (contingency doesn't solve). The Hemingway 500 kV bus will be constructed so that the Midpoint-Hemingway 500 kV line and the Hemingway 500/230 kV transformer do not share a common breaker. The Hemingway bus will be configured as depicted in Figure 2 of Section 2.4 (note the slightly grayed out breaker) if the Hemingway-Boardman 500 kV line is completed prior to the addition of the Populus-Cedar Hill-Hemingway 500 kV line.

With the Hemingway breaker failure addressed as part of the plan of service, all other post-transient results indicate that Idaho-Northwest path can achieve a 2250 MW west-to-east rating, absent other projects in the Plan of Service.

4.10.4 Voltage Stability

The Hemingway-Boardman Stand Alone study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Hemingway-Boardman Stand Alone study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 2362.5MW, 105% of the proposed 2250 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 2250 MW rating with only the Hemingway-Boardman 500 kV line in service.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16hs2a_2250idnw_N_solo base case can be found in Appendix E. Busses studied utilizing VQ Analysis are: Brownlee 230 kV, Hanford 500 kV, Hemingway 500 kV, John Day 500 kV, Malin 500 kV, Marion 500 kV, Mill Creek 230 kV, and Yellowtail 230 kV. The tables below highlight a sample of the reactive margins at Hanford, Hemingway, John Day and Malin. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 51: **Hanford 500 kV** bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-2: DOUBLE PALO VERDE	0.95	-1007	Worst VQ
N-2: PAUL-NAPAVINE & PAUL-ALLSTON #2 500 KV + RAS	0.95	-1495	2nd Worst VQ
N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV + RAS	0.95	-1502	3rd Worst VQ

Table 52: **Hemingway 500 kV** bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
BUS: SUMMER LAKE 500 KV	0.79	-1046	Worst VQ
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV + RAS	0.86	-1069	2nd Worst VQ
BF 4957 SUMMER L-MALIN & SUMMER L-HEMINGWAY 500 KV	0.79	-1076	3rd Worst VQ

Table 53: **John Day 500 kV** bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.99	-940	Worst VQ
BF 5003 SLATT-BUCKLEY & SLATT-BOARDMAN 500 KV	0.99	-1074	2nd Worst VQ
N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.99	-1084	3rd Worst VQ

Table 54: **Malin 500 kV** bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
BF 4072 GRIZZLY-MALIN #2 & MALIN-ROUND MTN #2 500 KV	0.86	-1835	Worst VQ
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.93	-1922	2nd Worst VQ
BF 4046 JOHN DAY-GRIZZLY #2 & GRIZZLY-MALIN #2 500 KV	0.88	-1928	3rd Worst VQ

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, voltage stability is not an issue for the Idaho-Northwest path at the flow levels studied.

4.10.5 Transient Stability

Transient stability contingency results for the 16hs2a_2250idnw_solo case can be found in Appendix E.

The 16hs2a_2250idnw_solo base case was the basis for all transient stability study results for this Hemingway-Boardman Stand Alone Sensitivity Study. All contingencies resulted in stable and damped performance with no violations to the WECC Performance Criteria.

FACRI was modeled in the base case dynamic data base file and triggered for loss of the Hemingway-Boardman 500 kV line.

4.10.6 Remedial Action Schemes

For the 16hs2a_2250idnw_solo base case, each contingency, and the associated switching (RAS), is documented in Appendix E. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF IPC Midpoint-Hem & Hem 500/230 kV Xfmr (non-credible)

As documented in the Post-Transient section, this contingency is not credible.

Severe Post-Transient Contingency #2 – BF IPC Hemingway-Grassland & Hem 500/230 kV Xfmr

After the loss of this line and transformer, switched VAr devices modeled at Dillon 69 kV and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. On the Hemingway 500 kV bus, a capacitor insertion scheme will switch a 200 MVAr shunt capacitor in service. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 55: Shunt Capacitor Switching in BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Dillon 69 kV (62345)	15.9 MVAr	27.9 MVAr
Hemingway 500 kV (60155)	200 MVAr	400 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #3 – N-1: Midpoint-Hemingway 500 kV + PTSN Shunt

After the loss of this line and transformer, switched VAr devices modeled at Dillon 69 kV, re Basin 34.5 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. On the Hemingway 500 kV bus, a capacitor insertion scheme will switch a 200 MVAr shunt capacitor in service. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 56: Shunt Capacitor Switching in N-1: Midpoint-Hemingway 500 kV + PTSN Shunt

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Dillon 69 kV (62345)	15.9 MVAr	27.9 MVAr
Hemingway 500 kV (60155)	200 MVAr	400 MVAr
Orebasin 34.5 kV (66146)	0 MVAr	20 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #4 – N-1: Hemingway-Grassland 500 kV + PTSN Shunt

After the loss of this line and transformer, switched VAr devices modeled at Dillon 69 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. On the Hemingway 500 kV bus, a capacitor insertion scheme will switch a 200 MVAr shunt capacitor in service. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 57: Shunt Capacitor Switching in N-1: Hemingway-Grassland 500 kV + PTSN Shunt

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Dillon 69 kV (62345)	15.9 MVAr	27.9 MVAr
Hemingway 500 kV (60155)	200 MVAr	400 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #5 – N-2: Bridger-Populus #1 & #2 345 kV

This contingency is monitored by the WECC RASRS accepted Bridger West Remedial Action Scheme (RAS). After this double line loss, given the flow levels modeled in the case, the Bridger RAS will trip two Bridger units totaling ~1100 MW (in this case). The Bridger RAS will also insert the Borah 345 kV 175 MVAr shunt capacitor. Flow reduction on the Bridger West path, following the unit trip, will result in bypassing of portions of the series capacitors on the Bridger West 345 kV lines. Finally, Dillon 69 kV and Peterson 230 kV shunt capacitors will switch in due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 58: Shunt Capacitor Switching in N-2: Bridger-Populus #1 & #2 345 kV

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Borah 345 kV (60060)	0 MVAr	175 MVAr
Hemingway 500 kV (60155)	15.9 MVAr	27.9 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

4.11 Sensitivity Study: Walla Walla Area, 100% Wind

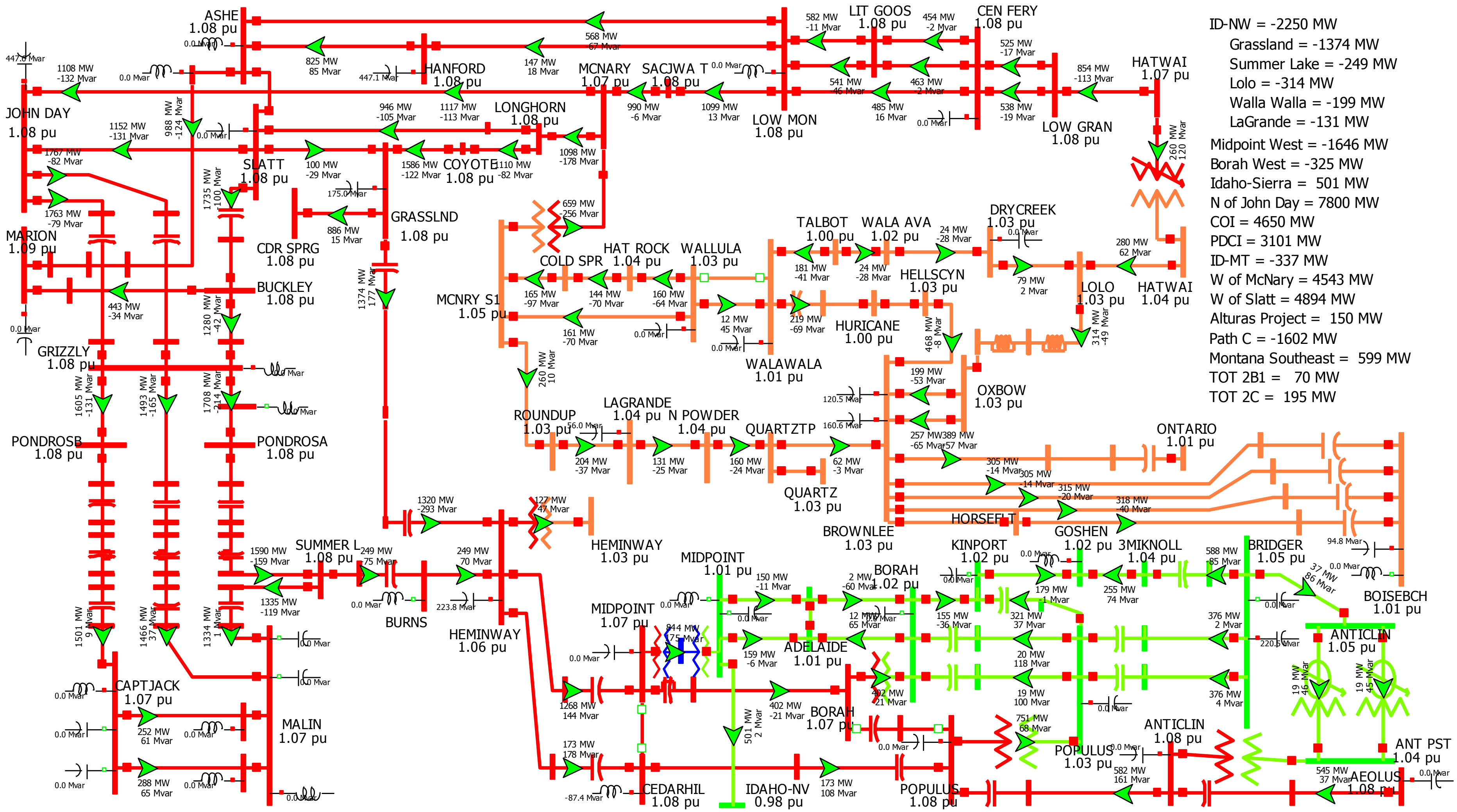


Figure 16: Idaho-Northwest (Path 14) 2250 MW, West to East, Walla Walla Area, 100% Wind, Base Case

4.11.1 Background & Need for Simultaneous Interaction Studies

With the influx of wind in the Pacific-Northwest, the Hemingway to Boardman Phase II study review group requested that the impacts of the Hemingway to Boardman project be evaluated with heavy wind modeled in the Walla Walla area.

4.11.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is 16hs2a_2250idnw_nww.

Step-by-step development of the 16hs2a_2250idnw_N_nww case:

Step 1: Begin with the 16hs2a_2250idnw_N base case.

Utilize the base case developed in Section 4.1.2 Steady State Case Stressing.

Step 2: Increase wind in the Walla Walla area (Southeast Washington).

Incorporate 100% wind output for the wind generators listed in the table below. Previously, Walla Walla area wind output was at 50% in the 16hs2a_2250idnw_N base case.

Table 59: Wind Modeled at 100% in Walla Walla Area, 100% Wind Case

Owner	BUS Name	Output (MW)
Avista	FWEGEN	100
BPA	DDGJN W1	190.9
	PHLNG W1	151.8
	9MILE W2	100
PacifiCorp	ECHOWIND	64.6
	FPL_LT	98.9
	CMBHL W1	41
	MARENG 1	141.6
	MARENG2LT	70.8
	STATL W2	210
	VANSY W1	25
	VNSCL3LT	98.9
Puget Sound Energy	HOPKR W1	75
	HOPKR W2	75

Step 3: Re-stress the Idaho-Northwest path to 2250 MW in the west-to-east direction.

With the wind generators noted in the table above at 100% output, TE Roach complex (Brownlee, Oxbow, and Hells Canyon hydroelectric dams) generation had to be curtailed by approximately 30 MW to avoid overloading the Oxbow-Lolo and Hells Canyon-Walla Walla lines. Idaho-Northwest flows were maintained at 2250 MW, west-to-east. No other paths were significantly altered.

4.11.3 Post Transient Results

Post-transient contingency results for the Walla Walla Area, Wind 100% study can be found in Appendix F. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF PGE Grassland-Cedar Sp 500 kV&Grassland-Hem 500 kV

The breaker failure is the most limiting contingency for the Walla Walla Area, 100% Wind sensitivity study. The contingency results in loading the Hells Canyon 230 kV line to 112.7% of its nominal rating (99.9% of the assumed emergency rating). Refer to the table below for more information about the overloads caused by this contingency.

Table 60: Post-transient results – BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kV

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	112.7% (1237 Amp Rating)	99.9% (1396 Amp Rating)
Oxbow – Lolo 230 kV	112.9% (920 Amp SOL)	99.2% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	104.1% (800 Amp Rating)	70% (1200 Amp Rating)

If COI transfers are heavy in the north-to-south direction, as modeled in this base case, FACRI will trigger the insertion of the Fort Rock series capacitors, significantly improving the Idaho-Northwest path performance for this contingency. Inserting the Fort Rock series capacitors in the Grizzly-Captain Jack, Grizzly-Malin & Grizzly-Summer Lake 500 kV lines is not modeled in this post-transient contingency analysis as a conservative study assumption.

Severe Contingency #2: BF IPCO Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 112% of its nominal rating (99% of its emergency rating). Refer to the table below for more information about the overloads caused by this contingency.

Table 61: Post-transient results – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	112% (1237 Amp Rating)	99.1% (1396 Amp Rating)
Oxbow – Lolo 230 kV	112% (920 Amp SOL)	98.6% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	100.4%(800 Amp Rating)	67% (1200 Amp Rating)

Severe Contingency #3: BF IPCO Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 111% of its nominal rating (99% of its emergency rating). Refer to the table below for more information about the overloads caused by this contingency.

Table 62: Post-transient results – BF IPC Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	111% (1237 Amp Rating)	98.6% (1396 Amp Rating)
Oxbow – Lolo 230 kV	111% (920 Amp SOL)	97.6% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	103% (800 Amp Rating)	69% (1200 Amp Rating)

As evidenced in the tables above, a breaker failure at Hemingway significantly stresses the Brownlee-Hells Canyon and Oxbow-Lolo 230 kV lines to near their emergency limits. Section 2.4 considers different Hemingway 500 kV substation configurations to avoid severe breaker failures; however, for this study, this breaker failure is considered to be credible.

If COI transfers are heavy in the north-to-south direction, as modeled in this base case, FACRI will trigger the insertion of the Fort Rock series capacitors, significantly improving the Idaho-Northwest path performance for this contingency. Inserting the Fort Rock series capacitors in the Grizzly-Captain Jack, Grizzly-Malin & Grizzly-Summer Lake 500 kV lines is not modeled in this post-transient contingency analysis as a conservative study assumption.

Notable Contingency #1: N-1: Hemingway-Grassland 500 kV

The system performance of the Walla Walla Area, 100% Wind case for the N-1 loss of the Hemingway-Grassland 500 kV line is similar to the performance for the Idaho-Northwest, west-to-east, base case study (Section 4.1.3). This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 112% of its nominal rating (98% of emergency). Since the overload is less than the Brownlee-Hells Canyon 230 kV line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 63: Post-transient loading – N-1: Hemingway-Grassland 500 kV

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	112% (1237 Amp Rating)	98% (1396 Amp Rating)
Oxbow – Lolo 230 kV	111% (920 Amp SOL)	97% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	103% (800 Amp Rating)	69% (1200 Amp Rating)

This contingency also results in post-transient voltage deviations greater than 5% at Amps and Peterson 230 kV busses. WECC System Performance Criteria does not allow post-transient voltage deviations of greater than 5% for N-1 contingencies. The plan of service for the Hemingway-Boardman 500 kV Transmission project, detailed in Section 2.4, includes a new 31.7 MVAr shunt capacitor connected to the Peterson 230 kV bus to be switched post-contingency (the existing 31.7 MVAr shunt capacitor is in-service pre-contingency). The contingency labeled "N-1: Hemingway-Grassland 500 kV + PTSN Shunt" switches this new Peterson 230 kV shunt capacitor, post-contingency, in response to low voltage on the Peterson 230 kV bus. The additional shunt bank switching solves the post-transient voltage deviation issue.

If COI transfers are heavy in the north-to-south direction, as modeled in this base case, FACRI will trigger the insertion of the Fort Rock series capacitors, significantly improving the Idaho-Northwest path performance for this contingency. Inserting the Fort Rock series capacitors in the Grizzly-Captain Jack, Grizzly-Malin & Grizzly-Summer Lake 500 kV lines is not modeled in this post-transient contingency analysis as a conservative study assumption.

Conclusion

The performance of the most severe contingencies for Walla Walla Area, 100% Wind study was similar to the performance of the same contingencies in the Base Case Study. No contingencies resulted in unacceptable performance. In summary, the post-transient results indicate that high wind generation in the Walla Walla area does not negatively impact the proposed Idaho-Northwest 2250 MW rating.

4.11.4 Voltage Stability

The Walla Walla 100% wind sensitivity study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Walla Walla 100% wind case, all contingencies have a post-transient solution with Idaho-Northwest stressed to 2363 MW, 105% of the proposed 2250 MW rating. This PV Analysis verifies that real power margin exists to operate the Idaho-Northwest path at the proposed 2250 MW rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16hs2a_2250idnw_nww case can be found in Appendix F. The busses studied utilizing VQ Analysis are: Brownlee 230 kV, Hanford 500 kV, Hemingway 500 kV, John Day 500 kV, Malin 500 kV, Marion 500 kV, Mill Creek 230 kV and Yellowtail 230 kV. The tables below highlight a sample of the reactive margins at these busses. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 64: 16hs2a_2250idnw_nww case reactive margin results (sample)

	Contingencies	Voltage @ Qmin	Margin (MVAr)	Comments
Brownlee	N-2: DOUBLE PALO VERDE	0.85	-563	Worst VQ contingency
	BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.89	-592	Worst VQ related to Idaho Power
	BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.90	-638	Worst VQ related to Idaho-Northwest
Hanford	N-2: DOUBLE PALO VERDE	0.96	-1815	Worst VQ contingency
	N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV + RAS	0.94	-2023	2nd Worst VQ contingency
	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.93	-2889	Worst VQ related to Idaho-Northwest
Hemingway	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.81	-1693	Worst VQ contingency
	BUS: SUMMER LAKE 500 KV	0.77	-1697	2nd Worst VQ contingency
	BF 4957 SUMMER L-MALIN & SUMMER L-HEMINGWAY 500 KV	0.76	-1731	3rd Worst VQ contingency
John Day	N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 kV + RAS	1.00	-1035	Worst VQ contingency
	N-2: PAUL-NAPAVINE & PAUL_ALLSTON #2 500 kV + RAS	1.00	-1069	2nd Worst VQ contingency
	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV+PTSN	0.98	-1270	Worst VQ related to Idaho-Northwest
Malin	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.88	-2025	Worst VQ contingency
	N-2: DOUBLE PALO VERDE	0.92	-2200	2nd Worst VQ contingency
	N-1: CAPTAIN JACK-OLINDA 500 KV	0.83	-2299	3rd Worst VQ contingency
Marion	N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV + RAS	0.93	-1299	Worst VQ contingency
	N-2: PAUL-NAPAVINE & PAUL-ALLSTON #2 500 KV + RAS	0.93	-1339	2nd Worst VQ contingency
	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.90	-1457	Worst VQ related to Idaho-Northwest
Mill Creek	N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.86	-283	Worst VQ contingency
	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.80	-431	2nd Worst VQ contingency
	N-2: DOUBLE PALO VERDE	0.80	-440	3rd Worst VQ contingency
Yellowtail	N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.78	-221	Worst VQ contingency
	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.77	-239	2nd Worst VQ contingency
	BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.77	-249	3rd Worst VQ contingency

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, voltage stability is not an issue for the Walla Walla Area, 100% Wind case.

4.11.5 Transient Stability

Transient stability contingency results for the 16hs2a_2250idnw_nww case can be found in Appendix F.

The 16hs2a_2250idnw_nww base case was the basis for all transient stability study results for this Hemingway-Boardman v West of Hatwai Simultaneous Interaction Study. All contingencies resulted in stable and damped performance with no violations to the WECC Performance Criteria.

FACRI was modeled in the base case dynamic data base file and triggered for loss of the Hemingway-Boardman 500 kV line.

4.11.6 Remedial Action Schemes

For the 16hs2a_2250idnw_nww case, each contingency, and the associated switching (RAS), is documented in Appendix F. Details for the notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF PGE Grassland-Cedar Sp 500 kV&Grassland-Hem 500 kV

After the loss of these two lines, switched VAr devices modeled at Hopkins Ridge Wind2 34.5 kV, Peterson 230 kV, and Quartz 138 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. On the Hemingway 500 kV bus, a capacitor insertion scheme will switch a 200 MVAr shunt capacitor in service. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 65: Shunt Capacitor Switching in BF PGE Grassland-Cedar Sp 500 kV&Grassland-Hem 500 kV

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Hemingway 500 kV (60155)	200 MVAr	400 MVAr
Hopkins Ridge Wind2 34.5 kV (47802)	9.4 MVAr	14.5 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr
Quartz 138 kV (60305)	0 MVAr	22.5 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency

Severe Contingencies #2: BF IPCO Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

After the loss of this line and transformer, switched VAr devices modeled at Hopkins Ridge Wind2 34.5 kV would switch from 9 MVAr to 14.5 MVAr due to depressed voltage on the bus that the device is controlling.

Severe Contingencies #3: BF IPCO Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

After the loss of this line and transformer, switched VAr devices modeled at Hopkins Ridge Wind2 34.5 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. On the Hemingway 500 kV bus, a capacitor insertion scheme will switch a 200

MVAr shunt capacitor in service. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 66: Shunt Capacitor Switching in BF IPCO Midpoint-Grassland 500 kV & Hem 500/230 Xfmr

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Hemingway 500 kV (60155)	200 MVAr	400 MVAr
Hopkins Ridge Wind2 34.5 kV (47802)	9.4 MVAr	14.5 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Notable Contingency #1: N-1: Hemingway-Grassland 500 kV

After the loss of this line and transformer, switched VAr devices modeled at Dillon 69 kV, Hopkins Ridge Wind2 34.5 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. On the Hemingway 500 kV bus, a capacitor insertion scheme will switch a 200 MVAr shunt capacitor in service. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 67: Shunt Capacitor Switching in N-1: Hemingway-Grassland 500 kV

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Dillon 69 kV (62345)	15.9 MVAr	27.9 MVAr
Hemingway 500 kV (60155)	200 MVAr	400 MVAr
Hopkins Ridge Wind2 34.5 kV (47802)	9.4 MVAr	14.5 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

4.12 Sensitivity Study: High West of McNary & West of Slatt

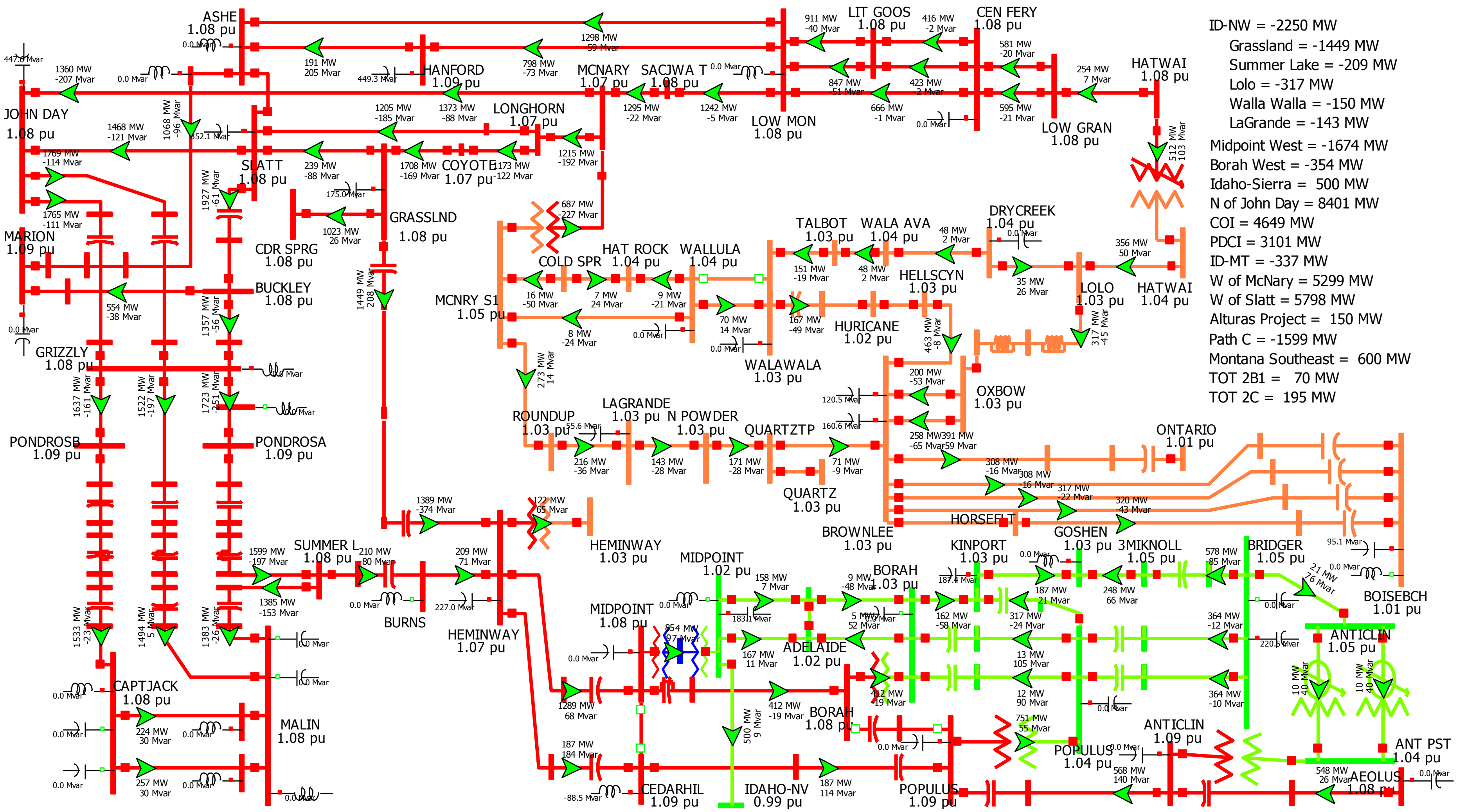


Figure 17: Idaho-Northwest (Path 14) 2250 MW, West to East, High West of McNary & West of Slatt Base Case

4.12.1 Background & Need for Simultaneous Interaction Studies

The Hemingway to Boardman Phase II study review group requested that the impacts of the Hemingway to Boardman project be evaluated with high flow on West of McNary and West of Slatt. West of McNary and West of Slatt are not WECC rated paths.

The West of McNary path is made up of the following lines: (1) Longhorn-Slatt 500 kV, (2) McNary-John Day 500 kV, (3) Coyote-Grassland 500 kV, (4) McNary-Ross 345 kV, (5) Jones Canyon-Tumble Creek 230 kV and (6) Harvalum-Big Eddy 230 kV. The Coyote-Grassland 500 kV line was added to the path for this base case due to the addition of the Cascade Crossings project.

The West of Slatt path is made up of the following lines: (1) Slatt-John Day 500 kV, (2) McNary-John Day 500 kV, (3) Slatt-Buckley 500 kV and (4) Grassland-Cedar Spring 500 kV. The Grassland-Cedar Spring 500 kV line was added to the path for this base case due to the addition of the Cascade Crossings project.

4.12.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is 16hs2a_2250idnw_wom.

<u>Step-by-step development of the 16hs2a_2250idnw_N_wom base case:</u>

Step 1: Begin with the 16hs2a_2250idnw_N base case.

> Utilize the base case developed in Section 4.1.2 Steady State Case Stressing.

Step 2: Stress the West of McNary and West of Slatt paths.

> Generation east of McNary and Slatt was increased to stress the West of McNary and West of Slatt paths to approximately 5,300 MW and 5,800 MW, respectively. The path flows were increased by modifying generation in the Pacific Northwest, mostly in Southeast Washington, Lower Columbia Basin and Boardman generation. The generation modification resulted a 600 MW increase in North of John Day flows (to 8,400 MW).

Step 3: Re-stress Idaho-Northwest

> The Idaho-Northwest path was re-stressed to 2250 MW in the west-to-east direction by reducing PacifiCorp East (PACE) and Idaho Power generation and replacing the generation with a schedule from the Northwest. No other paths were significantly altered.

4.12.3 Post Transient Results

Post-transient contingency results for high West of McNary and West of Slatt case can be found in Appendix G. The case name is 16hs2a_2250idnw_wom. Details for the severe/notable contingencies can be found below.

Most Severe Contingency: BF PGE Grassland-Cedar Springs 500 kV&Grasslnd-Hemingway 500 kV+CAPS

The breaker failure is the most limiting contingency for the High West of McNary/Slatt sensitivity study. This contingency results in loading the Oxbow-Lolo 230 kV line to 113.8% of its nominal rating (100.0% of emergency). Refer to the table below for more information about the overloads caused by this contingency.

Table 68: Post-transient results – PGE Grassland-Cedar Springs 500 kV & Grassland-Hemingway 500 kV

Element	Nominal % Loading	Emergency % Loading
Oxbow – Lolo 230 kV	113.8%	100.0%
Brownlee-Hells Canyon 230 kV	112.8%	99.9%

Without shunt capacitor switching at Dillon 69 kV, Hemingway 500 kV, North Powder 34.5 kV, Quartz 138 kV, and Peterson 230 kV, the Oxbow-Lolo 230 kV line, and Brownlee-Hells Canyon 230 kV line would have been overloaded slightly above their emergency ratings. Although very close to going over the emergency ratings of these two lines, additional post-transient actions could be taken to quickly reduce the loading on the lines. These actions include: (1) reducing Hells Canyon generation, and (2) inserting a Copperfield 230 kV series reactor in the Oxbow-Lolo 230 kV line.

If COI transfers are heavy in the north-to-south direction, as modeled in this base case, FACRI will trigger the insertion of the Fort Rock series capacitors, significantly improving the Idaho-Northwest path performance for this contingency. Inserting the Fort Rock series capacitors in the Grizzly-Captain Jack, Grizzly-Malin & Grizzly-Summer Lake 500 kV lines is not modeled in this post-transient contingency analysis as a conservative study assumption.

Severe Contingency #2: BF IPCO Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

This contingency results in loading the Oxbow-Lolo 230 kV line to 113.7% of its nominal rating (99.9% of emergency). Refer to the table below for more information about the overloads caused by this contingency.

Table 69: Post-transient results – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Oxbow – Lolo 230 kV	113.7% (920 Amp SOL)	99.9% (1047 Amp Rating)
Brownlee-Hells Canyon 230 kV	112.4% (1237 Amp Rating)	99.6% (1396 Amp Rating)

Severe Contingency #3: BF IPCO Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

This contingency results in loading the Brownlee-Hells Canyon 230 kV line to 111% of its nominal rating (99% of emergency). Refer to the table below for more information about the overloads caused by this contingency.

Table 70: Post-transient results – BF IPC Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	111% (1237 Amp Rating)	98.7% (1396 Amp Rating)
Oxbow – Lolo 230 kV	112% (920 Amp SOL)	98.5% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	103% (800 Amp Rating)	69% (1200 Amp Rating)

If COI transfers are heavy in the north-to-south direction, as modeled in this base case, FACRI will trigger the insertion of the Fort Rock series capacitors, significantly improving the Idaho-Northwest path performance for this contingency. Inserting the Fort Rock series capacitors in the Grizzly-Captain Jack, Grizzly-Malin & Grizzly-Summer Lake 500 kV lines is not modeled in this post-transient contingency analysis as a conservative study assumption.

The performance of these contingencies is very similar to the performance of the same contingencies in the base case. The fact that the performance is similar indicates that high West of McNary/Slatt flow does not impact the performance of the Idaho-Northwest transmission path.

Severe Post-Transient Contingency #4 – N-1: Hemingway-Grassland 500 kV

The system performance of this High West of McNary/Slatt base case for the N-1 loss of the Hemingway-Grassland 500 kV line is very similar to the performance for the Idaho-Northwest, west-to-east, base case study (Section 4.1.3). This contingency results in overloading the Brownlee-Hells Canyon and Oxbow-Lolo 230 kV lines to approximately 99% of their emergency ratings. Since the overloads are less than each line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 71: Post-transient loading – N-1: Hemingway-Grassland 500 kV

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	112% (1237 Amp Rating)	99% (1396 Amp Rating)
Oxbow – Lolo 230 kV	113% (920 Amp SOL)	99% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	103% (800 Amp Rating)	69% (1200 Amp Rating)

This contingency also results in post-transient voltage deviations greater than 5% at Amps and Peterson 230 kV busses. WECC System Performance Criteria does not allow post-transient voltage deviations of greater than 5% for N-1 contingencies. The plan of service for the Hemingway-Boardman 500 kV Transmission project, detailed in Section 2.4, includes a new 31.7 MVAr shunt capacitor connected to the Peterson 230 kV bus to be switched post-contingency (the existing 31.7 MVAr shunt capacitor is in-service pre-contingency). The contingency labeled “N-1: Hemingway-Grassland 500 kV + PTSN Shunt” switches this new Peterson 230 kV shunt capacitor, post-contingency, in response to low voltage on the Peterson 230 kV bus and solves the post-transient voltage deviation issue.

If COI transfers are heavy in the north-to-south direction, as modeled in this base case, FACRI will trigger the insertion of the Fort Rock series capacitors, significantly improving the Idaho-Northwest path performance for this contingency. Inserting the Fort Rock series capacitors in the Grizzly-Captain Jack, Grizzly-Malin & Grizzly-Summer Lake 500 kV lines is not modeled in this post-transient contingency analysis as a conservative study assumption.

Conclusion

The performance of the most severe contingencies for the High West of McNary/Slatt study was similar to the performance of the same contingencies in the Base Case Study. No contingencies resulted in unacceptable performance. In summary, the post-transient results indicate that high flow on West of McNary and West of Slatt does not negatively impact the proposed Idaho-Northwest 2250 MW west-to-east rating.

4.12.4 Voltage Stability

The High West of McNary and West of Slatt sensitivity study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest High West of McNary & West of Slatt sensitivity study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 2363 MW, 105% of the proposed 2250 MW rating. This PV Analysis verifies that real power margin exists to operate the Idaho-Northwest path at its proposed 2250 MW rating, simultaneous with the high West of McNary/Slatt flows.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16hs2a_2250idnw_N_wom case can be found in Appendix G. The busses studied utilizing VQ Analysis are: Brownlee 230 kV, Hanford 500 kV, Hemingway 500 kV, John Day 500 kV, Malin 500 kV, Marion 500 kV, McNary 500 kV, Mill Creek 230 kV and Yellowtail 230 kV. The tables below highlight a sample of the reactive margins at these busses. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 72: 16hs2a_2250idnw_N_wom case reactive margin results (sample)

	Contingencies	Voltage @ Qmin	Margin (MVAr)	Comments
Brownlee	BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.89	--615	Worst VQ contingency
	BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.88	-664	Worst VQ related to Idaho-Northwest
	N-2: DOUBLE PALO VERDE	0.84	-666	Worst VQ external to Idaho Power
Hanford	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.93	-3412	Worst VQ contingency
	N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.88	-3418	2nd Worst VQ contingency
	BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.89	-4096	Worst VQ related to Idaho-Northwest
Hemingway	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.81	-1826	Worst VQ contingency
	N-1: ALLSTON-KEELER 500 KV + RAS	0.74	-1848	2nd Worst VQ contingency
	BF PGE GRASSLAND-CEDAR SP 500 KV & GRASSLAND-HEM 500 kV	0.70	-1826	Worst VQ related to Idaho Power
John Day	N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.98	-1395	Worst VQ contingency
	N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.98	-1733	2nd Worst VQ contingency
	BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.97	-1917	Worst VQ related to Idaho-Northwest
Malin	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.86	-2258	Worst VQ contingency
	N-2: MALIN-ROUND MTN #1 & #2 500 KV	0.79	-2501	2nd Worst VQ contingency
	N-1: ALVERY-DIXONVILLE 500 KV	0.87	-2528	3rd Worst VQ contingency
Marion	N-2: JOHN DAY-MARION & MARION-PEARL 500 KV	0.79	-1416	Worst VQ contingency
	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.89	-1585	Worst VQ related to Idaho-Northwest
	BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.83	-2771	Worst VQ related to Idaho Power
McNary	N-2: GRASSLAND-COYOTE 500KV & SLATT-LONGHORN 500KV	0.91	-1451	Worst VQ contingency
	BF 4234 MCNARY-LONGHORN & MCNARY-HERMCALP 500 KV	0.86	-2101	2nd Worst VQ contingency
	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.92	-2422	Worst VQ related to Idaho-Northwest
Mill Creek	N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.86	-300	Worst VQ contingency
	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.80	-433	2nd Worst VQ contingency
	BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.80	-452	3rd Worst VQ contingency
Yellowtail	BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.75	-228	Worst VQ contingency
	N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.77	-237	2nd Worst VQ contingency
	BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.78	-238	3rd Worst VQ contingency

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, voltage stability is not an issue for the High West of McNary & West of Slatt base case.

4.12.5 Transient Stability

Transient stability contingency results for the 16hs2a_2250idnw_wom case can be found in Appendix G.

The 16hs2a_2250idnw_wom base case was the basis for all transient stability study results for this High West of McNary/Slatt Sensitivity Study. All contingencies resulted in stable and damped performance with no violations to the WECC Performance Criteria.

FACRI was modeled in the base case dynamic data base file and triggered for loss of the Hemingway-Boardman 500 kV line.

4.12.6 Remedial Action Schemes

For the 16hs2a_2250idnw_N_wom case, each contingency, and the associated switching (RAS), is documented in Appendix G. Details for the notable contingencies can be found below.

Most Severe Contingency: BF PGE Grassland-Cedar Springs 500 kV & Grassland-Hemingway 500 kV

After the loss of these two lines, switched VAr devices modeled at Dillon 69 kV, North Powder 34.5 kV, Peterson 230 kV, and Quartz 138 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. On the Hemingway 500 kV bus, a capacitor insertion scheme will switch a 200 MVAr shunt capacitor in service. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 73: Shunt Capacitor Switching in BF PGE Grassland-Cedar Sp 500 kV&Grassland-Hem 500 kV

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Dillon 69 kV (62345)	15.9 MVAr	27.9 MVAr
Hemingway 500 kV (60155)	200 MVAr	400 MVAr
North Powder 34.5 kV (60313)	0 MVAr	18 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr
Quartz 138 kV (60305)	0 MVAr	22.5 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency

Severe Contingency #2: BF IPCO Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

This contingency does not have any associated RAS.

Severe Contingency #3: BF IPCO Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

This contingency does not have any associated RAS.

Severe Post-Transient Contingency #4 – N-1: Hemingway-Grassland 500 kV

After the loss of this line, switched VAr devices modeled at Dillon 69 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. On the

Hemingway 500 kV bus, a capacitor insertion scheme will switch a 200 MVAr shunt capacitor in service. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 74: Shunt Capacitor Switching in N-1: Hemingway-Grassland 500 kV

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Dillon 69 kV (62345)	15.9 MVAr	27.9 MVAr
Hemingway 500 kV (60155)	200 MVAr	400 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

4.13 Sensitivity Study: Longhorn Terminus

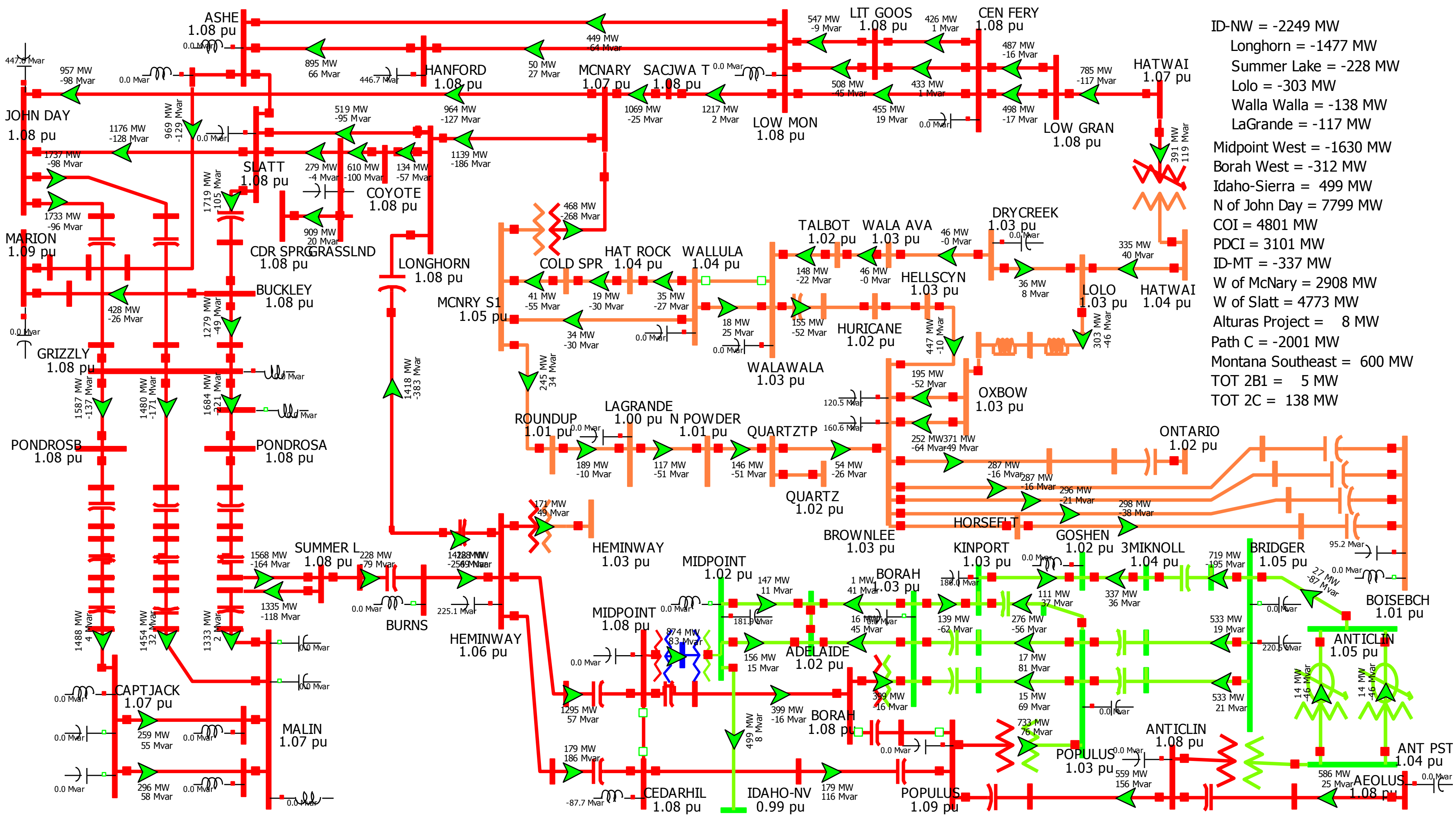


Figure 18: Idaho-Northwest (Path 14) 2250 MW, West to East, Longhorn Sensitivity Case

4.13.1 Background & Need for Sensitivity Study

The Boardman area terminus of the Hemingway to Boardman project has not been finalized. Grassland Substation and Longhorn Substation are the two terminus alternatives presently being evaluated. All previous studies assumed a Grassland terminus. This sensitivity study was conducted to determine if a Longhorn termination would adversely impact the proposed 2250 MW, west-to-east rating.

4.13.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is 16hs2a_2250idnw_lh.

Step-by-step development of the 16hs2a_2250idnw_N_lh base case:

Step 1: Begin with the 16hs2a_2250idnw_N base case.

Utilize the base case developed in Section 4.1.2 Steady State Case Stressing.

Step 2: Create a Hemingway-Longhorn 500 kV line and remove the Hemingway-Grassland 500 kV line.

The line impedance was modified based on the proposed Longhorn substation location. The series capacitor impedance values in the Hemingway-Longhorn were modified based on the new line impedance.

Step 3: Re-stress the Idaho-Northwest path to 2250 MW in the west-to-east direction.

Idaho-Northwest flows were re-stressed to 2,250 MW, west-to-east. This required minimal case modification. No other paths were significantly altered.

4.13.3 Post Transient Results

Post-transient contingency results for the 16hs2a_2250idnw_N_lh case can be found in Appendix K. The results are comparable to Grassland terminus studied in the base case. All contingencies result in acceptable post-transient performance.

The following tables compare the post transient results for the Grassland terminus versus Longhorn terminus for several of the notable contingencies discussed in preceding sections.

Table 75: Post-Tran. Results Comparison–BF IPC Hem-Grassland/Longhorn 500 kV & Hem 500/230 Xfmr

Element	Grassland Terminus	Longhorn Terminus
Brownlee-Hells Canyon 230 kV	98.1% (1396 Amp Rating)	97.2% (1396 Amp Rating)
Oxbow – Lolo 230 kV	96.2% (1047 Amp Rating)	96.7% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	68.8% (1200 Amp Rating)	69.5% (1200 Amp Rating)

Table 76: Post-Tran. Results Comparison – N-1: Hemingway-Grassland/Longhorn 500 kV +PTSN Shunt

Element	Grassland Terminus	Longhorn Terminus
Brownlee-Hells Canyon 230 kV	97.5% (1396 Amp Rating)	96.4% (1396 Amp Rating)
Oxbow – Lolo 230 kV	95.6% (1047 Amp Rating)	95.9% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	68.9% (1200 Amp Rating)	68.8% (1200 Amp Rating)

Table 77: Post-Tran. Results Comparison–BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Grassland Terminus	Longhorn Terminus
Brownlee-Hells Canyon 230 kV	99.6% (1396 Amp Rating)	99.0% (1396 Amp Rating)
Oxbow – Lolo 230 kV	98.4% (1047 Amp Rating)	99.5% (1047 Amp Rating)
Mill Creek – Peterson 230 kV	67.2% (1200 Amp Rating)	67.2% (1200 Amp Rating)

The tables above indicate that a Longhorn northwest terminus has comparable performance to the Grassland northwest terminus studied in previous sections.

The Longhorn terminus location results in several potential breaker failures that could result depending on the eventual layout of the Longhorn station. The potential breaker failures are listed below:

1) BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr
2) BF LH Hemingway-Longhorn & Longhorn-Coyote 500 kV
3) BF LH Hemingway-Longhorn & Longhorn-Slatt 500 kV
4) BF LH Hemingway-Longhorn & McNary-Longhorn 500 kV
5) BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr
6) BF LH Longhorn-Coyote & Longhorn-Slatt 500 kV
7) BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr
8) BF LH McNary-Longhorn & Longhorn 500/230 Xfmr
9) BF LH McNary-Longhorn & Longhorn-Coyote 500 kV
10) BF LH McNary-Longhorn & Longhorn-Slatt 500 kV

All Longhorn breaker failure contingencies result in acceptable post-transient performance.

Conclusion

The post-transient results indicate that a Longhorn 500 kV substation termination will not negatively impact the proposed Idaho-Northwest 2250 MW west-to-east rating.

4.13.4 Voltage Stability

Real Power Margin Assessment (PV Analysis) and Reactive Power Margin Assessment (VQ Analysis) were not conducted for this sensitivity study due to the close proximity of the Longhorn substation in relation to the Grassland substation studied in previous sections. It was assumed that the results for a Longhorn termination location would be nearly identical to the results for the Grassland termination. Refer to Section 4.1.4 and Appendix A for the voltage stability results associated with the Hemingway to Boardman (Grassland termination) base case study.

4.13.5 Transient Stability

Transient stability analysis was not conducted for the Longhorn Sensitivity study due to the close proximity of the Longhorn substation in relation to the Grassland substation studied in previous sections. It was assumed that the results for a Longhorn termination location would be nearly identical to the results for the Grassland termination. Refer to Section 4.1.4 and Appendix A for the transient stability results associated with the Hemingway to Boardman (Grassland termination) base case study.

4.13.6 Remedial Action Schemes

For the 16hs2a_2250idnw_N_lh case, each contingency, and the associated switching (RAS), is documented in Appendix K. Details for the notable contingencies can be found below.

BF IPC Hemingway-Longhorn 500 kV & Hem 500/230 Xfmr

After the loss of this line and transformer, switched VAr devices modeled at LaGrande 230 kV and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 78: Shunt Capacitor Switching in BF IPC Hemingway-Longhorn 500 kV & Hem 500/230 Xfmr

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
LaGrande 230 kV (40621)	0 MVAr	52.2 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency

N-1: Hemingway-Longhorn 500 kV

After the loss of this line, switched VAr devices modeled at LaGrande 230 kV and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 79: Shunt Capacitor Switching in N-1: Hemingway-Longhorn 500 kV

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
LaGrande 230 kV (40621)	0 MVAr	52.2 MVAr
Peterson 230 kV (62030)	31.7 MVAr	63.4 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency

BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

This breaker failure contingency opens the Midpoint-Hemingway 500 kV line and the Hemingway 500/230 kV transformer. After the loss of this line and transformer, switched VAr devices modeled at Peterson 230 kV would switch in-service due to depressed voltages on the bus that the device would be controlling.

In reality, additional capacitors may switch that are not modeled as part of this contingency

4.14 Sensitivity Study: NV Energy Updates

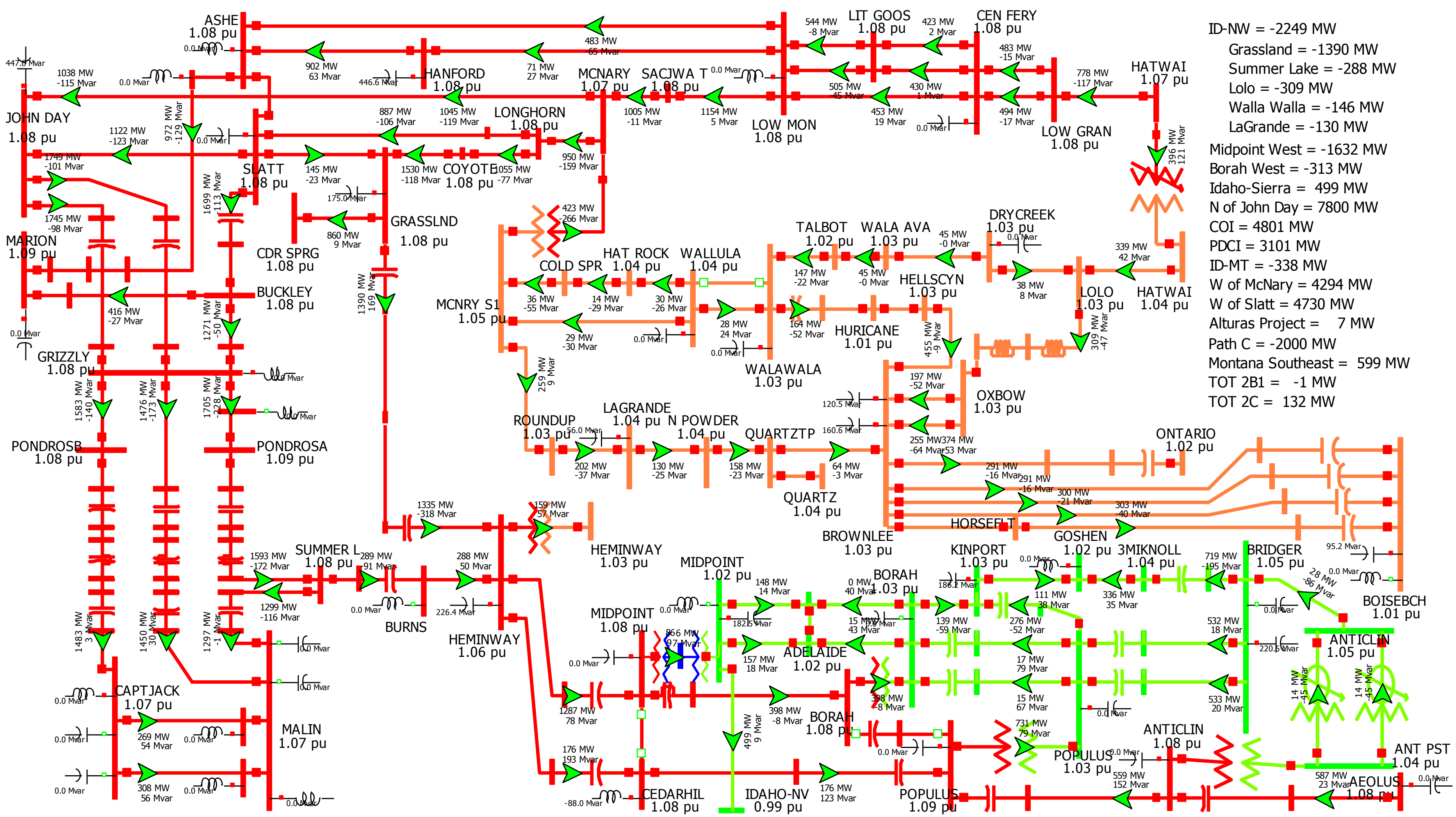


Figure 19: Idaho-Northwest (Path 14) 2250 MW, West to East, NV Energy Updates Sensitivity Case

4.14.1 Background & Need for Sensitivity Study

After completing the majority of the study work, including Post-Transient Analysis, PV/QV Analysis, and Transient Stability analysis, a few modeling errors were discovered in the base case in Area 64.

Modeling errors in the base case are: (1) the Hilltop 345 kV phase shifter is actually located at Bordertown, (2) the Bordertown-Cal Sub 138 kV line does not exist, and (3) the Robinson-Falcon 345 kV line should have two in-service series capacitors. In Sections 4.1-4.8, 4.11 & 4.12, these errors are present. The errors were corrected in the cases in 4.9, 4.10, 4.13, 4.14, and all of the Idaho-Northwest east-to-west cases (Section 5). As a sensitivity study, this section looks at the post-transient response of the system with these minor modifications. In the end, these modeling errors were slight and made little to no difference on the results of the case.

4.14.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is 16hs2a_2250idnw_nvmod.

Step-by-step development of the 16hs2a_2250idnw_N_nvmod base case:

Step 1: Begin with the 16hs2a_2250idnw_N base case.

Utilize the base case developed in Section 4.1.2 Steady State Case Stressing.

Step 2: Incorporate modifications in Area 64

- Hilltop 345 kV phase shifter moved to Bordertown 345 kV.
- Bordertown-Cal Sub 138 kV switched out of service.
- Added two series capacitors to the Robinson-Falcon 345 kV line.

Step 3: Modify the COI and Alturas Project path flows

As suggested by the review group, COI was stressed to 4800 MW, and Alturas Project was reduced to 0 MW.

Step 4: Re-stress the Idaho-Northwest path to 2250 MW in the west-to-east direction.

Idaho-Northwest flows were re-stressed to 2,250 MW, west-to-east. This required minimal case modification. No other paths were significantly altered.

4.14.3 Post Transient Results

Post-transient contingency results for the 16hs2a_2250idnw_nvmod case can be found in Appendix L. Contingencies of note resulted in similar post-transient performance.

This case did not result in any post-transient violations. The minor base case modifications to Area 64 had insubstantial impact on the results for the original base case. Any change in the post-transient flows on the system were more likely to be due to COI flow changes, pre-contingency, than the slight modifications to the NV Energy system.

4.14.4 Voltage Stability

Real Power Margin Assessment (PV Analysis) and Reactive Power Margin Assessment (VQ Analysis) were not conducted for this sensitivity study due to the similarity to the base case. Refer to earlier sections for PV and QV Analysis results.

4.14.5 Transient Stability

Due to the similarity between the 16hs2a_2250idnw_N base case and the 16hs2a_2250idnw_nvmod base case, and the almost identical post-transient results, a transient stability study is unnecessary for this case.

4.14.6 Remedial Action Schemes

For the 16hs2a_2250idnw_nvmod case, each contingency, and the associated switching (RAS), is documented in Appendix L.

4.15 Simultaneous Interaction Study: MSTI & SWIP (SWIP South – 1770 MW)

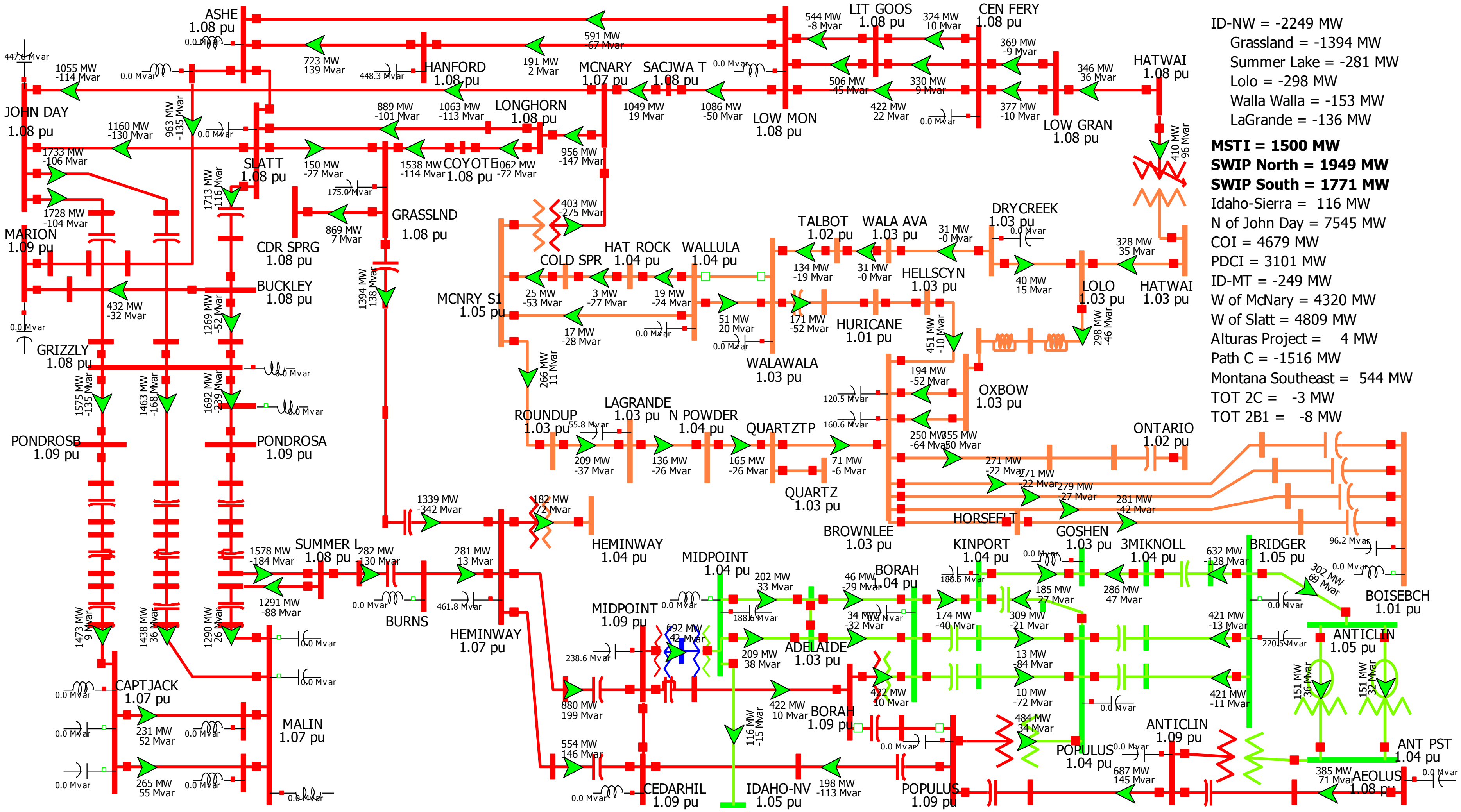


Figure 20: Idaho-Northwest (Path 14) 2250 MW, West to East, MSTI & SWIP Case

4.15.1 Background & Need for Simultaneous Interaction Studies

In the previous MSTI and SWIP study, Section 4.9, the SWIP South was flowing at 1500 MW north-to-south. In this section, the previous study case was modified such that SWIP South flow is 1770 MW north-to-south. This section was added to memorialize the post-transient contingency results of this new case.

4.15.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case names for this study are: 16hs2a_2250idnw_ms_swips.

Step-by-step development of the 16hs2a_2250idnw_ms case:

Step 1: Begin with the 16hs2a_2250idnw_ms base case.

Utilize the base case developed in Section 4.9.

Step 2: Stress the SWIP South path to at least 1750 MW in the north-to-south direction.

In order to stress SWIP South to greater than 1750 MW, while maintaining 1950 MW of flow on SWIP North, the phase shifters at Robinson on the 345 kV system were adjusted, and additional power was scheduled from northern areas (Sierra, California, Idaho and the Northwest) to Southern Nevada.

4.15.3 Post Transient Results

Post-transient contingency results for the MSTI & SWIP (SWIP South 1770 MW) case can be found in Appendix M. The case name is 16hs2a_2250idnw_ms_swips.

No additional post-transient overloads of concern were discovered in this second base case studying MSTI and SWIP. In this case, SWIP South was stressed to 1770 MW north-to-south pre-contingency, rather than the 1500 MW north-to-south stressing in the original base case in Section 4.9.

5. Idaho-Northwest, East-to-West Studies

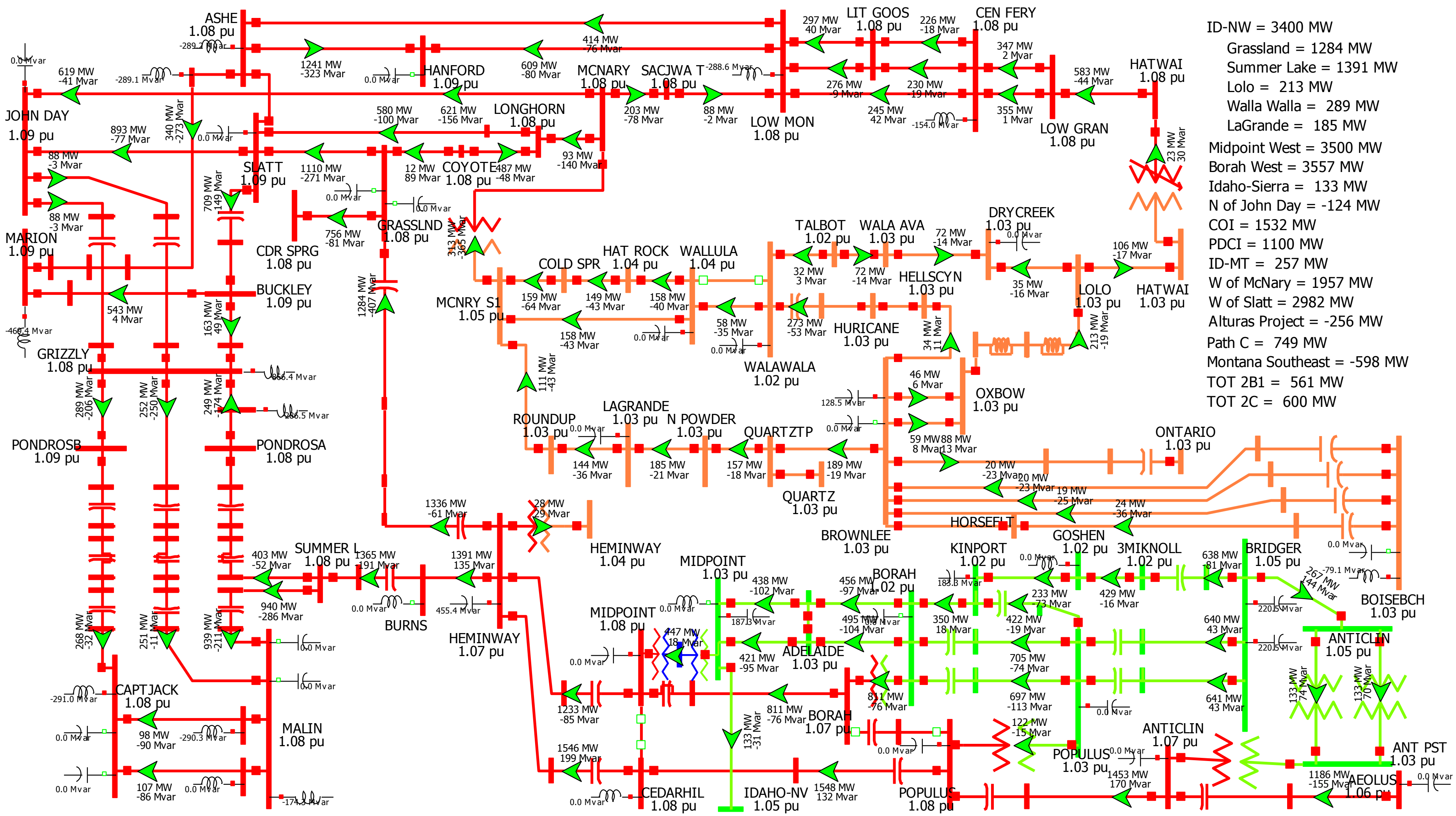


Figure 21: Idaho-Northwest (Path 14) 3400 MW, East to West, Base Case

5.1 Idaho – Northwest, East-to-West (Path 14) Base Case

5.1.1 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is: 16la1sa_3400idnw_N.

Step-by-step development of the 16la1sa_3400idnw_N base case:

Step 1: Add the transmission facilities described in the Plan of Service in Section 2.4.

> The 16la1sa_3400idnw_N case includes all of the additions described in Section 2.4. The Populus to Cedar Hill to Hemingway 500 kV line is required to achieve the Idaho-Northwest proposed rating for all cases in Section 5 (Idaho-Northwest east-to-west base cases).

Step 2: Adjust the COI (Path 66) and PDCI (Path 65) to flow in the north-to-south direction.

> The original 16la1sa base case, downloaded from WECC.biz, has COI & PDCI each flowing at approximately 1800 MW south-to-north. COI & PDCI rarely flow in the south-to-north direction. South-to-north flow on COI reduces the loading on Hemingway-Summer Lake, and increases the loading on Hemingway-Boardman. Studying the Idaho-Northwest path with COI flowing south-to-north would result in a higher rating than the 3400 MW east-to-west rating proposed in this report. By modifying generation patterns in the Northwest and Southwest, COI & PDCI flows were adjusted to flow in the north-to-south direction, reasonably corresponding with actual flows seen while Idaho-Northwest path transfers are high in the east-to-west direction.

Step 3: Stress the Idaho-Northwest path to 3400 MW in the east-to-west direction.

> The Idaho-Northwest path was stressed to 3400 MW in the east-to-west direction by increasing PacifiCorp East (PACE) and Idaho Power generation and scheduling it to the Northwest. Generation in the Northwest was reduced as a sink for the new generation coming out of Wyoming, Utah, and Idaho. Generation adjustments in the Northwest were limited to combined cycle power plants that could be switched in or out, and wind generation. Only minor changes were made to the Northwest hydro generation pattern modeled in the base 16la1sa case.

Step 4: Stress simultaneous interaction study paths.

> The following paths were stressed to their transfer limit in the 16la1sa_3400idnw_N base case simultaneous with Idaho-Northwest at 3400 MW east-to-west:

1) **Montana-Idaho (Path 18**) – Adjusted to the 256 MW south-to-north limit utilizing the Mill Creek 230 kV phase shifter and the Jefferson 161 kV phase shifter.
2) **Montana-Northwest (Path 8)** – Adjusted to 2200 MW east-to-west by increasing Montana area generation, and reducing Northwest area generation.
3) **Montana Southeast (Path 80)** – Adjusted to the 600 MW south-to-north limit by increasing generation at Yellowtail, and adjusting the Billing, Rimrock, and Crossover phase shifters.
4) **TOT 2B1 (Path 78)** – Adjusted to the 560 MW north-to-south limit utilizing the Pinto 345 kV phase shifters.
5) **TOT 2C (Path 35)** – Adjusted to the 600 MW north-to-south limit utilizing the Harry Allen 345 kV phase shifters.

Step 5: Adjusted other paths of concern.

The proposed Idaho-Northwest path rating increase is 1000 MW over the 2400 MW east-to-west rating that exists today. Borah West (2557 MW 2012 rating) and Midpoint West (2500 MW 2012 internal rating) were stressed to 3557 MW and 3500 MW, respectively.

5.1.2 Post Transient Results

Post-transient contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS

This is the limiting contingency for the Idaho-Northwest path in the east-to-west direction. This contingency results in overloading the Burns 500 kV series capacitor to 133% of its nominal rating (99% of emergency). To prevent exceeding the emergency rating of the Burns series capacitor, RAS action to bypass half of the Midpoint 500 kV series capacitor is required. Since the overload is less than the Burns series capacitors emergency rating, this contingency results in acceptable performance. Refer to the table below for additional overloads caused by this contingency:

Table 80: Post-transient results – BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS

Element	Nominal % Loading	Emergency % Loading
Burns 500 kV Series Capacitor	133%	99%
Harry Allen 345/230 kV Xfmrs	111%	90%
Jefferson 161 kV Phase Shifter	110%	84%
Pinto 345 kV Phase Shifter	102%	81%

Severe Post-Transient Contingency #2 – N-2: Double Palo Verde

Following the loss of two Palo Verde units, Northwest generation responds to the generation deficiency; Hemingway-Boardman and Gateway West offer a low impedance parallel path between the Northwest and Southwest that ends up having to flow through Utah and Colorado lines to go south. The addition of

Hemingway-Boardman and Gateway West causes the 2PV contingency to become slightly more severe across the Gladstone-Springer 115 kV transmission line, TOT 2A, TOT 2B, and TOT 2C.

The table below compares the existing system to the future system. The existing system is a representation of the system as it stands in 2012. The future system is the study base case and includes the Hemingway-Boardman and Gateway West 500 kV lines.

Table 81: Post-transient results – N-2: Double Palo Verde

	Existing System (2400 Case)			Future System (3400 Case)		
Element	Pre-Cont. % Limit B	Post-Cont. % Limit B	Difference	Pre-Cont. % Limit B	Post-Cont. % Limit B	Difference
Gladstone-Springer 115 kV	62.5%	99.1%	36.6%	62.0%	98.8%	36.8%
Pinto 345 kV Phase Shifter	73.9%	91.7%	17.8%	73.8%	93.0%	19.2%
H. Allen 345 kV Phase Shifters	79.9%	98.2%	18.3%	79.9%	99.7%	19.8%

This contingency results in acceptable performance. The difference columns in the table above illustrate the increase in flow after the 2PV on the Existing System and the Future System. The change in flow on the Gladstone-Springer 115 kV line, Pinto 345 kV phase shifters, and Harry Allen 345 kV phase shifters is 0.2%, 1.2%, and 1.6% higher, respectively, on the Future System after the addition of the Hemingway-Boardman and Gateway West 500 kV lines.

Severe Post-Transient Contingency #3 – Bus: Summer Lake 500 kV

The Summer Lake 500 kV bus outage includes the loss of the Hemingway-Summer Lake 500 kV line. This contingency results in the Hemingway and Boardman 500 kV series capacitors exceeding their nominal ratings. The emergency rating of the Hemingway and Boardman 500 kV series capacitors will be designed for approximately 150% of nominal so the post-transient loading will be below emergency ratings.

Table 82: Post-transient results – Bus: Summer Lake 500 kV

Element	Nominal % Loading	Emergency % Loading
Boardman & Hemingway 500 kV Series Cap	112%	75%
Bordertown 345 kV Phase Shifter	102%	83%
Hines 138/115 kV Xfmr	103%	94%
Harry Allen 345 kV Phase Shifters	112%	91%
Pinto 345 kV Phase Shifters	102%	82%

Severe Post-Transient Contingency #4 – BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS

This is the most severe contingency across the Idaho Power internal transmission system. For this contingency, RAS action is required to (1) bypass a portion of the Midpoint 500 kV series capacitor, and (2) insert 400 MVAr of shunt capacitors on the Midpoint 500 kV bus. This contingency also results in post-transient voltage deviations between 5-10% at Amps 69 kV. WECC System Performance Criteria allows for post-transient voltage deviations of up to 10% for N-2 or breaker failure contingencies. Refer to the table below for overloads caused by this contingency:

Table 83: Post-transient results – BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS

Element	Nominal % Loading	Emergency % Loading
Bordertown 345 kV Phase Shifter	100%	81%
Harry Allen 345 kV Phase Shifters	116%	94%
Jefferson 161 kV Phase Shifter	109%	83%
Pinto 345 kV Phase Shifters	105%	84%
Populus-Borah 345 kV #1	106%	86%
Populus-Borah 345 kV #2	109%	80%

Conclusions

Several of the notable post transient contingencies resulting in more severe system stressing were noted above. All of these contingencies as well as all other post-transient contingencies result in acceptable performance. The results of contingencies associated with potential simultaneous interactions are in the sections that follow. Ultimately, the results indicate that Idaho-Northwest can achieve a 3400 MW east-to-west rating simultaneous with all other paths.

5.1.3 Voltage Stability

The Idaho-Northwest base case utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest base case, all contingencies have a post-transient solution with Idaho-Northwest stressed to 3570 MW, 105% of the proposed 3400 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16la1sa_3400idnw_N base case can be found in Appendix B. Busses studied utilizing VQ Analysis are: Harry Allen 345 kV, Hemingway 500 kV, Midpoint 500 kV, Mill Creek 230 kV, Pinto 345 kV, Populus 500 kV, Taft 500 kV, and Yellowtail 230 kV. The tables below highlight a sample of the reactive margins at Hemingway, Midpoint and Populus. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 84: Hemingway 500 kV bus reactive margin results (sample)

Contingency Name (Hemingway)	**Voltage @ Qmin**	**Margin (MVAr)**	**Comments**
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR + RAS	0.70	-964	Worst VQ Contingency
BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.70	-1148	
N-2: BROADVIEW-GARRISONT #1 & #2 500 KV + RAS	0.85	-1198	

Table 85: Midpoint 500 kV bus reactive margin results (sample)

Contingency Name (Midpoint)	**Voltage @ Qmin**	**Margin (MVAr)**	**Comments**
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR + RAS	0.73	-992	Worst VQ Contingency
N-2: BROADVIEW-GARRISONT #1 & #2 500 KV + RAS	0.83	-1205	
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV	0.81	-1236	

Table 86: Populus 500 kV bus reactive margin results (sample)

Contingency Name (Populus)	**Voltage @ Qmin**	**Margin (MVAr)**	**Comments**
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV	0.84	-861	Worst VQ Contingency
N-2: BROADVIEW-GARRISONT #1 & #2 500 KV + RAS	0.86	-1030	
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR + RAS	0.83	-1082	

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Voltage stability is not an issue for the Idaho-Northwest path.

5.1.4 Transient Stability

Transient stability contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B.

The 16la1sa_3400idnw_N base case was the basis for all transient stability study results for the Idaho-Northwest v Montana-Idaho, Montana-Northwest, Montana Southeast, TOT 2B1, and TOT 2C simultaneous interaction studies.

The performance of transient stability contingencies are generally ranked based upon transient voltage dip. The worst N-1 contingency is the loss of the Populus-Cedar Hill-Hemingway 500 kV line (part of the Gateway West upgrades). This contingency results in a voltage dip of approximately 13% on the Midpoint 500 kV bus. 13% is well within the acceptable limits. The worst multi-element contingency is a breaker failure at Hemingway substation resulting in the loss of the Populus-Cedar Hill-Hemingway 500 kV line & Hemingway 500/230 kV transformer. This contingency results in a voltage dip of approximately 14% on the Midpoint 500 kV bus. Again, 14% is well within the acceptable limits.

5.1.5 Remedial Action Schemes

For the 16la1sa_3400idnw_N base case, each contingency, and the associated switching (RAS), is documented in Appendix B. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS

This contingency opens the Hemingway-Grassland 500 kV line, and the Hemingway 500/230 kV transformer. To prevent exceeding the emergency rating of the Burns series capacitor, RAS action to bypass half of the Midpoint 500 kV series capacitor is required. After the loss of this line and transformer, switched VAr devices modeled at Amps 69 kV, Dillon 69 kV, LaGrande 230 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 87: Shunt Capacitor Switching in BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Amps 69 kV (65026)	20 MVAr	30 MVAr
Dillon 69 kV (62345)	3.9 MVAr	15.9 MVAr
LaGrande 230 kV (40621)	0 MVAr	52.2 MVAr
Peterson 230 kV (62030)	0 MVAr	31.7 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #2 – N-2: Double Palo Verde

This contingency opens two Palo Verde generators operating at approximately 1400 MW each. After this generation loss, switched VAr devices modeled at Durango 115 kV, Pinto 138 kV, and York Canyon 115 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 88: Shunt Capacitor Switching in N-2: Double Palo Verde

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Durango 115 kV (79023)	20 MVAr	40 MVAr
Pinto 138 kV (66230)	32 MVAr	64 MVAr
York Canyon 115 kV (12091)	0 MVAr	15 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #3 – Bus: Summer Lake 500 kV

This contingency does not have any associated RAS.

For the existing Idaho-Northwest system, rated at 2400 MW east-to-west, this contingency would have required the tripping of ~1000 MW at Jim Bridger Power Plant.

Severe Post-Transient Contingency #4 – BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS

This contingency opens the Populus-Cedar Hill-Hemingway 500 kV line, and the Hemingway 500/230 kV transformer. To prevent exceeding the emergency rating of the Midpoint 500 kV series capacitor, RAS action to bypass half of the Midpoint 500 kV series capacitor is required. After the loss of this line and transformer, switched VAr devices modeled at Amps 69 kV, Midpoint 500 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 89: Shunt Capacitor Switching in BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Amps 69 kV (65026)	20 MVAr	30 MVAr
Midpoint 500 kV (60240)	0 MVAr	400 MVAr
Peterson 230 kV (62030)	0 MVAr	31.7 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

5.2 Simultaneous Interaction Study: Alturas Project, S-N (Path 76)

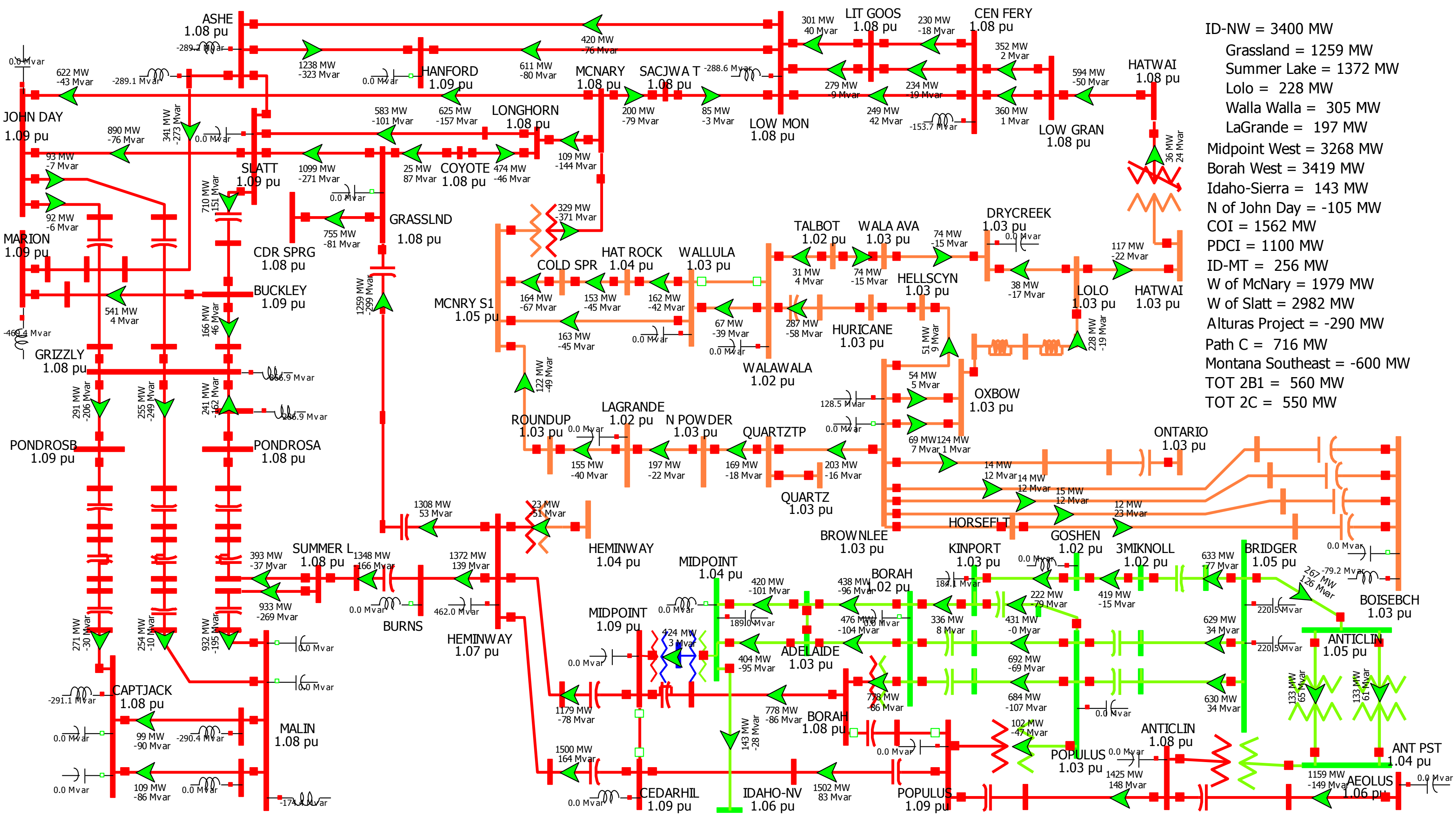


Figure 22: Idaho-Northwest (Path 14) 3400 MW, East to West v. Alturas Project (Path 76), South to North, Base Case

5.2.1 Background & Need for Simultaneous Interaction Study

The Alturas Project transmission path (Path 76) is made up of single transmission line extending from western Nevada to northeast California. The metering point for this line is the Hilltop substation. In the 16la1sa_3400idnw_Path76 base case, the flow measured at Hilltop is 290 MW, just shy of the 300 MW limit. The path was limited to 290 MW in the simultaneous interaction due to VAr flow through the Bordertown 345 kV phase shifter, rated at 300 MVA, and losses between Bordertown and Hilltop. Following the N-1 loss of the Hemingway-Boardman 500 kV, the loading on the Alturas Project increases to 320 MW, a 10% increase on the path. Due to this sizable increase in path transfers, the Alturas Project path may have a simultaneous interaction with the Idaho-Northwest path.

In order to stress the Alturas Project path to ~300 MW, the Bordertown 345 kV phase shifter was adjusted to be loaded to its nominal rating in the 16la1sa_3400idnw_Path76 base case. Many of the studied contingencies resulted in nominal overloads on this 345 kV phase shifter; however, no contingency resulted in overloading the phase shifter beyond its 370 MVA emergency rating.

5.2.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is: 16la1sa_3400idnw_N_Path76.

Information about the case, such as area generation/load patterns, and path transfers is located in Appendix H.

Step-by-step development of the 16la1sa_3400idnw_Path76 base case:

Step 1: Begin with the 16la1sa_3400idnw_N base case

Utilize the base case developed in Section 5.1.1 Steady State Case Stressing.

Step 2: Stress the Alturas Project transmission path (Path 76) to 300 MW south-to-north

Utilize the Bordertown 345 kV phase shifting transformer.

5.2.3 Post Transient Results

Post-transient contingency results for the 16la1sa_3400idnw_Path76 case can be found in Appendix H. Details for the severe/notable contingencies can be found below.

Most Severe Post-Transient Contingency – N-1: Robinson-Harry Allen 500 kV

The pre-contingency flow on the Robinson-Harry Allen 500 kV line is ~412 MW north-to-south. This contingency results in overloading the Bordertown 345 kV phase shifter to 120% of its nominal rating (97% of emergency). Since the overload is less than the Bordertown 345 kV phase shifting transformers emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 90: Post-transient results – N-1: Robinson-Harry Allen 500 kV

Element	Nominal % Loading	Emergency % Loading
Bordertown 345 kV Phase Shifter	119.5%	96.9%
Cal Sub 120 kV Phase Shifter	108.6%	90.5%
Harry Allen 345 kV Phase Shifter	102.5%	83.1%

Most Severe Idaho-Northwest Contingency – Bus: Summer Lake 500 kV

This contingency results in overloading the Bordertown 345 kV phase shifter to 113% of its nominal rating (92% of emergency). Since the overload is less than the Bordertown 345 kV phase shifting transformers emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 91: Post-transient results – Bus: Summer Lake 500 kV

Element	Nominal % Loading	Emergency % Loading
Bordertown 345 kV Phase Shifter	113.0%	91.7%
Harry Allen 345 kV Phase Shifter	103.7%	84.1%
Hines 138/115 kV Transformer	105.3%	95.7%

Other Notable Contingencies related to Alturas Project

N-1: Cal Sub 120 kV Phase Shifter – The pre-contingency flow through the Cal Sub 120 kV phase shifter is ~106 MW. This contingency results in overloading the Bordertown 345 kV phase shifter to 109% of its nominal rating (89% of emergency). This contingency could be much more severe if the Cal Sub 120 kV phase shifter were loaded closer to its rating, simultaneous with Path 76 at its rating.

BF IPC Populus-Chill-Hem 500 kV & Hem 500/230 Xfmr – This contingency results in overloading the Midpoint 500 kV series capacitor to 101% of its emergency rating. A RAS to bypass a portion of this series capacitor will be required in order to avoid this overload. This RAS action was also discussed in Section 5.1.2 for the same contingency.

N-1: Midpoint-Humboldt 345 kV Line – This contingency can be a problem when the Alturas Project path is at its maximum flow levels, however, in this case the Midpoint-Humboldt line was only flowing at 143 MW north-to-south. Loss of Midpoint-Humboldt in this configuration would actually act to reduce the flow on the Alturas project path.

Conclusions

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 3400 MW east-to-west rating simultaneous with Alturas Project at 300 MW south-to-north.

5.2.4 Voltage Stability

The Idaho-Northwest v Alturas Project study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v Alturas Project study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 3570 MW, 105% of the proposed 3400 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 3400 MW rating, simultaneous with the Alturas Project path at its 300 MW south-to-north rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16la1sa_3400idnw_Path76 base case can be found in Appendix H. Busses studied utilizing VQ Analysis are: Bordertown 345 kV, Hemingway 500 kV, Hilltop 230 kV, Humboldt 345 kV, Malin 500 kV, Midpoint 500 kV, Populus 500 kV, and Valley Road 345 kV. The tables below highlight a sample of the reactive margins at Bordertown, Hilltop and Valley Road. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 92: **Bordertown 345 kV** bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-1: ROBINSON-HARRY ALLEN 500 KV	0.70	-741	Worst VQ contingency
BF PGE GRASSLAND-CEDAR SPRING & HEM-GRASSLAND 500	0.70	-767	Second Worst VQ contingency
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR	0.70	-768	Worst VQ contingency related to ID-NW

Table 93: **Hilltop 230 kV** bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-1: MALIN-HILLTOP 230 KV	0.70	-181	Worst VQ contingency
BF 4019 CAPTJACK-MALIN #2 & MALIN 500/230 XFMR	0.70	-249	Second Worst VQ Contingency
BF PGE GRASSLAND-CEDAR SPRING & HEM-GRASSLAND 500	0.70	-319	Worst VQ N-1 contingency

Table 94: **Valley Road 345 kV** bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-1: ROBINSON-HARRY ALLEN 500 KV	0.70	-850	Worst VQ contingency
N-1: CAL SUB 120 KV PHASE SHIFTER	0.70	-871	Worst VQ contingency related to ID-NW
BF PGE GRASSLAND-CEDAR SPRING & HEM-GRASSLAND 500	0.70	-879	Worst VQ N-1 contingency

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. Idaho Power busses have sufficient reactive margin for all contingencies.

Given the explanation in this section, there is not a voltage stability type interaction between the Idaho-Northwest path and the Alturas Project path at the flow levels studied.

5.2.5 Transient Stability

A separate transient stability study for the 16la1sa_3400idnw_Path76 case was not completed due to the extreme similarities between the 16la1sa_3400idnw_N case and the 16la1sa_3400idnw_Path76 base case. A separate transient stability study would yield equivalent results. Transient stability contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B.

5.2.6 Remedial Action Schemes

For the 16la1sa_3400idnw_Path76 base case, each contingency, and the associated switching (RAS), is documented in Appendix H. Details for the severe/notable contingencies can be found below.

Most Severe Post-Transient Contingency – N-1: Robinson-Harry Allen 500 kV

This contingency does not have any associated RAS.

Most Severe Idaho-Northwest Contingency – Bus: Summer Lake 500 kV

This contingency does not have any associated RAS.

Notable Contingency – N-1: Cal Sub 120 kV Phase Shifter

This contingency does not have any associated RAS.

Notable Contingency – BF IPC Populus-Chill-Hem 500 kV & Hem 500/230 Xfmr

This contingency opens the Populus-Cedar Hill-Hemingway 500 kV line, and the Hemingway 500/230 kV transformer. To prevent exceeding the emergency rating of the Midpoint 500 kV series capacitor, RAS action to bypass half of the Midpoint 500 kV series capacitor is required. Post-contingency, switched VAr devices modeled at Amps 69 kV, Midpoint 500 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 95: Shunt Capacitor Switching in BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Amps 69 kV (65026)	20 MVAr	30 MVAr
Midpoint 500 kV (60240)	0 MVAr	400 MVAr
Peterson 230 kV (62030)	0 MVAr	31.7 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

5.3 Simultaneous Interaction Study: Idaho – Sierra, N-S (Path 16)

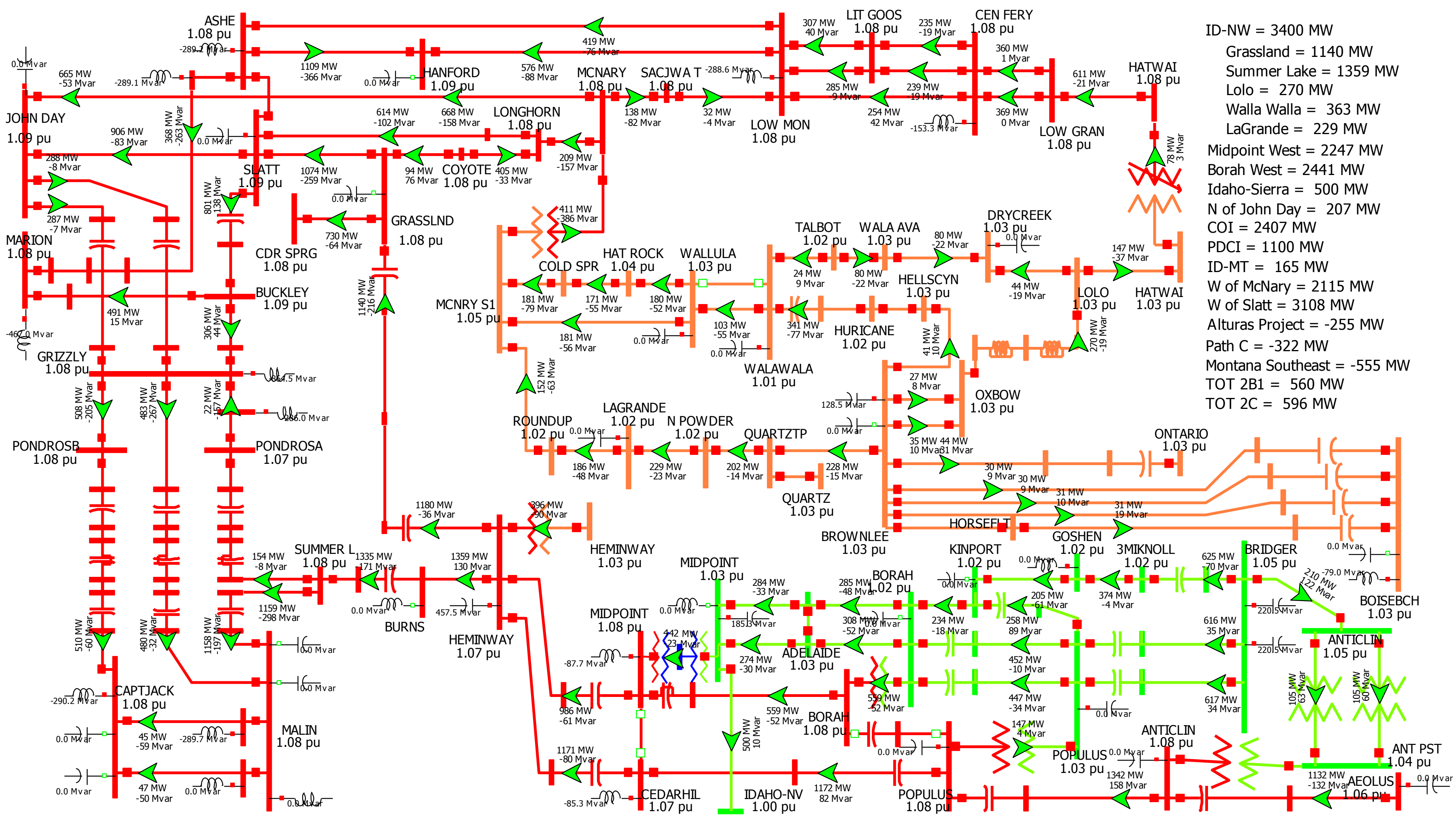


Figure 23: Idaho-Northwest (Path 14) 3400 MW, East to West v. Idaho-Sierra (Path 16), North to South, Base Case

5.3.1 Background & Need for Simultaneous Interaction Studies

The Idaho-Sierra transmission path (Path 16) is made up of single transmission line extending from Midpoint substation in southern Idaho, to Humboldt substation in northern Nevada. In the 16la1sa_3400idnw_nv base case, the flow measured at the Idaho-Nevada border is 500 MW, pre-contingency. Following the N-1 loss of the Hemingway-Boardman 500 kV, the loading on the Idaho-Sierra path increases to 568 MW, a 14% increase on the path. Due to this sizable increase in path transfers, the Idaho-Sierra path may have a simultaneous interaction with the Idaho-Northwest path.

5.3.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is: 16la1sa_3400idnw_nv.

Step-by-step development of the 16la1sa_3400idnw_nv base case:

Step 1: Begin with the 16la1sa_3400idnw_N base case

Utilize the base case developed in Section 5.1.1 Steady State Case Stressing.

Step 2: Stress Idaho-Sierra to 500 MW north-to-south

Schedule generation from the Northwest and Idaho to Sierra and the Southwest (southern California and Arizona).

Step 3: Un-stress Phase Shifters

If phase shifters were being utilized to stress a path, such as the Mill Creek phase shifter stressing the Montana-Idaho path, the phase shifter was moved to zero degrees.

5.3.3 Post Transient Results

Post-transient contingency results for the 16la1sa_3400idnw_nv case can be found in Appendix I. Details for the severe/notable contingencies can be found below.

Severe Post-Trans Contingency #1 – BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr

This contingency results in overloading the Hines 138/115 kV transformer to 110% of its nominal rating (99% of emergency). Since the overload is less than the Hines 138/115 kV transformers emergency rating, this contingency results in acceptable performance.

Severe Post-Transient Contingency #2 – N-2: Double Palo Verde

This contingency results in overloading the Harry Allen 345 kV phase shifters to 123% of their nominal rating (99.6% of emergency). Since the contingency does not overload the Harry Allen 345 kV phase shifters beyond their emergency rating, this contingency results in acceptable performance.

Severe Post-Transient Contingency #3 – N-1: Huntington-Pinto-Four Corners 345 kV

This contingency results in overloading the Harry Allen 345 kV phase shifters to 119% of its nominal rating (97% of emergency). Since the overload is less than the Harry Allen 345 kV phase shifters emergency rating, this contingency results in acceptable performance.

Conclusions

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 3400 MW east-to-west rating simultaneous with Idaho-Sierra at 500 MW north-to-south.

5.3.4 Voltage Stability

The Idaho-Northwest v Idaho-Sierra study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v Idaho-Sierra study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 3570 MW, 105% of the proposed 3400 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 3400 MW rating, simultaneous with the Idaho-Sierra path at its 500 MW north-to-south rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16la1sa_3400idnw_nv base case can be found in Appendix I. Busses studied utilizing VQ Analysis are: Bordertown 345 kV, Hemingway 500 kV, Hilltop 230 kV, Humboldt 345 kV, Malin 500 kV, Midpoint 500 kV, Populus 500 kV, and Valley Road 345 kV. The table below highlights a sample of the reactive margins at Humboldt. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 96: Humboldt 345 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-1: HUMBOLDT-COYOTE CK 345 KV	0.70	-215	Worst VQ contingency
BF IPC MIDPOINT-HEM 500 KV & HEM 500/230 XFMR	0.70	-408	Worst VQ contingency related to Idaho Power
BUS: SUMMER LAKE 500 KV	0.70	-420	Worst VQ contingency related to Idaho-NW

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability type interaction between the Idaho-Northwest path and the Idaho-Sierra path at the flow levels studied.

5.3.5 Transient Stability

Transient stability contingency results for the 16la1sa_3400idnw_nv case can be found in Appendix I.

The 16la1sa_3400idnw_nv base case was the basis for all transient stability study results for the Idaho-Northwest v Idaho-Sierra (Path 16) simultaneous interaction study.

The performance of transient stability contingencies are generally ranked based upon transient voltage dip. The worst N-1 contingency is the loss of the Hemingway-Summer Lake 500 kV line. This contingency results in a voltage dip of approximately 9% on the West John Day 138 kV bus. 9% is well within the acceptable limits. The worst multi-element contingency is a breaker failure at Hemingway substation resulting in the loss of the Midpoint-Hemingway 500 kV line & Hemingway 500/230 kV transformer. This contingency results in a voltage dip of approximately 13% on the West John Day 138 kV bus. Again, 13% is well within the acceptable limits.

5.3.6 Remedial Action Schemes

For the 16la1sa_3400idnw_nv base case, each contingency, and the associated switching (RAS), is documented in Appendix I. Details for the severe/notable contingencies can be found below.

Severe Post-Trans Contingency #1 – BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr

This contingency opens the Hemingway-Summer Lake 500 kV line, and the Hemingway 500/230 kV transformer. After the loss of this line and transformer, switched VAr devices modeled at Harney 115 kV, LaGrande 230 kV and Walla Walla 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 97: Shunt Capacitor Switching in BF IPC Hemingway-Summer Lake 500 kV & Hem 500/230 Xfmr

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Harney 115 kV (40507)	-8.5 MVAr	0 MVAr
LaGrange 230 kV (40621)	0 MVAr	52.2 MVAr
Walla Walla 230 kV (45327)	0 MVAr	40 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #2 – N-2: Double Palo Verde

This contingency opens two Palo Verde generators operating at approximately 1400 MW each. After this generation loss, switched VAr devices modeled at Durango 115 kV, Peigan 4 240 kV, Pinto 138 kV, and York Canyon 115 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 98: Shunt Capacitor Switching in N-2: Double Palo Verde

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Durango 115 kV (79023)	20 MVAr	40 MVAr
Peigan 4 240 kV (54165)	-201 MVAr	0 MVAr
Pinto 138 kV (66230)	32 MVAr	64 MVAr
York Canyon 115 kV (12091)	0 MVAr	15 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #3 – N-1: Huntington-Pinto-Four Corners 345 kV

This contingency does not have any associated RAS.

5.4 Simultaneous Interaction Study: Montana-Idaho, S-N (Path 18)

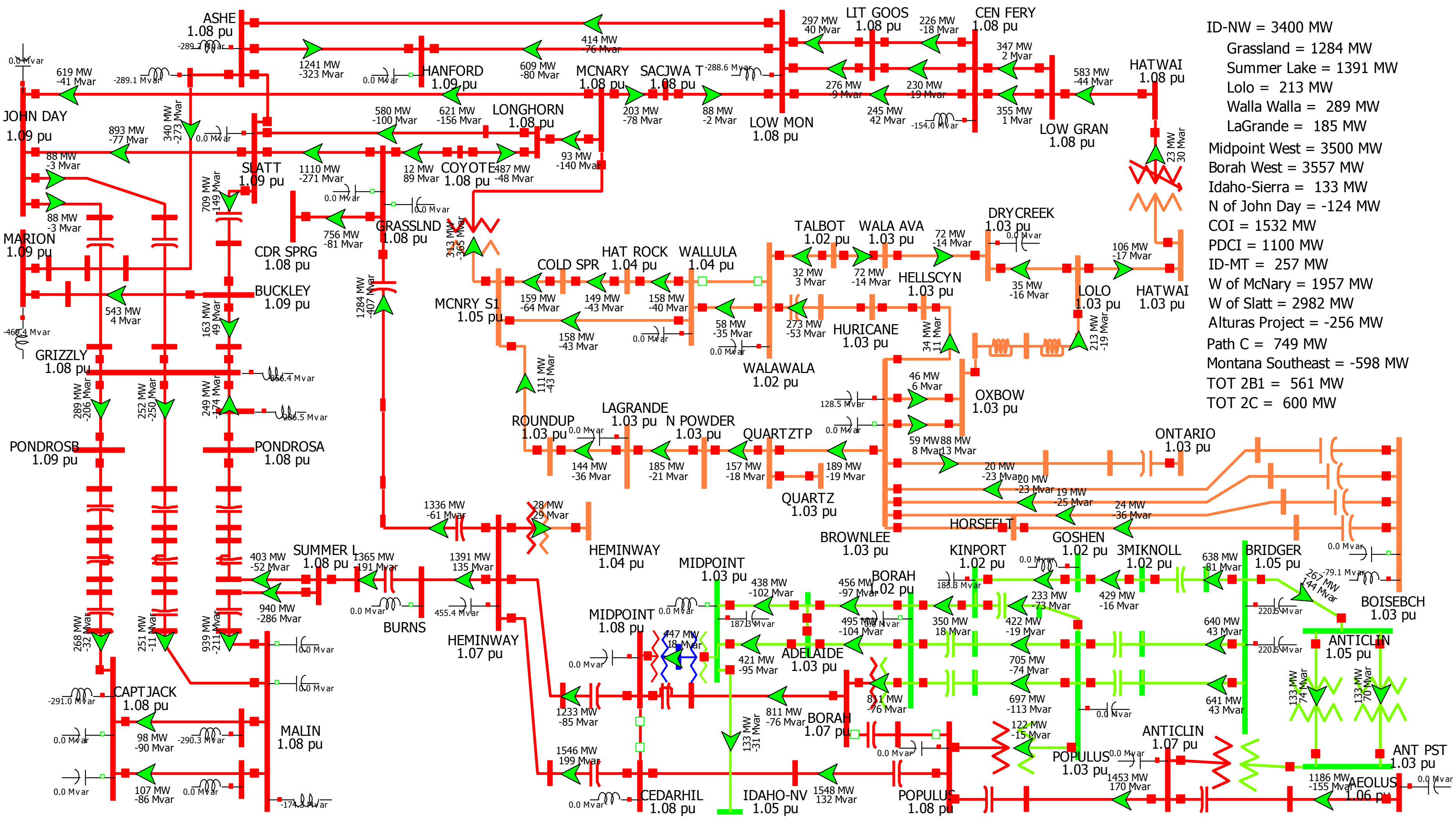


Figure 24: Idaho-Northwest (Path 14) 3400 MW, East to West v. Montana-Idaho (Path 18), South to North, Base Case

5.4.1 Background & Need for Simultaneous Interaction Studies

The Montana-Idaho transmission path (Path 18) has a 256 MW south-to-north rating and consists of two transmission lines: (1) a 230 kV line that extends between Mill Creek, Amps and Brady and (2) a 161 kV line that extends between Dillon, Big Grassy, and Jefferson. In the base case, the path is flowing at 257 MW. Following the N-1 loss of the Hemingway-Boardman 500 kV, the loading on the path increases to 329 MW, a 28% increase. Due to this sizable increase in path transfers, the Idaho-Montana path may have a simultaneous interaction with the Idaho-Northwest path.

5.4.2 Steady State Case Stressing

The study of Idaho-Northwest v Montana-Idaho utilized the 16la1sa_3400idnw_N base case. This base case is described in Section 5.1.1. See Section 5.1.1 for the discussion on steady state case stressing.

5.4.3 Post Transient Results

Post-transient contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B. Details for the severe/notable contingencies can be found below.

Most Severe Post-Transient Contingency: N-2: Broadview-Garrison #1 and #2 500 kV + RAS

This contingency results in overloading the Jefferson 161 kV phase shifter to 113% of its nominal rating (112 MVA) and 86% of its emergency rating (146.7 MVA). Since the overload is less than the Jefferson 161 kV phase shifters emergency rating, this contingency results in acceptable performance. Post-transient voltage deviations are within WECC System Performance Criteria allowable 10% for N-2 contingencies.

Although the most severe, this contingency results in acceptable performance.

Most Severe Idaho-Northwest Contingency: BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS

This contingency results in overloading the Jefferson 161 kV phase shifter to 110% of its nominal rating (84% of emergency). This contingency results in acceptable performance

Other Notable Contingencies related to Montana (all result in acceptable performance):

BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 kV Xfmr + RAS – This contingency results in post-transient voltage deviations between 5-10% at Peterson 230 kV and Amps 230 kV.

N-1: Hemingway-Grassland 500 kV – This contingency results in overloading the Jefferson 161 kV phase shifter to 109% of its nominal rating (83% of emergency).

Conclusions

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 3400 MW east-to-west rating simultaneous with Montana-Idaho at 256 MW south-to-north.

5.4.4 Voltage Stability

The Idaho-Northwest v Montana-Idaho study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v Idaho-Montana study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 3570 MW, 105% of the proposed 3400 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 3400 MW rating, simultaneous with the Montana-Idaho path at its 256 MW south-to-north rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16la1sa_3400idnw_N base case can be found in Appendix B. Busses studied utilizing VQ Analysis are: Harry Allen 345 kV, Hemingway 500 kV, Midpoint 500 kV, Mill Creek 230 kV, Pinto 345 kV, Populus 500 kV, Taft 500 kV, and Yellowtail 230 kV. The table below highlights a sample of the reactive margins at Mill Creek. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 99: Mill Creek 230 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-2: GARRISON-TAFT #1 & #2 500 KV + RAS	0.83	-296	Worst VQ contingency
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR+RAS	0.82	-380	Worst VQ related to Idaho Power
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR + RAS	0.80	-443	Worst VQ related to Idaho-NW

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability interaction between the Idaho-Northwest path and the Montana-Idaho path at the flow levels studied.

5.4.5 Transient Stability

Transient stability contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B. A write up of these results can be found in Section 5.1.4.

5.4.6 Remedial Action Schemes

For the 16la1sa_3400idnw_N base case, each contingency, and the associated switching (RAS), is documented in Appendix B. Details for the severe/notable contingencies can be found below.

Most Severe Post-Transient Contingency: N-2: Broadview-Garrison #1 and #2 500 kV + RAS

For this contingency, given the associated flows on the Montana-Northwest path, the Colstrip ATR would be expected to trip three Colstrip units (the two big units, and a little unit). After the loss of this line and transformer, switched VAr devices would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in/out of service in this post-transient contingency run.

Table 100: Shunt Capacitor Switching in N-2: Broadview-Garrison #1 & #2 500 kV + RAS

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Amps 69 kV (65026)	20 MVAr	30 MVAr
BZ EGALL 50 kV (62348)	0 MVAr	20.4 MVAr
Dillon 69 kV (62345)	3.9 MVAr	27.9 MVAr
JackRabb 50 kV (62349)	0 MVAr	19.7 MVAr
Mill Ck T1 13.8 kV (62332)	-25 MVAr	0 MVAr
Mill Ck T2 13.8 kV (62333)	-25 MVAr	0 MVAr
Peterson 230 kV (62030)	0 MVAr	31.7 MVAr
Taft 500 kV (41057)	0 MVAr	-186 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Most Severe Idaho-Northwest Contingency: BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS

For this contingency, to prevent exceeding the emergency rating of the Burns series capacitor, RAS action to bypass half of the Midpoint 500 kV series capacitor is required. After the loss of this line and transformer, switched VAr devices modeled at Amps 69 kV, Dillon 69 kV, Peterson 230 kV, and LaGrande 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 101: Shunt Capacitor Switching in BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Amps 69 kV (65026)	20 MVAr	30 MVAr
Dillon 69 kV (62345)	3.9 MVAr	15.9 MVAr
Peterson 230 kV (62030)	0 MVAr	31.7 MVAr
LaGrande 230 kV (40621)	0 MVAr	52.2 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Notable Contingency: BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 kV Xfmr + RAS

This contingency opens the Populus-Cedar Hill-Hemingway 500 kV line, and the Hemingway 500/230 kV transformer. To prevent exceeding the emergency rating of the Midpoint 500 kV series capacitor, RAS action to bypass half of the Midpoint 500 kV series capacitor is required. After the loss of this line and transformer, switched VAr devices modeled at Amps 69 kV, Midpoint 500 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 102: Shunt Capacitor Switching in BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Amps 69 kV (65026)	20 MVAr	30 MVAr
Midpoint 500 kV (60240)	0 MVAr	400 MVAr
Peterson 230 kV (62030)	0 MVAr	31.7 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Notable Contingency: N-1: Hemingway-Grassland 500 kV

This contingency opens the Hemingway-Grassland 500 kV line. After the loss of this line and transformer, switched VAr devices modeled at Dillon 161 kV, Harney 115 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 103: Shunt Capacitor Switching in N-1: Hemingway-Grassland 500 kV

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Dillon 161 kV (62084)	3.9 MVAr	27.9 MVAr
Harney 115 kV (40507)	0 MVAr	13 MVAr
Peterson 230 kV (62030)	0 MVAr	31.7 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

5.5 Simultaneous Interaction Study: Montana-Northwest, E-W (Path 8)

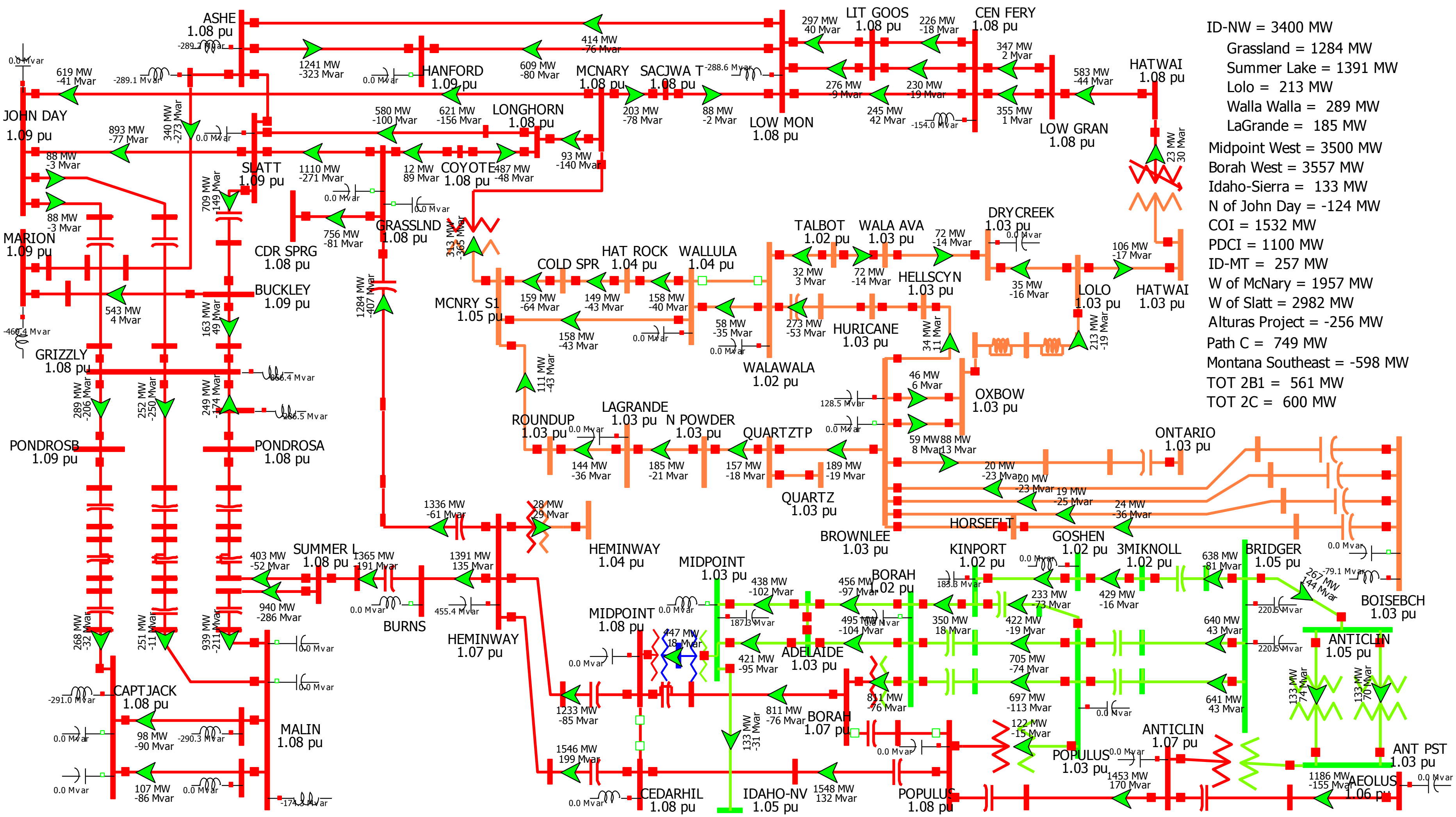


Figure 25: Idaho-Northwest (Path 14) 3400 MW, East to West v. Montana-Northwest (Path 8), East to West, Base Case

5.5.1 Background & Need for Simultaneous Interaction Studies

The Montana-Northwest path is made up of two 500 kV lines, four 230 kV lines, three 115 kV lines, and a 230/115 kV transformer connecting the Montana transmission system to the Northwest transmission system. In the 16la1sa_3400idnw_N base case, the flow on the Montana-Northwest path is 2200 MW, pre-contingency. Following the N-1 loss of the Hemingway-Boardman 500 kV, the loading on the Montana-Northwest path increases to 2332 MW, a 6% increase on the path. Although 6% is less than the 10% threshold, the project review group asked that a simultaneous interaction study be performed between the Idaho-Northwest path and the Montana-Northwest path.

5.5.2 Steady State Case Stressing

The study of Idaho-Northwest v Montana-Northwest utilized the 16la1sa_3400idnw_N base case. The 16la1sa_3400idnw_N base case is described in Section 5.1.1. See Section 5.1.1 for the discussion on steady state case stressing.

5.5.3 Post Transient Results

Post-transient contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B. Details for the severe/notable contingencies can be found below.

Post-Transient Contingencies

See Section 5.4.3 for a detailed discussion on contingencies that impact the Montana area.

Conclusions

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 3400 MW east-to-west rating simultaneous with Montana-Northwest at 2200 MW east-to-west.

5.5.4 Voltage Stability

The Idaho-Northwest v Montana-Northwest study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v Montana-Northwest study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 3570 MW, 105% of the proposed 3400 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 3400 MW rating, simultaneous with the Montana-Northwest path at its 2200 MW rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16la1sa_3400idnw_N base case can be found in Appendix B. Busses studied utilizing VQ Analysis are: Harry Allen 345 kV, Hemingway 500 kV, Midpoint 500 kV, Mill Creek 230 kV, Pinto 345 kV, Populus 500 kV, Taft 500 kV and Yellowtail 230 kV. The table below highlights a sample of the reactive margin at Taft. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 104: Taft 500 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.91	-368	Worst VQ contingency
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR + RAS	0.95	-736	Worst VQ related to Idaho Power
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR + RAS	0.84	-856	Worst VQ related to Idaho-NW

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability type interaction between the Idaho-Northwest path and the Montana-Northwest path at the flow levels studied.

5.5.5 Transient Stability

Transient stability contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B. A write up of these results can be found in Section 5.1.4.

5.5.6 Remedial Action Schemes

See Section 5.4.6 for a detailed discussion on RAS associated with contingencies that impact the Montana area.

5.6 Simultaneous Interaction Study: Montana Southeast, S-N (Path 80)

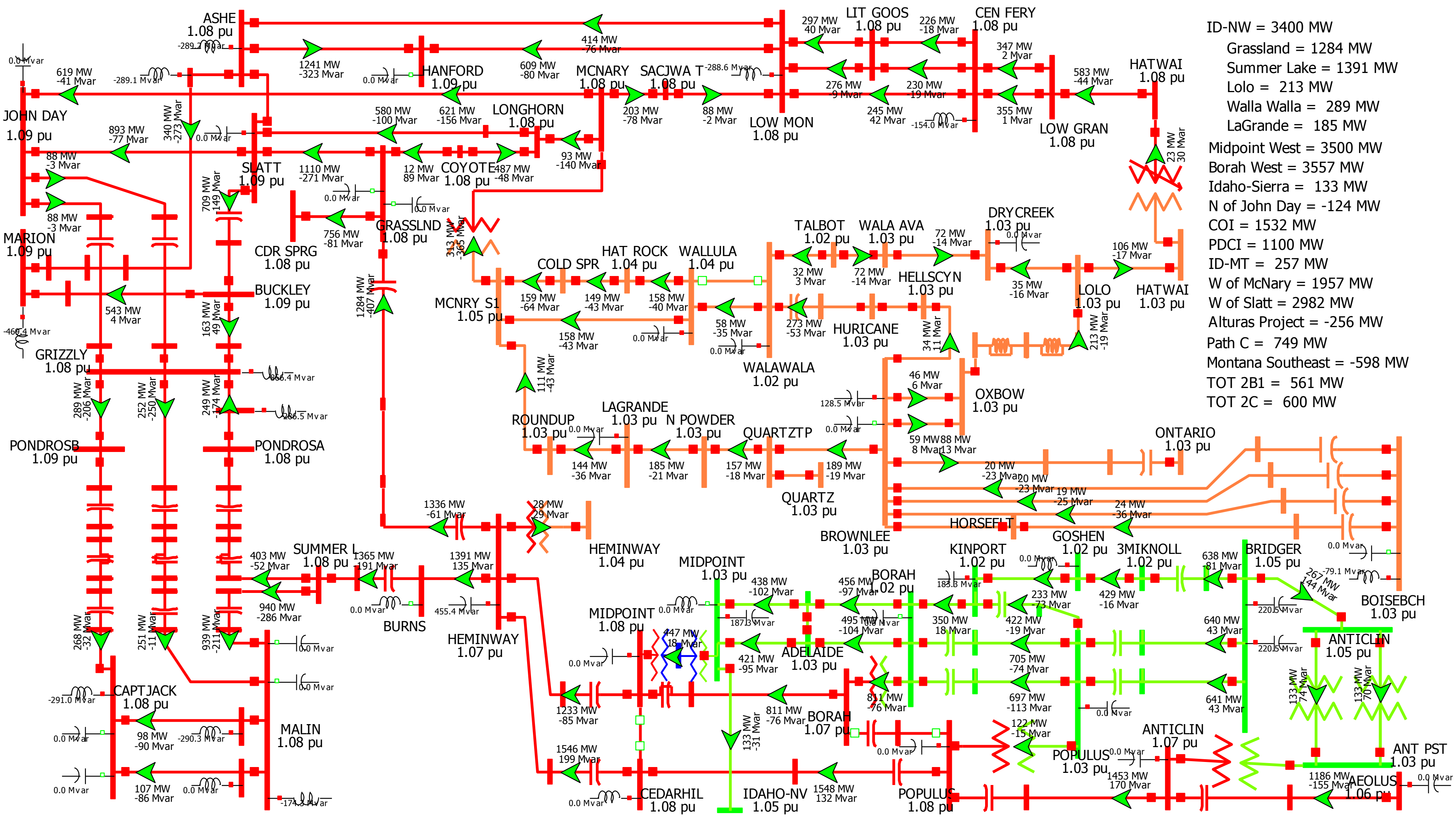


Figure 26: Idaho-Northwest (Path 14) 3400 MW, East to West v. Montana Southeast (Path 80), South to North, Base Case

5.6.1 Background & Need for Simultaneous Interaction Studies

The Montana Southeast path is made up of three 230 kV lines and one 161 kV line connecting the Montana transmission system to the northern Wyoming transmission system. In the 16la1sa_3400idnw_N base case, the flow on the Montana Southeast path is 600 MW south-to-north, pre-contingency. Following the N-1 loss of the Hemingway-Boardman 500 kV, the loading on the Montana Southeast path increases to 677 MW, a 13% increase on the path. Due to this sizable increase in path transfers, the Montana Southeast path may have a simultaneous interaction with the Idaho-Northwest path.

5.6.2 Steady State Case Stressing

The study of Idaho-Northwest v Montana Southeast utilized the 16la1sa_3400idnw_N base case. The 16la1sa_3400idnw_N base case is described in Section 5.1.1. See Section 5.1.1 for the discussion on steady state case stressing.

5.6.3 Post Transient Results

Post-transient contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B.

Post-Transient Contingencies

See Section 5.4.3 for a detailed discussion on contingencies that impact the Montana area.

None of the studied contingencies had an impact on the transmission system around Billings and Yellowtail.

Conclusions

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 3400 MW east-to-west rating simultaneous with Montana Southeast at 600 MW south-to-north.

5.6.4 Voltage Stability

The Idaho-Northwest v Montana Southeast study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v Montana Southeast study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 3570 MW, 105% of the proposed 3400 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its 3400 MW rating, simultaneous with the Montana Southeast path at its 600 MW south-to-north rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16la1sa_3400idnw_N base case can be found in Appendix B. Busses studied utilizing VQ Analysis are: Harry Allen 345 kV, Hemingway 500 kV, Midpoint 500 kV, Mill Creek 230 kV, Pinto 345 kV, Populus 500 kV, Taft 500 kV, and Yellowtail 230 kV. The table below highlights a sample of the reactive margins at Yellowtail. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 105: Yellowtail 230 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-2: BROADVIEW-GARRISONT #1 & #2 500 KV + RAS	0.92	-140	Worst VQ contingency
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR + RAS	0.77	-330	Worst VQ related to Idaho Power
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR + RAS	0.75	-378	Worst VQ related to Idaho-NW

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability type interaction between the Idaho-Northwest path and the Montana Southeast path at the flow levels studied.

5.6.5 Transient Stability

Transient stability contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B. A write up of these results can be found in Section 5.1.4.

5.6.6 Remedial Action Schemes

See Section 5.4.6 for a detailed discussion on RAS associated with contingencies that impact the Montana area.

5.7 Simultaneous Interaction Study: PG&E – Sierra, E-W (Path 24)

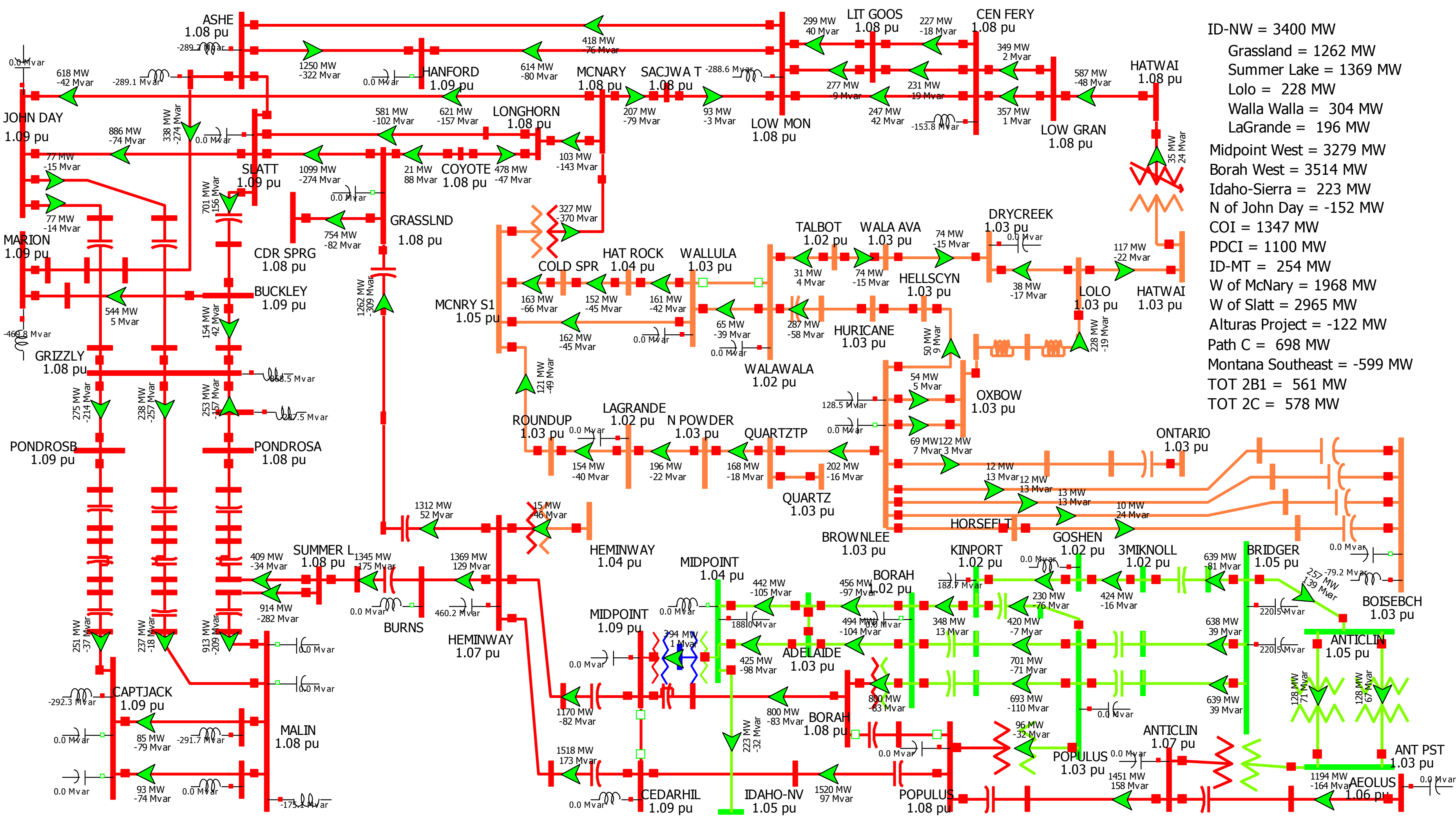


Figure 27: Idaho-Northwest (Path 14) 3400 MW, East to West v. PG&E-Sierra (Path 24), East to West, Base Case

5.7.1 Background & Need for Simultaneous Interaction Studies

The PG&E-Sierra transmission path (Path 24) is made up of two 115 kV transmission lines and a 60 kV transmission line connecting western Nevada to northeast California. The majority of the power flowing through the PG&E-Sierra path begins at California Substation, and flows through the Cal Sub 120 kV phase shifter. In the 16la1sa_3400idnw_N base case, the flow through the Cal Sub 120 kV phase shifter is 147 MW, and the flow through the PG&E-Sierra path is 149 MW. Following the N-1 loss of the Hemingway-Boardman 500 kV, the loading on the PG&E-Sierra path increases to 171 MW, a 15% increase on the path. Due to this sizable increase in path transfers, the PG&E-Sierra path may have a simultaneous interaction with the Idaho-Northwest path.

In order to stress the PG&E-Sierra path to ~150 MW, the Cal Sub 120 kV phase shifter has to be loaded to its nominal rating, pre-contingency. Of the 329 studied contingencies, 98 resulted in overloading the Cal Sub 120 kV phase shifter beyond its nominal rating, of which none of those resulted in overloads beyond the emergency rating.

5.7.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is: 16la1sa_3400idnw_Path24.

<u>Step-by-step development of the 16la1sa_3400idnw_Path24 base case:</u>

Step 1: Begin with the 16la1sa_3400idnw_N base case

Utilize the base case developed in Section 5.1.1 Steady State Case Stressing.

Step 2: Stress the PG&E-Sierra (Path 24) to 150 MW east-to-west

Utilize the Cal Sub 120 kV phase shifting transformer.

5.7.3 Post Transient Results

Post-transient contingency results for the 16la1sa_3400idnw_Path24 case can be found in Appendix J. Details for the severe/notable contingencies can be found below.

Most Severe Post-Transient Contingency – N-1: Hilltop 345/230 Xfmr

The pre-contingency flow through the Hilltop 345/230 kV transformer is ~123 MW. This contingency results in overloading the Cal Sub 120 kV phase shifter to 119.2% of its nominal rating (99.3% of emergency). Since the overload is less than the Cal Sub 120 kV phase shifting transformers emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 106: Post-transient results – N-1: Hilltop 345/230 kV Transformer

Element	Nominal % Loading	Emergency % Loading
Cal Sub 120 kV Phase Shifter	119.2%	99.3%
Drum-Dtch Fl1 115 kV	105.1%	90.4%

Most Severe Idaho-Northwest Contingency – BF 4957 Summer L-Malin & Summer L-Hemingway 500kV

This contingency results in overloading the Cal Sub 120 kV phase shifter to 116% of its nominal rating (97% of emergency). Since the overload is less than the Cal Sub 120 kV phase shifting transformers emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 107: Post-transient results – BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV

Element	Nominal % Loading	Emergency % Loading
Cal Sub 120 kV Phase Shifter	119.2%	99.3%
Drum-Dtch Fl1 115 kV	103.1%	88.7%
Harry Allen 345 kV Phase Shifters	108.2%	87.7%
Hemingway-Grassland 500 kV	110.6%	73.7%
Hines 138/115 kV Xfmr	103.9%	94.5%
Pinto 345 kV Phase Shifters	102.0%	81.6%

Other Notable Contingencies related to PG&E-Sierra

N-1: Robinson-Harry Allen 500 kV – This contingency results in overloading the Cal Sub 120 kV phase shifter to 119.0% of its nominal rating (99.2% of emergency).

N-2: Round Mtn-Table Mtn #1 & #2 500 kV – This contingency results in overloading the Cal Sub 120 kV phase shifter to 118.5% of its nominal rating (98.8% of emergency).

Conclusions

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 3400 MW east-to-west rating simultaneous with PG&E-Sierra at 150 MW east-to-west.

5.7.4 Voltage Stability

The Idaho-Northwest v PG&E-Sierra study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. For the Idaho-Northwest v PG&E-Sierra study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 3570 MW, 105% of the proposed 3400 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 3400 MW rating, simultaneous with the PG&E-Sierra path at its 150 MW east-to-west rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16la1sa_3400idnw_Path24 base case can be found in Appendix J. Busses studied utilizing VQ Analysis are: Bordertown 345 kV, Cal Sub 120 kV, Hemingway 500 kV, Hilltop 230 kV, Humboldt 345 kV, Midpoint 500 kV, Populus 500 kV, and Valley Road 345 kV. The tables below highlight a sample of the reactive margins at Bordertown, Cal Sub and Valley Road. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 108: Bordertown 345 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-1: HILL TOP 345/230 XFMR	0.70	-777	Worst VQ contingency
N-1: MALIN-HILLTOP 230 KV	0.70	-785	Second Worst VQ contingency
BF PGE GRASSLAND-CEDAR SPRING & HEM-GRASSLAND 500	0.70	-825	Worst VQ contingency related to ID-NW

Table 109: Cal Sub 120 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-1: CAL SUB 120 KV PHASE SHIFTER	0.70	-463	Worst VQ contingency
BF PGE GRASSLAND-CEDAR SPRING & HEM-GRASSLAND 500	0.70	-535	Worst VQ contingency related to ID-NW

Table 110: Valley Road 345 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-1: HILL TOP 345/230 XFMR	0.70	-887	Worst VQ contingency
BF IPC POP-CHILL-HEM 500 KV & HEM 500/230 XFMR+RAS	0.72	-911	Worst VQ related to Idaho Power
BF PGE GRASSLAND-CEDAR SPRING & HEM-GRASSLAND	0.72	-912	Worst VQ contingency related to ID-NW

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400

MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability type interaction between the Idaho-Northwest path and the PG&E-Sierra path at the flow levels studied.

5.7.5 Transient Stability

A separate transient stability study for the 16la1sa_3400idnw_Path24 case was not completed due to the similarities between the 16la1sa_3400idnw_N case and the 16la1sa_3400idnw_Path24 base case. A separate transient stability study would yield equivalent results. Transient stability contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B.

5.7.6 Remedial Action Schemes

For the 16la1sa_3400idnw_Path76 base case, each contingency, and the associated switching (RAS), is documented in Appendix J. Details for the severe/notable contingencies can be found below.

Most Severe Post-Transient Contingency – N-1: Hilltop 345/230 Xfmr

This contingency does not have any associated RAS.

Most Severe Idaho-Northwest Contingency – BF 4957 Summer L-Malin & Summer L-Hemingway 500kV

This contingency does not have any associated RAS.

Notable Contingency - N-1: Robinson-Harry Allen 500 kV

This contingency does not have any associated RAS.

Notable Contingency - N-2: Round Mtn-Table Mtn #1 & #2 500 kV

This contingency does not have any associated RAS.

5.8 Simultaneous Interaction Study: TOT 2B1, N-S (Path 78)

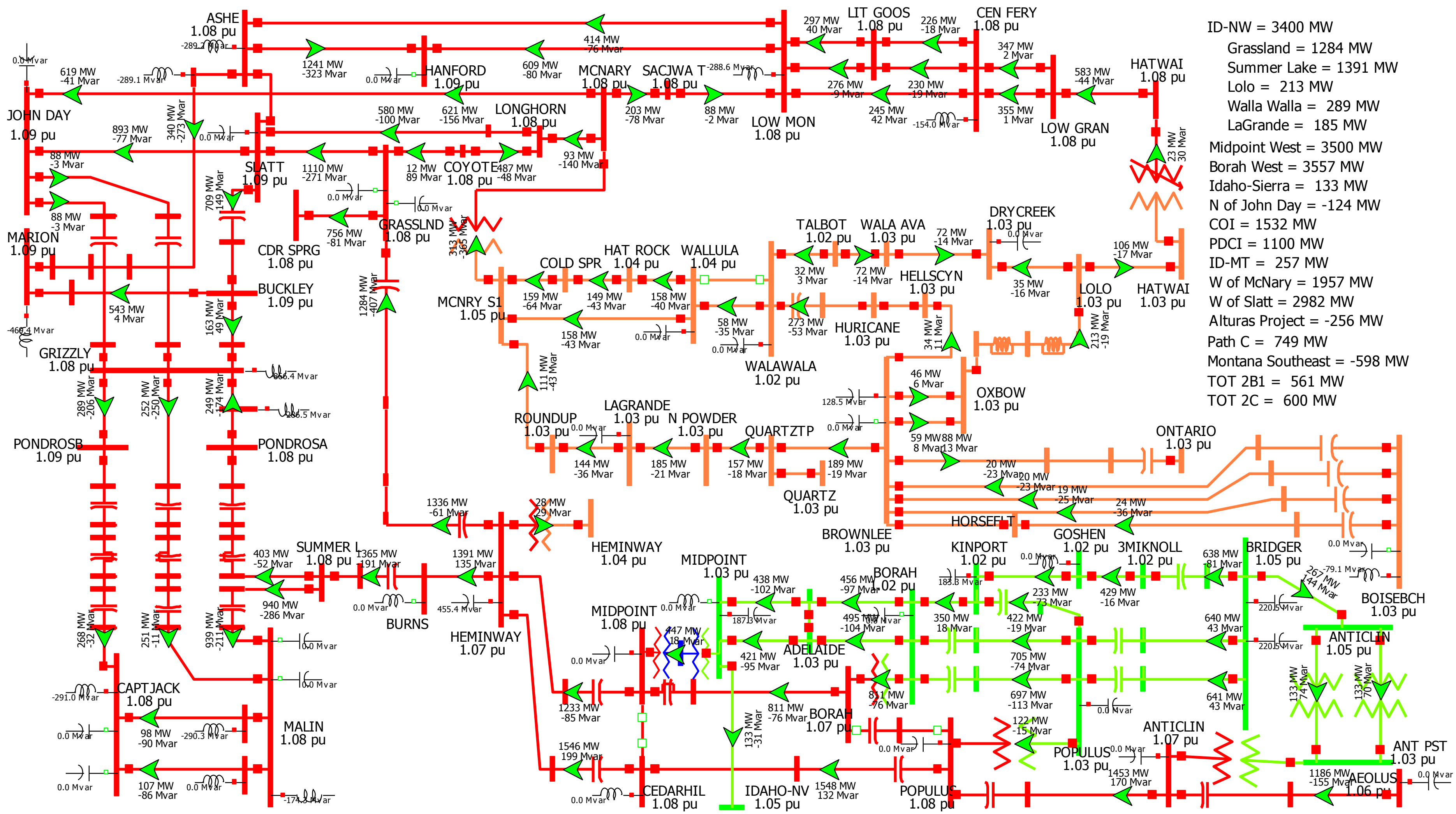


Figure 28: Idaho-Northwest (Path 14) 3400 MW, East to West v. TOT 2B1, North to South, Base Case

Background & Need for Simultaneous Interaction Studies

The TOT 2B1 transmission path (Path 78) is made up of a single 345 kV transmission line connecting Pinto substation in southeast Utah to Four Corners substation in northwest New Mexico. In the base case, the flow through TOT 2B1 is 561 MW. Following the N-1 loss of the Hemingway-Boardman 500 kV, the loading on the TOT 2B1 path increases to 611 MW, a 9% increase on the path.

5.8.1 Steady State Case Stressing

The study of Idaho-Northwest v TOT 2B1 utilized the 16la1sa_3400idnw_N base case. The 16la1sa_3400idnw_N base case is described in Section 5.1.1.

5.8.2 Post Transient Results

Post-transient contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – N-2: Double Palo Verde

This contingency results in overloading the Pinto 345 kV phase shifters to 116% of their nominal rating (93% of emergency). Since the overloads are less than the phase shifters emergency ratings, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table 111: Post-transient results – N-2: Double Palo Verde

Element	Nominal % Loading	Emergency % Loading
Gladston-Springer 115 kV	99%	99%
Harry Allen 345 kV Phase Shifters	123%	99.7%
Pinto 345 kV Phase Shifters	116%	93%

Severe Post-Transient Contingency #2 – N-1: Red Butte-Harry Allen 345 kV

This contingency results in overloading the Pinto 345 kV phase shifters to 111% of their nominal ratings (89% of emergency). Since the overload is less than the Pinto 345 kV phase shifters emergency ratings, this contingency results in acceptable performance.

Most Severe Idaho-Northwest Contingency – Bus: Summer Lake 500 kV

This contingency results in overloading the Pinto 345 kV phase shifters to 102% of their nominal ratings (82% of emergency).

Notable Contingency - BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS

This contingency results in overloading the Pinto 345 kV phase shifters to 105% of their nominal ratings (84% of emergency).

Conclusions

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 3400 MW east-to-west rating simultaneous with TOT 2B1 at 560 MW north-to-south.

5.8.3 Voltage Stability

The Idaho-Northwest v TOT 2B1 study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v TOT 2B1 study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 3570 MW, 105% of the proposed 3400 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 3400 MW rating, simultaneous with the TOT 2B1 path at its 560 MW north-to-south rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16la1sa_3400idnw_N base case can be found in Appendix B. Busses studied utilizing VQ Analysis are: Harry Allen 345 kV, Hemingway 500 kV, Midpoint 500 kV, Mill Creek 230 kV, Pinto 345 kV, Populus 500 kV, Taft 500 kV and Yellowtail 230 kV. The table below highlights a sample of the reactive margins at Pinto. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 112: Pinto 345 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-2: DOUBLE PALO VERDE	0.70	-575	Worst VQ contingency
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR + RAS	0.70	-635	Worst VQ related to Idaho Power
BUS: SUMMER LAKE 500 KV	0.70	-658	Worst VQ related to Idaho-NW

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability type interaction between the Idaho-Northwest path and the TOT 2B1 path at the flow levels studied.

5.8.4 Transient Stability

Transient stability contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B. A write up of these results can be found in Section 5.1.4.

5.8.5 Remedial Action Schemes

For the 16la1sa_3400idnw_N base case, each contingency, and the associated switching (RAS), is documented in Appendix B. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – N-2: Double Palo Verde

This contingency opens two Palo Verde generators operating at approximately 1400 MW each. After this generation loss, switched VAr devices modeled at Durango 115 kV, Pinto 138 kV, and York Canyon 115 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 113: Shunt Capacitor Switching in N-2: Double Palo Verde

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Durango 115 kV (79023)	20 MVAr	40 MVAr
Pinto 138 kV (66230)	32 MVAr	64 MVAr
York Canyon 115 kV (12091)	0 MVAr	15 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #2 – N-1: Red Butte-Harry Allen 345 kV

This contingency opens the Red Butte-Harry Allen 345 kV transmission line. After the loss of this line, a discrete switched VAr device modeled at Red Butte 345 kV would switch out due to high voltages on the bus that the device is controlling.

Most Severe Idaho-Northwest Contingency – Bus: Summer Lake 500 kV

This contingency does not have any associated RAS.

For the existing Idaho-Northwest system, rated at 2400 MW east-to-west, this contingency would have required the tripping of ~1000 MW at Jim Bridger Power Plant.

Notable Contingency - BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS

This contingency opens the Populus-Cedar Hill-Hemingway 500 kV line, and the Hemingway 500/230 kV transformer. To prevent exceeding the emergency rating of the Midpoint 500 kV series capacitor, RAS action to bypass half of the Midpoint 500 kV series capacitor is required. After the loss of this line and transformer, switched VAr devices modeled at Amps 69 kV, Midpoint 500 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 114: Shunt Capacitor Switching in BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Amps 69 kV (65026)	20 MVAr	30 MVAr
Midpoint 500 kV (60240)	0 MVAr	400 MVAr
Peterson 230 kV (62030)	0 MVAr	31.7 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

5.9 Simultaneous Interaction Study: TOT 2C, N-S (Path 35)

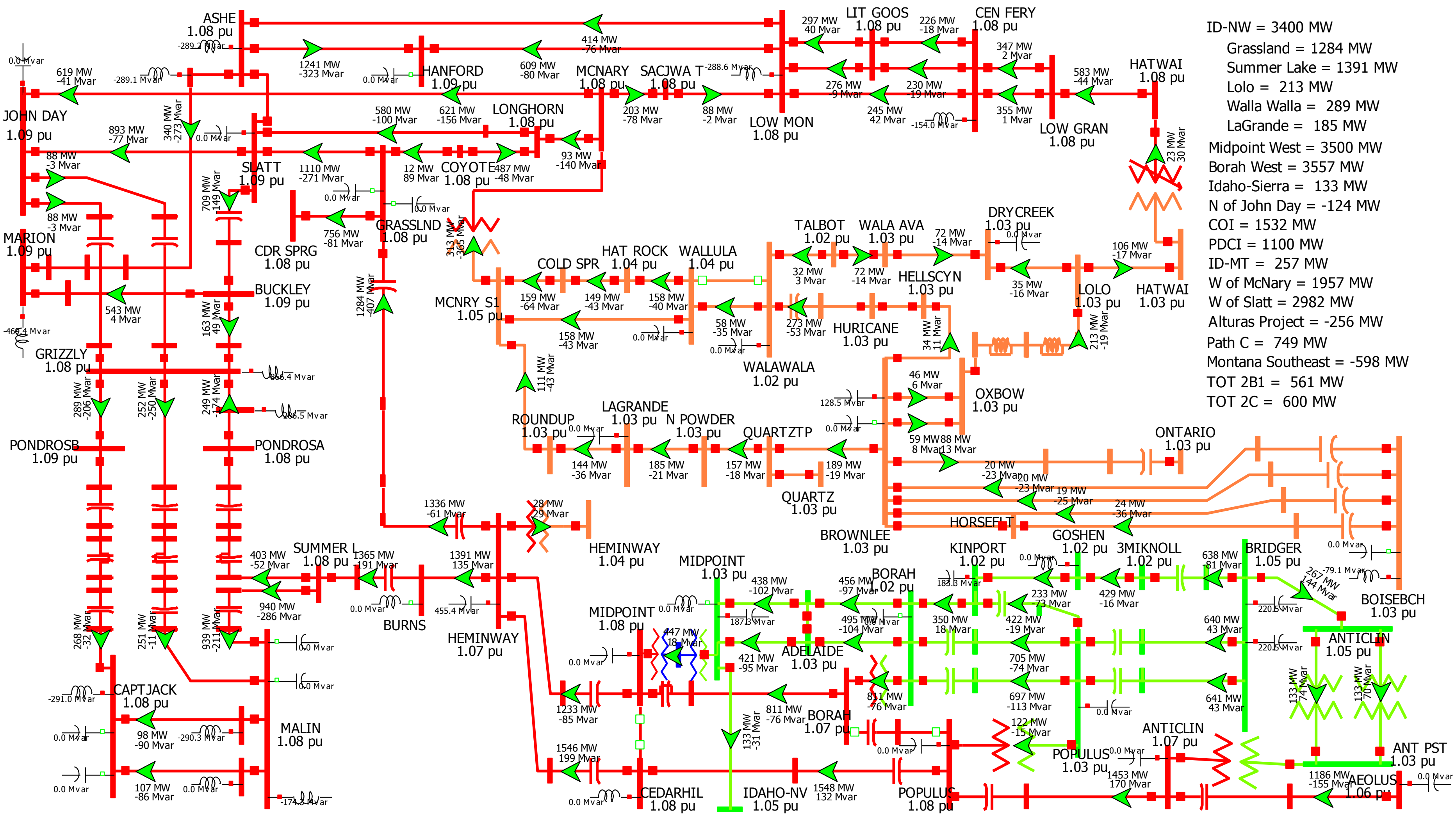


Figure 29: Idaho-Northwest (Path 14) 3400 MW, East to West v. TOT 2C (Path 35), North to South, Base Case

5.9.1 Background & Need for Simultaneous Interaction Studies

TOT 2C (Path 35) is made up of one 345 kV transmission line connecting Red Butte substation in southwest Utah to Harry Allen 345 kV substation in the Las Vegas area. In the base case, the flow through TOT 2C is 600 MW. Following the N-1 loss of the Hemingway-Boardman 500 kV line, the loading on the TOT 2C path increases to 671 MW, a 12% increase on the path. Due to this sizable increase in path transfers, the TOT 2C path may have a simultaneous interaction with the Idaho-Northwest path.

5.9.2 Steady State Case Stressing

The study of Idaho-Northwest v TOT 2C utilized the 16la1sa_3400idnw_N base case. The 16la1sa_3400idnw_N base case is described in Section 5.1.1.

5.9.3 Post Transient Results

Post-transient contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – N-2: Double Palo Verde

This contingency results in overloading the Harry Allen 345 kV phase shifters to 123% of their nominal rating (99.7% of emergency). Refer to the table below for more information about the overloads caused by this contingency.

Table 115: Post-transient results – N-2: Double Palo Verde

Element	Nominal % Loading	Emergency % Loading
Gladston-Springer 115 kV	99%	99%
Harry Allen 345 kV Phase Shifters	123%	99.7%
Pinto 345 kV Phase Shifters	116%	93%

Severe Post-Transient Contingency #2 – N-1: Harry Allen 345/230 kV Xfmr

This contingency results in overloading the remaining Harry Allen 345/230 kV transformer to 155% of its nominal rating (133% of emergency). Due to this overload, this contingency would ultimately result in back-tripping the Redbutte-Harry Allen 345 kV line. After including the loss of the Redbutte-Harry Allen 345 kV line, this contingency results in overloading the Pinto 345 kV phase shifters to 111% of their nominal ratings (89% of emergency). Since the overload is less than the Pinto 345 kV phase shifters emergency ratings, this contingency results in acceptable performance.

Severe Post-Transient Contingency #3 – N-1: Pinto-Four Corners 345 kV

This contingency results in overloading the remaining Harry Allen 345 phase shifters to 119% of their nominal rating (97% of emergency). Since the overload is less than the Harry Allen 345 kV phase shifters emergency ratings, this contingency results in acceptable performance.

Most Severe Idaho Power Contingency: BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS

This contingency results in overloading the Harry Allen 345 kV phase shifters to 116% of their nominal rating (94% of emergency).

Most Severe Idaho-Northwest Contingency: Bus: Summer Lake 500 kV

This contingency results in overloading the Harry Allen 345 kV phase shifters to 112% of their nominal rating (91% of emergency).

Conclusions

No violations of the NERC/WECC standards and local reliability criteria were observed. The Idaho-Northwest path can achieve a 3400 MW east-to-west rating simultaneous with TOT 2C at 600 MW north-to-south.

5.9.4 Voltage Stability

The Idaho-Northwest v TOT 2C study utilizes two methods to verify voltage stability: (1) Real Power Margin Assessment (PV Analysis) and (2) Reactive Power Margin Assessment (VQ Analysis).

PV Analysis requires N-1, N-2, and breaker failure contingencies to have a post-transient solution with the path under study stressed to at least 105%, 102.5% and 102.5%, respectively, of the proposed rating. In the Idaho-Northwest v TOT 2C study, all contingencies have a post-transient solution with Idaho-Northwest stressed to 3570 MW, 105% of the proposed 3400 MW rating. This PV Analysis verifies that sufficient real power margin exists to operate the Idaho-Northwest path at its proposed 3400 MW rating, simultaneous with the TOT 2C path at its 600 MW north-to-south rating.

VQ Analysis determines the reactive power margin, in MVAr, following a contingency at a specific electrical bus. In this study, reactive margin is represented by a negative number. The larger the negative number, the more reactive margin (-500 MVAr is a superior reactive margin than -100 MVAr).

VQ results for the 16la1sa_3400idnw_N base case can be found in Appendix B. Busses studied utilizing VQ Analysis are: Harry Allen 345 kV, Hemingway 500 kV, Midpoint 500 kV, Mill Creek 230 kV, Pinto 345 kV, Populus 500 kV, Taft 500 kV and Yellowtail 230 kV. The table below highlights a sample of the reactive margins at Harry Allen. The study results indicate that all studied busses have sufficient reactive margin for all studied contingencies.

Table 116: Harry Allen 345 kV bus reactive margin results (sample)

Contingency Name	Voltage @ Qmin	Margin (MVAr)	Comments
N-1: HATWAI 500/230 KV XFMR	0.70	-805	Worst VQ contingency
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR +RAS	0.70	-1039	Worst VQ related to Idaho Power
BUS: SUMMER LAKE 500 KV	0.70	-1066	Worst VQ related to Idaho-NW

Idaho Power has special reactive margin criteria for Idaho Power busses. For N-1 outages, Idaho Power's reactive margin requirement is 250 MVAr for critical 230 kV and 345 kV busses and 500 MVAr for critical 500 kV busses. For N-2 outages, the requirement is 200 MVAr for 230 kV and 345 kV busses and 400 MVAr for 500 kV busses. The study results indicate that Idaho Power busses have sufficient reactive margin for all studied contingencies.

Given the explanation in this section, there is not a voltage stability type interaction between the Idaho-Northwest path and the TOT 2C path at the flow levels studied.

5.9.5 Transient Stability

Transient stability contingency results for the 16la1sa_3400idnw_N case can be found in Appendix B. A write up of these results can be found in Section 5.1.4.

5.9.6 Remedial Action Schemes

For the 16la1sa_3400idnw_N base case, each contingency, and the associated switching (RAS), is documented in Appendix B. Details for the severe/notable contingencies can be found below.

Most Severe Post-Transient Contingency – N-2: Double Palo Verde

This contingency opens two Palo Verde generators operating at approximately 1400 MW each. After this generation loss, switched VAr devices modeled at Durango 115 kV, Pinto 138 kV, and York Canyon 115 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this contingency.

Table 117: Shunt Capacitor Switching in N-2: Double Palo Verde

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Durango 115 kV (79023)	20 MVAr	40 MVAr
Pinto 138 kV (66230)	32 MVAr	64 MVAr
York Canyon 115 kV (12091)	0 MVAr	15 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Severe Post-Transient Contingency #2 – N-1: Harry Allen 345/230 kV Xfmr

If loss of a single Harry Allen 345/230 kV transformer results in severe overloads on the remaining Harry Allen 345/230 kV transformer, as it does in this study, the Redbutte-Harry Allen 345 kV line is tripped to relieve this overload.

Severe Post-Transient Contingency #3 – N-1: Pinto-Four Corners 345 kV

This contingency does not have any associated RAS.

Most Severe Idaho-Power Contingency – BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS

This contingency opens the Populus-Cedar Hill-Hemingway 500 kV line, and the Hemingway 500/230 kV transformer. To prevent exceeding the emergency rating of the Midpoint 500 kV series capacitor, RAS action to bypass half of the Midpoint 500 kV series capacitor is required. Post-contingency, switched VAr devices modeled at Amps 69 kV, Midpoint 500 kV, and Peterson 230 kV would switch in-service due to depressed voltages on the busses that the devices are controlling. The table below illustrates the amount and location of VArs switched in-service in this post-transient contingency run.

Table 118: Shunt Capacitor Switching in BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS

Shunt Device (Bus)	Initial MVAr	Post-Transient MVAr
Amps 69 kV (65026)	20 MVAr	30 MVAr
Midpoint 500 kV (60240)	0 MVAr	400 MVAr
Peterson 230 kV (62030)	0 MVAr	31.7 MVAr

In reality, additional capacitors may switch that are not modeled as part of this contingency.

Most Severe Idaho-Northwest Contingency – Bus: Summer Lake 500 kV

This contingency does not have any associated RAS.

6. Conclusion

The objective of this Phase II Rating Study was to evaluate the addition of the proposed Hemingway – Boardman 500 kV transmission project into the existing WECC transmission system. The Hemingway – Boardman 500 kV transmission project will be treated as an addition to the Idaho – Northwest (Path 14) WECC rated path. Idaho Power is requesting an increase to the Idaho – Northwest Path 14 WECC Accepted Rating upon completion of the Hemingway-Boardman 500 kV transmission project. Below are the proposed ratings in the west-to-east direction and the east-to-west direction:

Table 119: Proposed ratings for Idaho-Northwest (Path 14) and Hemingway-Boardman 500 kV

WECC Path Name	Rating West-to-East	Rating East-to-West
Idaho-Northwest (Path 14)	2250	3400

Simultaneous Interaction Studies Summary

In order to prove the proposed ratings are acceptable, this report studied Idaho-Northwest at its proposed ratings simultaneous with other relevant similarly situated Phase 2 projects, Phase 3 projects, and existing WECC rated paths at their proposed ratings. The following simultaneous interaction studies have been completed:

Table 120: Simultaneous Interaction Studies Completed

		Simultaneous Path		
Idaho-Northwest (Path 14)	Hemingway-Boardman 500 kV	Path Name	Path #	Path Rating
W-E, 2250 MW	-1407 MW	COI	66	4800 MW
W-E, 2250 MW	-1407 MW	Idaho-Sierra	16	500 MW
W-E, 2250 MW	-1407 MW	Montana-Idaho	18	337 MW
W-E, 2250 MW	-1407 MW	Montana Southeast	80	660 MW
W-E, 2250 MW	-1407 MW	North of John Day	73	7800 MW
W-E, 2250 MW	-1407 MW	PDCI	65	3100 MW
W-E, 2250 MW	-1301 MW	West of Hatwai	6	3400 MW
W-E, 2250 MW	-1407 MW	MSTI & SWIP	II-5, II-11	1500 MW, 1950 MW
E-W. 3400 MW	1284 MW	Alturas Project	76	300 MW
E-W. 3400 MW	1111 MW	Idaho-Sierra	16	500 MW
E-W. 3400 MW	1284 MW	Montana-Idaho	18	256 MW
E-W. 3400 MW	1284 MW	Montana-Northwest	8	2200 MW
E-W. 3400 MW	1284 MW	Montana Southeast	80	600 MW
E-W. 3400 MW	1284 MW	PG&E-Sierra	24	150 MW
E-W. 3400 MW	1284 MW	TOT 2B1	78	560 MW
E-W. 3400 MW	1284 MW	TOT 2C	35	600 MW

The Plan of Service in Section 2.4 of this report lists the system additions corresponding with the Hemingway-Boardman 500 kV Project. All simultaneous interaction studies included the system additions described in Section 2.4.

For all simultaneous interaction studies, Idaho Power completed Post-Transient, Voltage Stability, and Transient Stability studies.

Simultaneous Interaction Studies Summary – Post-Transient Contingency Results

Three breaker failure contingencies limited the transfer capability in this report:

1) Breaker Failure: Hemingway-Grassland 500 kV Line & Hemingway 500/230 kV transformer
2) Breaker Failure: Midpoint-Hemingway 500 kV Line & Hemingway 500/230 kV transformer
3) Breaker Failure: Hemingway-Grassland & Grassland-Cedar Spring 500 kV Lines

Each of these breaker failure contingencies are avoidable by setting up the Hemingway and Grassland 500 kV busses in different manners, however, the N-1 loss of Hemingway-Grassland 500 kV is almost as severe as each of these breaker failure contingencies. These contingencies result in thermal loading approaching the emergency rating on the Brownlee-Hells Canyon and Oxbow-Lolo 230 kV lines, and post-transient voltage deviation issues at Peterson 230 kV and Amps 230 kV substations. A new shunt capacitor on the Peterson 230 kV bus, switchable based on a voltage set point, is required to arrest the post-transient voltage deviations issues associated with these critical contingencies.

Given proper remediation, all contingencies in the simultaneous interaction studies resulted in acceptable post-transient performance. Post-transient performance indicates that the Idaho-Northwest path is capable of a 2250 MW west-to-east rating and a 3400 MW east-to-west rating simultaneous with all other studied paths.

Simultaneous Interaction Studies Summary – Voltage Stability Results

All contingencies resulted in adequate Real Power Margin (PV) and Reactive Power Margin (QV) in each of the simultaneous interaction studies. PV/QV analysis indicates that the Idaho-Northwest path is capable of a 2250 MW west-to-east rating and a 3400 MW east-to-west rating simultaneous with all other studied paths.

Simultaneous Interaction Studies Summary – Transient Stability Results

All studied contingencies resulted in stable and damped performance with no violations to the WECC Performance Criteria. Transient stability analysis indicates that the Idaho-Northwest path is capable of a 2250 MW west-to-east rating and a 3400 MW east-to-west rating simultaneous with all other studied paths.

Sensitivity Studies Summary

In addition to simultaneous interaction studies, several sensitivity studies were completed. These sensitivity studies are listed below:

Table 121: Sensitivity Studies Completed in Phase II

Idaho-Northwest (Path 14)	Hemingway-Boardman 500 kV	Sensitivity Name
W-E, 2250 MW	-1323 MW	Hemingway-Boardman Stand Alone
W-E, 2250 MW	-1374 MW	Walla Walla Area, 100 % Wind
W-E, 2250 MW	-1449 MW	High West of McNary & West of Slatt
W-E, 2250 MW	-1418 MW	Longhorn Terminus
W-E, 2250 MW	-1390 MW	NV Energy Updates

Sensitivity Studies Summary – Post-Transient Contingency Results

The Hemingway-Boardman Stand Alone sensitivity case offered one particular contingency that must be avoided if the Hemingway-Boardman 500 kV line is completed prior to the Populus-Cedar Hill-Hemingway 500 kV line:

1) Breaker Failure: Midpoint-Hemingway 500 kV Line & Hemingway 500/230 kV transformer

If this contingency were to occur, Hemingway-Boardman 500 kV and Hemingway-Summer Lake 500 kV would be disconnected from the Idaho-Power transmission system, and the remaining lower voltage 230 kV system connecting Idaho Power to the Northwest would not be able to support the increased transfers.

Hemingway substation will be configured in such a way as to prevent the possibility of this contingency prior to the addition of the Populus-Cedar Hill-Hemingway 500 kV Gateway West transmission line.

Other than the aforementioned contingency, given proper remediation, all contingencies in the sensitivity studies resulted in acceptable post-transient performance. Post-transient performance results indicate that the Idaho-Northwest path is capable of a 2250 MW west-to-east rating and a 3400 MW east-to-west rating regardless of the system configuration or northwestern terminus.

Sensitivity Studies Summary – Voltage Stability Results

All contingencies resulted in adequate Real Power Margin (PV) and Reactive Power Margin (QV) in each of the simultaneous interaction studies. PV/QV analysis indicates that the Idaho-Northwest path is capable of a 2250 MW west-to-east rating and a 3400 MW east-to-west rating regardless of the system configuration or northwestern terminus.

Sensitivity Studies Summary – Transient Stability Results

All studied contingencies resulted in stable and damped performance with no violations to the WECC Performance Criteria. Transient stability analysis indicates that the Idaho-Northwest path is capable of a 2250 MW west-to-east rating and a 3400 MW east-to-west rating regardless of the system configuration or northwestern terminus.

Appendix A

16hs2a_2250idnw_N Base Case (Idaho-Northwest West-to-East)

Appendix A – 16hs2sa_2250idnw_N Base Case Post-Transient Contingency Results

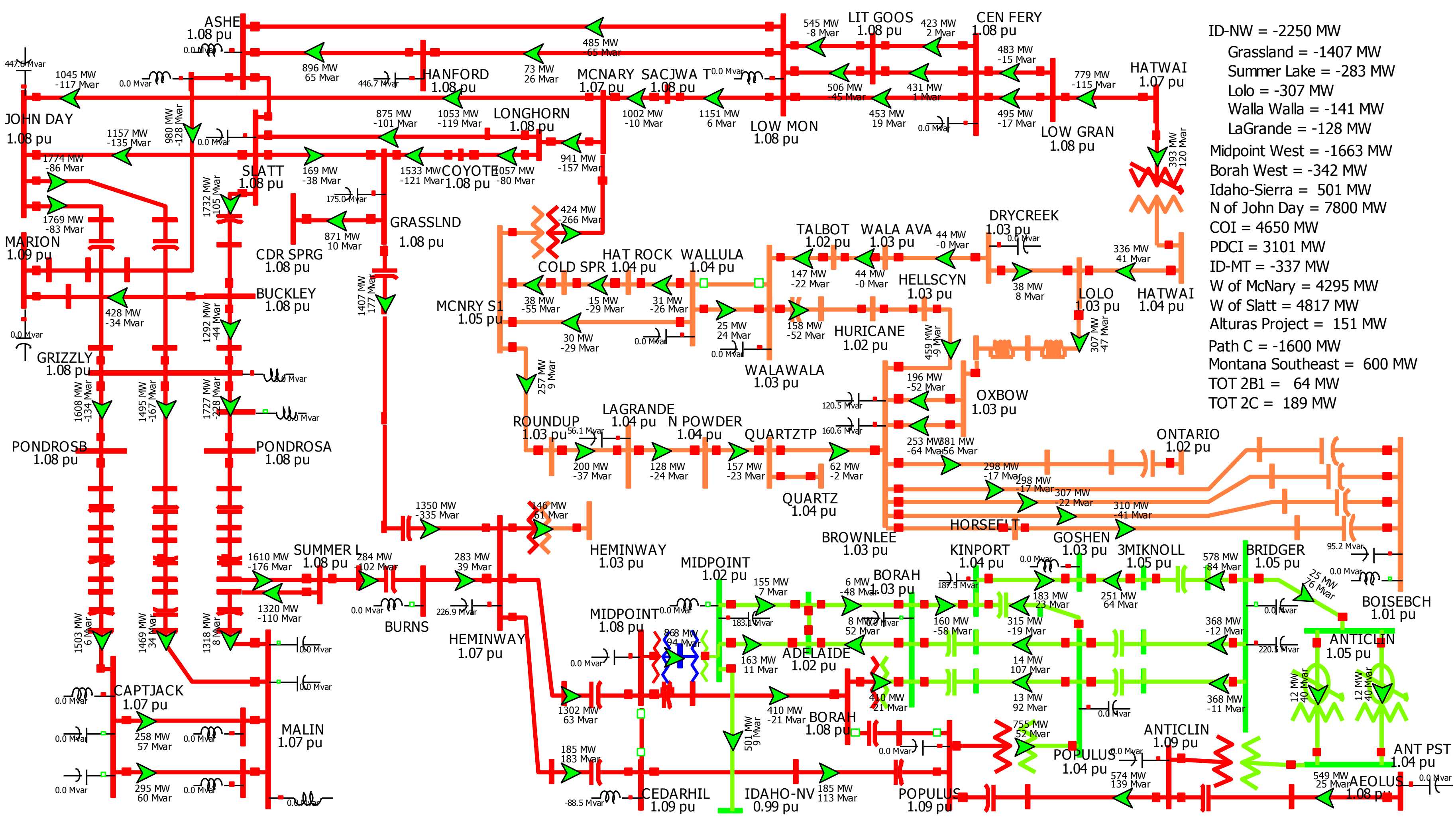
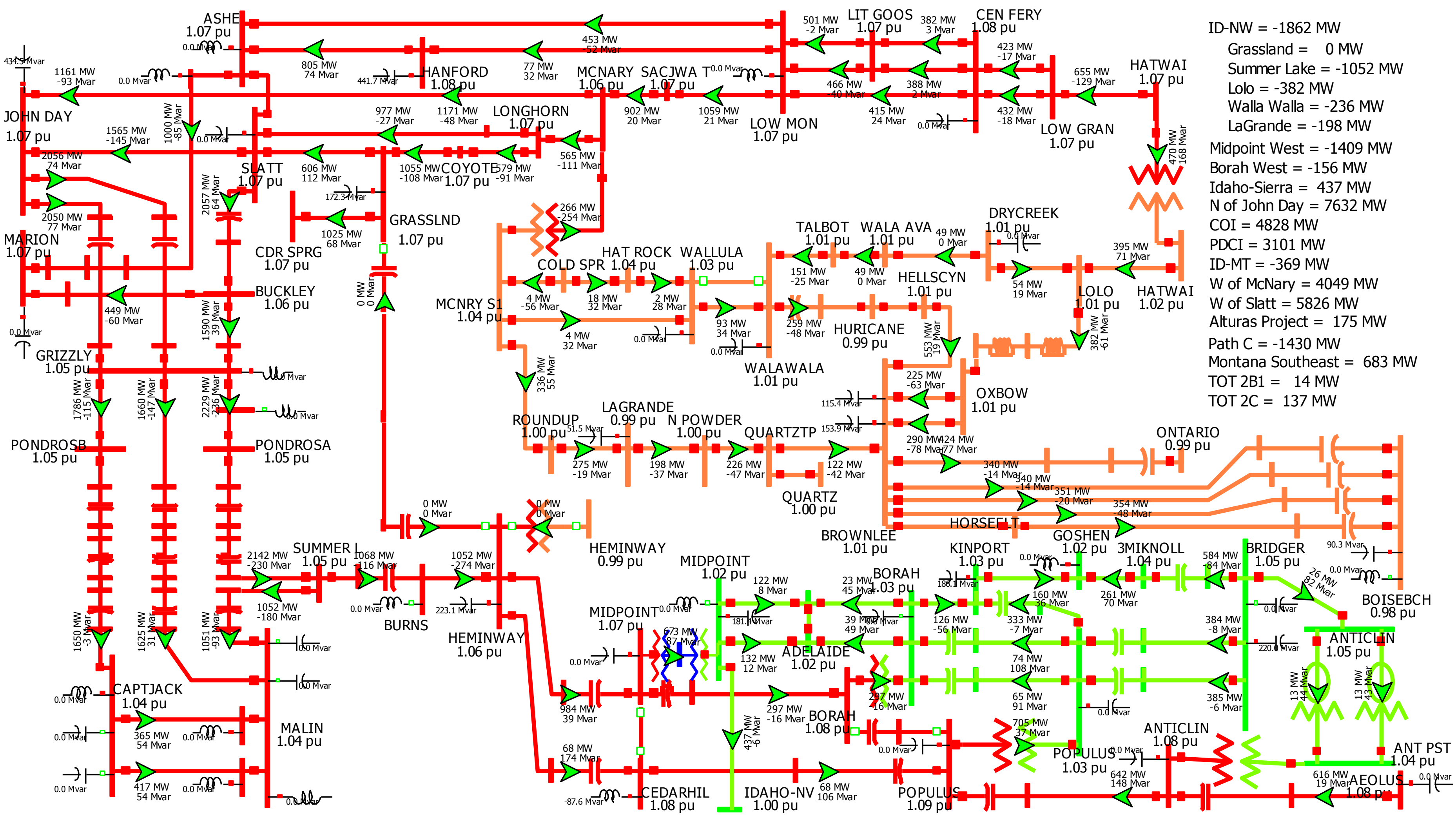


Figure A1: 16hs2sa_2250idnw_N Base Case **Pre-Contingency**

Appendix A – 16hs2sa_2250idnw_N Base Case Post-Transient Contingency Results



ID-NW = -1862 MW
Grassland = 0 MW
Summer Lake = -1052 MW
Lolo = -382 MW
Walla Walla = -236 MW
LaGrande = -198 MW
Midpoint West = -1409 MW
Borah West = -156 MW
Idaho-Sierra = 437 MW
N of John Day = 7632 MW
COI = 4828 MW
PDCI = 3101 MW
ID-MT = -369 MW
W of McNary = 4049 MW
W of Slatt = 5826 MW
Alturas Project = 175 MW
Path C = -1430 MW
Montana Southeast = 683 MW
TOT 2B1 = 14 MW
TOT 2C = 137 MW

Figure A2: 16hs2sa_2250idnw_N Base Case after the contingency **BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr**

Appendix A – 16hs2sa_2250idnw_N Base Case Post-Transient Contingency Results

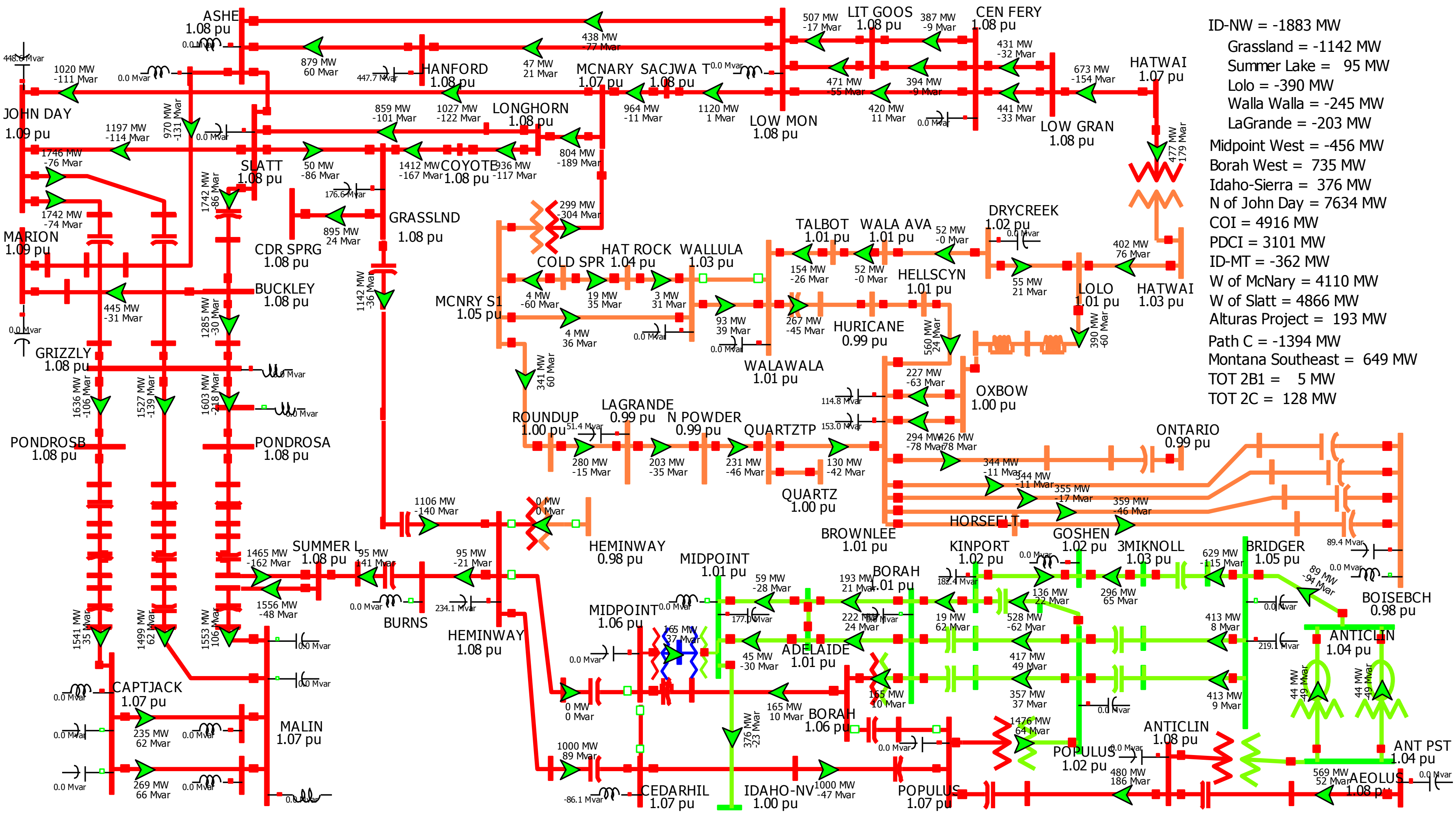


Figure A3: 16hs2sa_2250idnw_N Base Case after the contingency **BF IPC Hemingway-Midpoint 500 kV & Hemingway 500/230 Xfmr**

Appendix A – 16hs2sa_2250idnw_N Base Case Post-Transient Contingency Results

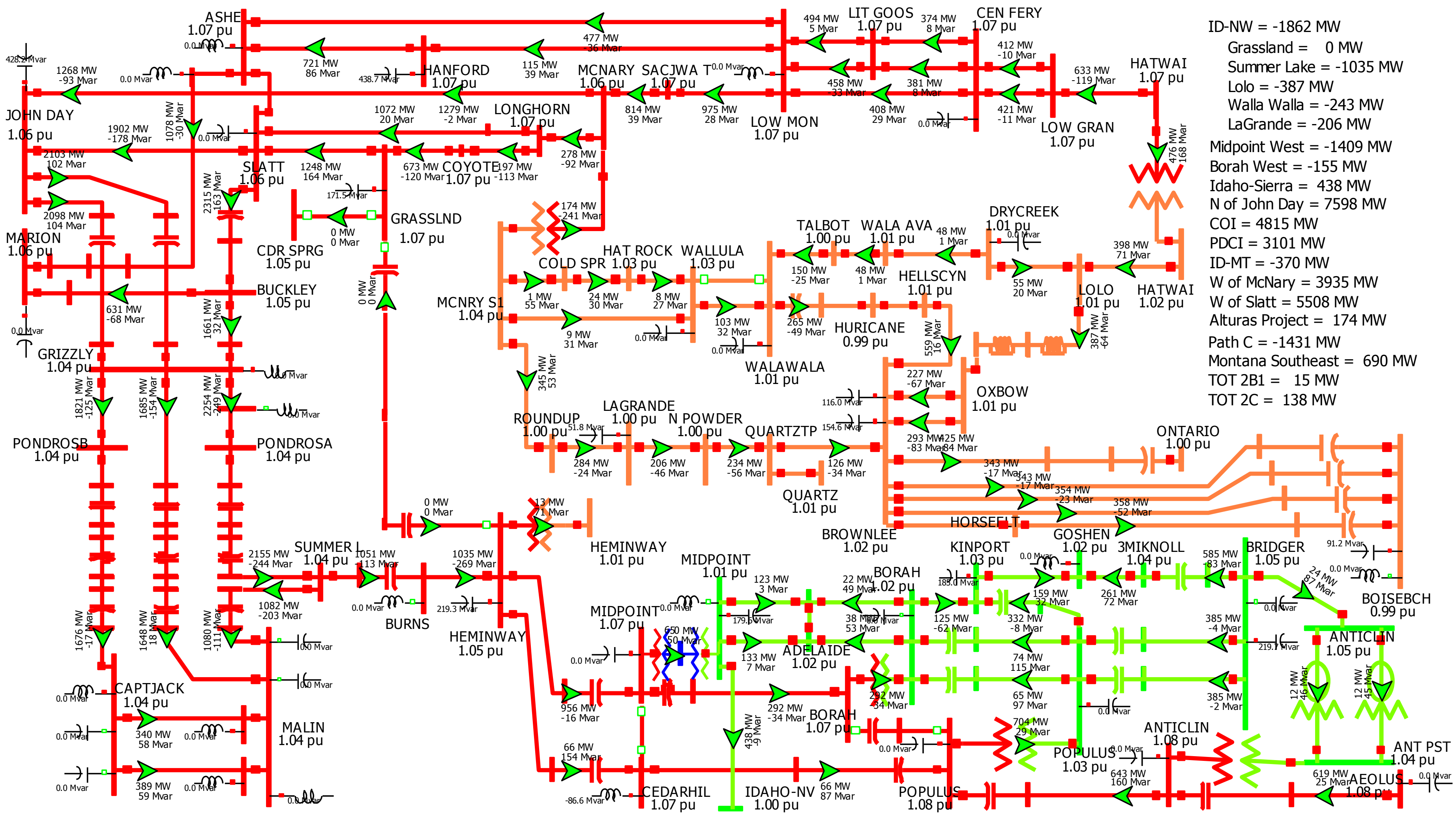


Figure A4: 16hs2sa_2250idnw_N Base Case after the contingency **BF PGE Grassland-Cedar Springs 500 kV & Grassland-Hemingway 500 kV**

Appendix A – 16hs2sa_2250idnw_N Base Case Post-Transient Contingency Results

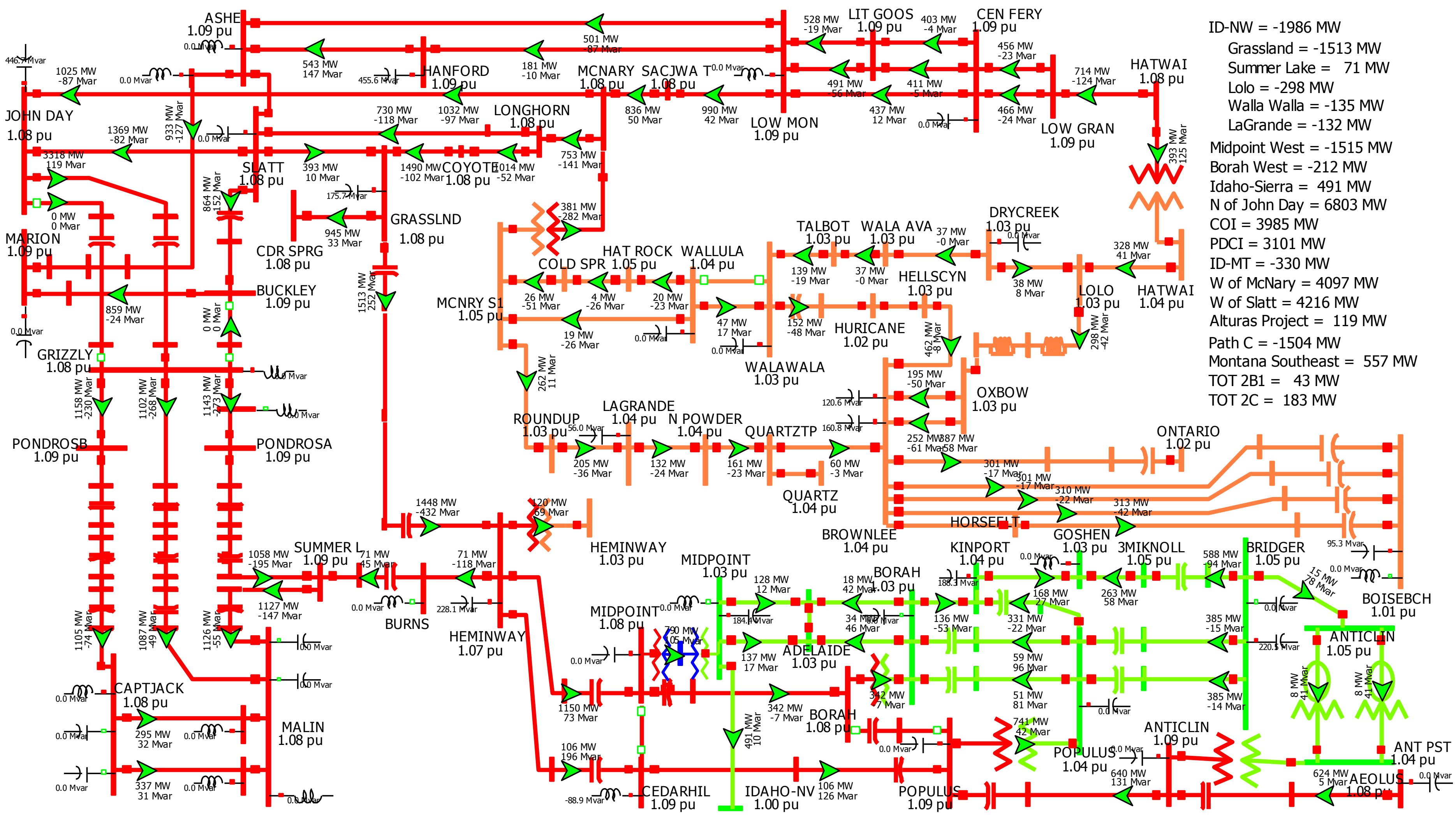


Figure A5: 16hs2sa_2250idnw_N Base Case after the contingency **N-2 John Day-Grizzly#2 500 kV & Buckley-Grizzly 500 kV**

Appendix A – 16hs2sa_2250idnw_N Base Case Post-Transient Contingency Results

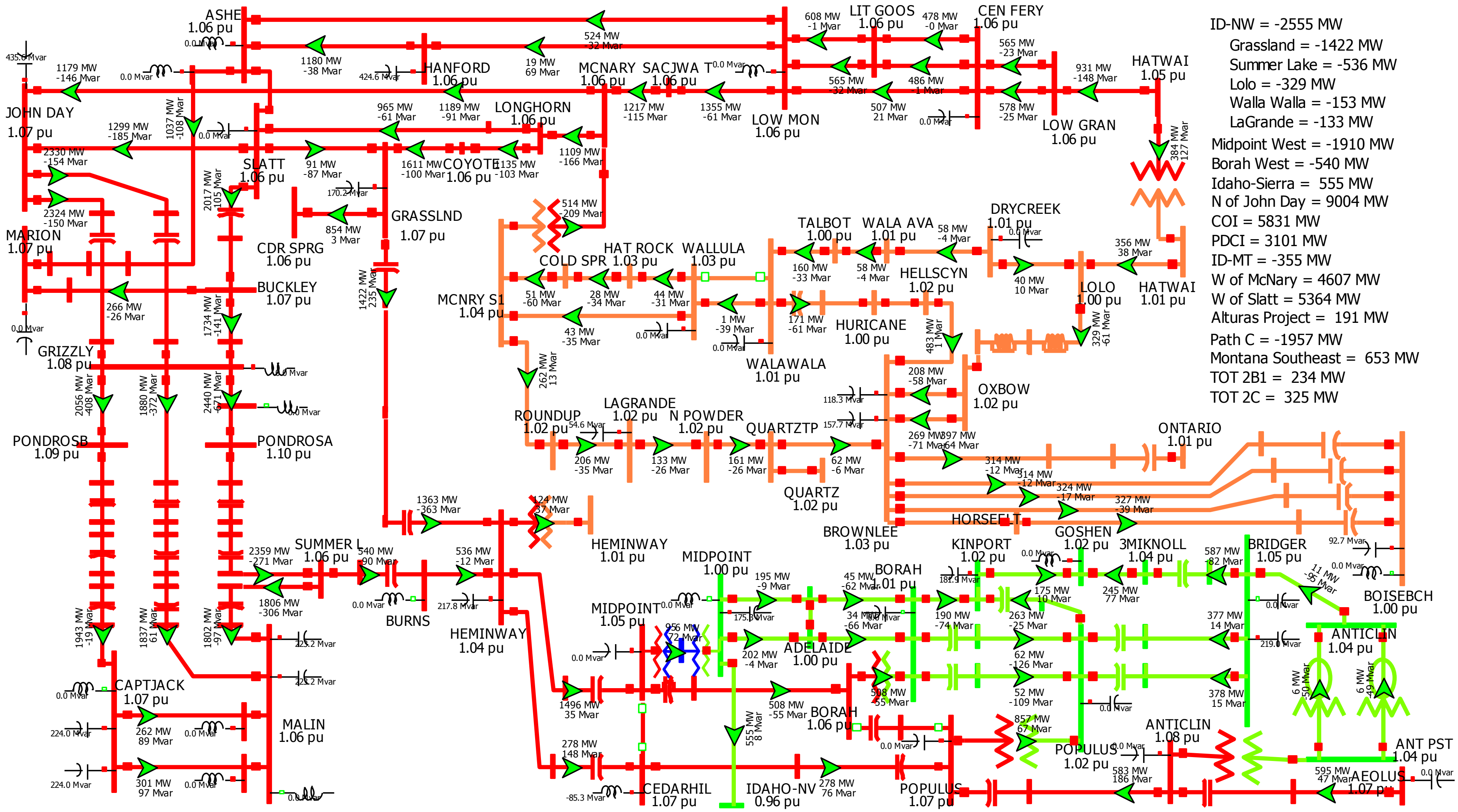


Figure A6: 16hs2sa_2250idnw_N Base Case after the contingency **N-2: Double Palo Verde**

Appendix A – 16hs2sa_2250idnw_N Base Case Post-Transient Contingency Results

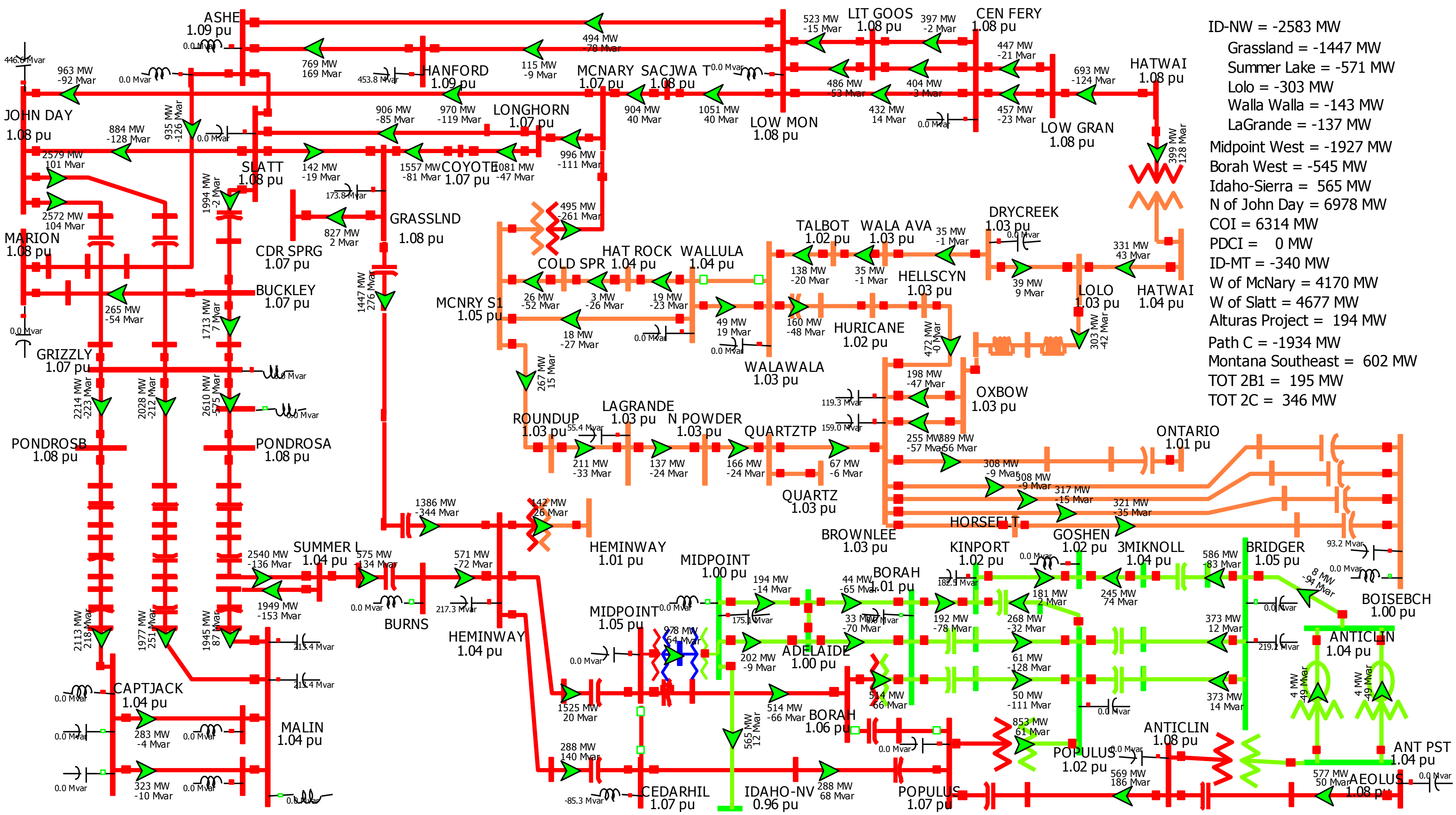


Figure A7: 16hs2sa_2250idnw_N Base Case after the contingency **N-2: DC Bi-pole**

Appendix A - 16hs2a_2250idnw_N Base Case Post-Transient Contingency Results

					1200 HS Case				2250 HS Case			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	No Violations											
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	No Violations											
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	MERIDINP (45197) -> MERIDINP (45195) CKT 2 at MERIDINP	Branch MVA	650.0	780.0	371.5	694.2	106.8%	89.0%	370.8	688.2	105.9%	88.2%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	979.0	1287.7	654.6	1236.5	126.3%	96.0%	639.8	1213.7	124.0%	94.3%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	GLENDL (45113) -> GRANT PS (45123) CKT 1 at GLENDL	Branch Amp	722.9	1265.2	302.3	792.5	109.6%	62.6%	310.5	787.3	108.9%	62.2%
BF 4003 Hanford-Vantage & Hanford Caps	No Violations											
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations											
BF 4028 Taft-Dworshak & Taft Reactor 500kV	No Violations											
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH11	Branch Amp	3000.0	4050.0	2035.4	3077.2	102.6%	76.0%	No Violations			
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	2400.0	3800.0	1974.4	2605.1	108.5%	68.6%	No Violations			
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1018.9	1063.3	105.4%	82.7%	No Violations			
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	2442.0	3235.5	1658.5	2875.0	117.7%	88.9%	1646.9	2847.8	116.6%	88.0%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	2199.9	3280.0	1658.1	2875.0	130.7%	87.7%	1646.9	2847.8	129.4%	86.8%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	2666.9	4000.0	1658.5	2869.6	107.6%	71.7%	1646.1	2841.2	106.5%	71.0%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at ROUND MT	Branch Amp	2667.0	4000.0	1647.4	2856.1	107.1%	71.4%	1637.4	2830.4	106.1%	70.8%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	2699.7	4000.0	1614.4	2803.1	103.8%	70.1%	1602.4	2765.6	102.4%	69.1%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	2699.7	4000.0	1604.6	2783.6	103.1%	69.6%	1595.2	2749.9	101.9%	68.7%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	2400.0	3800.0	1974.4	2720.0	113.3%	71.6%	No Violations			
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	2400.0	3800.0	1724.7	2445.7	101.9%	64.4%	No Violations			
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	2400.0	3800.0	1709.0	2431.3	101.3%	64.0%	No Violations			
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations											
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations											
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	No Violations											
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	No Violations											
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	No Violations											
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	2900.0	4350.0	2217.4	3199.1	110.3%	73.5%	No Violations			
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	GRIJOH22 (90067) -> GRIJOH21 (90066) CKT 2 at GRIJOH22	Branch Amp	3000.0	4050.0	2030.1	3198.2	106.6%	79.0%	No Violations			
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	No Violations											
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations											
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	2442.0	3235.5	1658.5	2930.2	120.0%	90.6%	1646.9	2904.0	118.9%	89.8%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	2199.9	3280.0	1658.1	2930.2	133.2%	89.3%	1646.9	2904.0	132.0%	88.5%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	2666.9	4000.0	1658.5	2924.0	109.6%	73.1%	1646.1	2896.9	108.6%	72.4%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	2667.0	4000.0	1647.4	2911.6	109.2%	72.8%	1637.4	2886.6	108.2%	72.2%
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations											
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations											
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations											
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	No Violations											
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	No Violations											
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations											
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations											
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations											
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations											

Appendix A - 16hs2a_2250idnw_N Base Case Post-Transient Contingency Results

					1200 HS Case				2250 HS Case			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	320.0	370.0	275.2	338.8	105.9%	91.6%	270.1	328.6	102.7%	88.8%
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	950.0	1286.0	653.3	1094.6	115.2%	85.1%	650.5	1044.3	109.9%	81.2%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	320.0	370.0	275.2	348.8	109.0%	94.3%	270.1	335.6	104.9%	90.7%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	950.0	1286.0	653.3	1115.8	117.5%	86.8%	650.5	1057.2	111.3%	82.2%
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations											
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations											
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations											
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations											
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1018.9	1163.6	115.3%	90.5%	901.8	1036.0	102.7%	80.6%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations											
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	No Violations											
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations											
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations											
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations											
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations											
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	No Violations											
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations											
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	No Violations											
BF 4530 Raver-Paul & Paul-Satsop 500 kV	No Violations											
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	No Violations											
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations											
BF 4542 Paul-Allston 500 kV & Center G2	No Violations											
BF 4542 Paul-Napavine 500 kV & Center G1	No Violations											
BF 4550 Olympia-Paul & Paul-Allston 500 kV	No Violations											
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	No Violations											
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	No Violations											
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations											
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	No Violations											
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations											
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations											
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations											
BF 4700 Hatwai 500kV & 230 kV + RAS	No Violations											
BF 4708 Hatwai 500 kV Bus	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	717.0	813.0	101.6%	67.8%	715.0	810.6	101.3%	67.6%
BF 4708 Hatwai 500 kV Bus	AMPS (65025)	% Δ Volts			0.963	0.911		-5.40%	0.970	0.920		-5.15%
BF 4708 Hatwai 500 kV Bus	PTRSNFLT (62030)	% Δ Volts			0.957	0.895		-6.48%	0.963	0.904		-6.13%
BF 4708 Hatwai 500 kV Bus	PTRSNFUR (62386)	% Δ Volts			0.966	0.902		-6.63%	0.980	0.918		-6.33%
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations											
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	No Violations											
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	970.5	105.5%	92.7%	775.1	965.6	105.0%	92.2%
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations											
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations											
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations											
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations											
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations											

Appendix A - 16hs2a_2250idnw_N Base Case Post-Transient Contingency Results

					1200 HS Case				2250 HS Case			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON16	Branch Amp	2400.0	3800.0	1724.7	2493.1	103.9%	65.6%	No Violations			
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	2400.0	3800.0	1709.0	2482.9	103.5%	65.3%	No Violations			
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1378.5	111.4%	98.8%	No Violations			
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	1026.7	111.6%	98.1%	No Violations			
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	717.0	827.7	103.5%	69.0%	No Violations			
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	2400.0	3800.0	1724.7	2476.2	103.2%	65.2%	No Violations			
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	2400.0	3800.0	1709.0	2463.3	102.6%	64.8%	No Violations			
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1388.9	112.3%	99.5%	No Violations			
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	1038.1	112.8%	99.2%	No Violations			
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	717.0	833.7	104.2%	69.5%	No Violations			
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations											
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	No Violations											
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	No Violations											
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	No Violations											
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations											
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at SLATT	Branch Amp	2900.0	4350.0	2217.4	2906.7	100.2%	66.8%	No Violations			
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	2400.0	3800.0	1724.7	2435.4	101.5%	64.1%	No Violations			
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	2400.0	3800.0	1709.0	2416.3	100.7%	63.6%	No Violations			
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1311.8	106.0%	94.0%	No Violations			
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1018.9	1069.7	106.0%	83.2%	No Violations			
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	969.8	105.4%	92.6%	No Violations			
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	717.0	807.6	101.0%	67.3%	No Violations			
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	GRIJOH22 (90067) -> GRIJOH21 (90066) CKT 2 at GRIJOH21	Branch Amp	3000.0	4050.0	2030.1	3196.9	106.6%	78.9%	No Violations			
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations											
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations											
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations											
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations											
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations											
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations											
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	No Violations											
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	No Violations											
BF 5214 Low Mon-McNary & Calpine PH 500 kV	No Violations											
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations											
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations											
BF 5266 Slatt-Buckly 500 kV	No Violations											
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations											
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations											
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	Contingency Unavailable				1118.5	1370.0	110.7%	98.1%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	Contingency Unavailable				775.1	1007.4	109.5%	96.2%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	Contingency Unavailable				715.0	825.6	103.2%	68.8%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	AMPS (65025)	% Δ Volts			Contingency Unavailable				0.970	0.909		-6.29%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts			Contingency Unavailable				0.963	0.890		-7.58%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	PTRSNFUR (62386)	% Δ Volts			Contingency Unavailable				0.980	0.903		-7.86%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1321.1	106.8%	94.6%	No Violations			

Appendix A - 16hs2a_2250idnw_N Base Case Post-Transient Contingency Results

					1200 HS Case				2250 HS Case			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	974.5	105.9%	93.1%	No Violations			
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	717.0	804.9	100.6%	67.1%	No Violations			
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1313.1	106.1%	94.1%	1118.5	1389.7	112.3%	99.6%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	965.8	105.0%	92.3%	775.1	1029.8	111.9%	98.4%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	No Violations				715.0	806.1	100.8%	67.2%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	AMPS (65025)	% Δ Volts			0.963	0.909		-5.61%	0.970	0.916		-5.57%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts			0.957	0.898		-6.17%	0.963	0.902		-6.33%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	PTRSNFUR (62386)	% Δ Volts			0.966	0.906		-6.21%	0.980	0.916		-6.53%
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	No Violations											
BF Lolo 230kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1270.7	102.7%	91.0%	1118.5	1257.8	101.7%	90.1%
BF McNary 230 kV SECT 1	No Violations											
BF McNary 230 kV SECT 2	No Violations											
BF McNary 230 kV SECT 3	FRANKLIN (40443)	% Δ Volts			1.005	0.946		-5.87%	1.005	0.943		-6.17%
BF PGE Grassland - Slatt 500 kV & Boardman Plant	No Violations											
BF PGE Grassland-Cedar Sp 500 kV & Grassland - Hem 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	Contingency Unavailable				1118.5	1385.9	112.0%	99.3%
BF PGE Grassland-Cedar Sp 500 kV & Grassland - Hem 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	Contingency Unavailable				775.1	1021.2	111.0%	97.6%
BF PGE Grassland-Cedar Sp 500 kV & Grassland - Hem 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	Contingency Unavailable				901.8	1009.8	100.1%	78.6%
BF PGE Grassland-Cedar Sp 500 kV & Grassland - Hem 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	Contingency Unavailable				715.0	934.7	116.8%	77.9%
BF PGE Grassland-Cedar Sp 500 kV & Grassland - Hem 500 kV	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	2400.0	3800.0	Contingency Unavailable				1744.6	2431.5	101.3%	64.0%
BF PGE Grassland-Cedar Sp 500 kV & Grassland - Hem 500 kV	BIGGRASS (65155)	% Δ Volts			Contingency Unavailable				0.988	0.937		-5.16%
BF PGE Grassland-Cedar Sp 500 kV & Grassland - Hem 500 kV	DILLON S (62084)	% Δ Volts			Contingency Unavailable				0.983	0.931		-5.29%
BF PGE Grassland-Cedar Sp 500 kV & Grassland - Hem 500 kV	AMPS (65025)	% Δ Volts			Contingency Unavailable				97.0%	0.9		-7.22%
BF PGE Grassland-Cedar Sp 500 kV & Grassland - Hem 500 kV	PTRSNFLT (62030)	% Δ Volts			Contingency Unavailable				96.3%	0.882		-8.41%
BF PGE Grassland-Cedar Sp 500 kV & Grassland - Hem 500 kV	PTRSNFUR (62386)	% Δ Volts			Contingency Unavailable				98.0%	0.894		-8.78%
BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kv + PTSN	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	Contingency Unavailable				1118.5	1383.6	111.8%	99.1%
BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kv + PTSN	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	Contingency Unavailable				775.1	1018.4	110.7%	97.3%
BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kv + PTSN	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	Contingency Unavailable				901.8	1009.4	100.0%	78.5%
BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kv + PTSN	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	Contingency Unavailable				715.0	832.3	104.0%	69.4%
BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kv + PTSN	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	2400.0	3800.0	Contingency Unavailable				1744.6	2426.8	101.1%	63.9%
BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kv + PTSN	PTRSNFUR (62386)	% Δ Volts			Contingency Unavailable				0.980	0.930		-5.10%
BF PGE Grassland-Cedar Sp 500 kV & Grassland-Hem 500 kv + PTSN	AMPS (65025)	% Δ Volts			Contingency Unavailable				0.970	0.920		-5.15%
BF PGE Grassland-Coyote Springs 500 kV & Carty Plant	No Violations											
Bus: Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1018.9	1142.9	113.3%	88.9%	901.8	1015.3	100.6%	79.0%
Bus: Bell BPA 500 kV	No Violations											
Bus: Buckley 500 kV	No Violations											
Bus: Dixonville 500 kV	No Violations											
Bus: Hot Springs 500 kV	No Violations											
Bus: Keeler 500 kV + RAS	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	94.0	139.0	82.1	97.9	104.2%	70.4%	No Violations			
Bus: Rock Creek 500 kV	No Violations											
Bus: Sickler 500 kV	No Violations											
Bus: Summer Lake 500 kV	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	2400.0	3800.0	1724.7	2478.2	103.3%	65.2%	No Violations			
Bus: Summer Lake 500 kV	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	2400.0	3800.0	1709.0	2465.3	102.7%	64.9%	No Violations			
Bus: Summer Lake 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1388.6	112.3%	99.5%	No Violations			

Appendix A - 16hs2a_2250idnw_N Base Case Post-Transient Contingency Results

					1200 HS Case				2250 HS Case			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
Bus: Summer Lake 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	1036.5	112.7%	99.0%	No Violations			
Bus: Summer Lake 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	717.0	833.1	104.1%	69.4%	No Violations			
N-1: Allston-Keeler 500 kV + RAS	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	94.0	139.0	82.1	97.9	104.1%	70.4%	No Violations			
N-1: Allston-Napavine 500 kV	No Violations											
N-1: Allston-Paul #2 500 kV	No Violations											
N-1: Alvery-Dixonville 500 kV	No Violations											
N-1: Alvey-Marion 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1018.9	1212.4	120.1%	94.3%	901.8	1082.7	107.3%	84.2%
N-1: Ashe-Hanford 500 kV	No Violations											
N-1: Ashe-Low Mon 500 kV	No Violations											
N-1: Ashe-Marion 500 kV	No Violations											
N-1: Ashe-Slatt 500 kV	No Violations											
N-1: Bell-Coulee 500 kV	No Violations											
N-1: Bell-Taft 500 kV	No Violations											
N-1: Big Eddy-Celilo 500 kV	No Violations											
N-1: Big Eddy-John Day 500 kV	No Violations											
N-1: Big Eddy-Knight 500 kV	No Violations											
N-1: Big Eddy-Ostrander 500 kV	No Violations											
N-1: Boise Bench-Brownlee #3 230 kV	No Violations											
N-1: Brady-Antelope 230 kV	No Violations											
N-1: Broadview-Garrison #1 500 kV	No Violations											
N-1: Brownlee-Ontario 230 kV	QUARTZ (60305) -> NELSN TP (61055) CKT 1 at QUARTZ	Branch Amp	400.0	491.2	217.4	408.5	102.1%	83.2%	No Violations			
N-1: Buckley-Grizzly 500 kV	No Violations											
N-1: Buckley-Marion 500 kV	No Violations											
N-1: Buckley-Slatt 500 kV	No Violations											
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 1 at COTWDWAP	Branch Amp	785.7	926.3	267.2	837.8	106.6%	90.4%	281.9	850.5	108.2%	91.8%
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 2 at COTWDWAP	Branch Amp	785.7	926.3	267.2	837.8	106.6%	90.4%	281.9	850.5	108.2%	91.8%
N-1: Captain Jack-Olinda 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	2442.0	3235.5	1658.5	2552.8	104.5%	78.9%	1646.9	2524.5	103.4%	78.0%
N-1: Captain Jack-Olinda 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	2199.9	3280.0	1658.1	2552.8	116.0%	77.8%	1646.9	2524.5	114.8%	77.0%
N-1: Captain Jack-Olinda 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	2199.9	3280.5	1810.8	2449.3	111.3%	74.7%	1802.9	2428.8	110.4%	74.0%
N-1: Captain Jack-Olinda 500 kV	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	2199.9	3280.5	1795.5	2428.6	110.4%	74.0%	1787.6	2408.3	109.5%	73.4%
N-1: Captain Jack-Olinda 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2477.9	4000.0	2011.7	2676.2	108.0%	66.9%	1971.2	2626.5	106.0%	65.7%
N-1: Captain Jack-Olinda 500 kV	TABLE MT (30015) -> TABVAC11 (30031) CKT 1 at TABLE MT	Branch Amp	2667.0	4000.0	2011.7	2676.2	100.3%	66.9%	No Violations			
N-1: CaptJack-Kfalls 500 kV	No Violations											
N-1: Cascade Crossing 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	Contingency Unavailable				901.8	1018.2	100.9%	79.2%
N-1: Chief Jo-Coulee 500 kV	No Violations											
N-1: Chief Jo-Monroe 500 kV	No Violations											
N-1: Chief Jo-Sickler 500 kV	No Violations											
N-1: Coulee-Hanford 500 kV	No Violations											
N-1: Coulee-Schultz 500 kV	No Violations											
N-1: Covington4-Raver 500 kV	No Violations											
N-1: Covington5-Raver 500 kV	No Violations											
N-1: Coyote-Longhorn 500 kV	No Violations											
N-1: CusterW-Monroe 500 kV	No Violations											
N-1: Dixonville-Meridian 500 kV	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	979.0	1287.7	654.6	1193.7	121.9%	92.7%	639.8	1170.4	119.6%	90.9%

Appendix A - 16hs2a_2250idnw_N Base Case Post-Transient Contingency Results

					1200 HS Case				2250 HS Case			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-1: Dixonville-Meridian 500 kV	GLENDL (45113) -> GRANT PS (45123) CKT 1 at GLENDL	Branch Amp	722.9	1265.2	302.3	741.3	102.5%	58.6%	310.5	736.3	101.8%	58.2%
N-1: Drycreek-Lolo 230 kV	No Violations											
N-1: Drycreek-N Lewiston 230 kV	No Violations											
N-1: Drycreek-Wala Ava 230 kV	No Violations											
N-1: Dworshak-Hatwai 500 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	717.0	816.0	102.0%	68.0%	715.0	814.1	101.8%	67.8%
N-1: Dworshak-Hatwai 500 kV + RAS	PTRSNFLT (62030)	% Δ Volts			0.957	0.906		-5.33%	0.963	0.913		-5.19%
N-1: Dworshak-Hatwai 500 kV + RAS	PTRSNFUR (62386)	% Δ Volts			0.966	0.913		-5.49%	0.980	0.928		-5.31%
N-1: Dworshak-Hatwai 500 kV + RAS + PTSN	No Violations											
N-1: Dworshak-Taft 500 kV	No Violations											
N-1: Echo Lake-Maple Valley 500 kV	No Violations											
N-1: Echo Lake-Raver 500 kV	No Violations											
N-1: Echo Lake-Schultz 500 kV	No Violations											
N-1: Echo Lake-Snok Tap 500 kV	No Violations											
N-1: Garrison-Taft #2 500 kV	No Violations											
N-1: Goldhill-Placer 115 kV	No Violations											
N-1: Grassland-Coyote 500 kV	No Violations											
N-1: Grassland-Slatt 500 kV	No Violations											
N-1: Grizzly-John Day #2 500 kV	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH11	Branch Amp	3000.0	4050.0	2035.4	3182.8	106.1%	78.6%	No Violations			
N-1: Grizzly-Malin 500 kV	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	2400.0	3800.0	1974.4	2723.4	113.5%	71.7%	1744.6	2404.9	100.2%	63.3%
N-1: Grizzly-Malin 500 kV	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	2400.0	3800.0	1724.7	2453.0	102.2%	64.6%	No Violations			
N-1: Grizzly-Malin 500 kV	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	2400.0	3800.0	1709.0	2439.3	101.6%	64.2%	No Violations			
N-1: Grizzly-Ponderosa A-Summer L 500 kV	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	2400.0	3800.0	1724.7	2534.1	105.6%	66.7%	No Violations			
N-1: Grizzly-Ponderosa A-Summer L 500 kV	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	2400.0	3800.0	1709.0	2518.9	105.0%	66.3%	No Violations			
N-1: Grizzly-Ponderosa A-Summer L 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1261.4	102.0%	90.4%	No Violations			
N-1: Grizzly-Ponderosa A-Summer L 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	924.4	100.5%	88.3%	No Violations			
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	2400.0	3800.0	1974.4	2720.2	113.3%	71.6%	1744.6	2402.9	100.1%	63.2%
N-1: Grizzly-Round Bu 500 kV	No Violations											
N-1: Hanford-Low Mon 500 kV	No Violations											
N-1: Hanford-Vantage 500 kV	No Violations											
N-1: Hanford-Wautoma 500 kV	No Violations											
N-1: Hatwai 500/230 kV Xfmr + RAS	No Violations											
N-1: Hatwai-Lolo 230 kV	No Violations											
N-1: Hatwai-Low Gran 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	970.1	105.4%	92.7%	775.1	965.2	104.9%	92.2%
N-1: Hatwai-N Lewiston 230 kV	No Violations											
N-1: Hells Canyon-Brownlee 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	1009.2	109.7%	96.4%	775.1	980.1	106.5%	93.6%
N-1: Hells Canyon-Walla Walla 230 kV	No Violations											
N-1: Hemingway-Grassland 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	Contingency Unavailable				1118.5	1366.1	110.4%	97.9%
N-1: Hemingway-Grassland 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	Contingency Unavailable				775.1	1004.8	109.2%	96.0%
N-1: Hemingway-Grassland 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	Contingency Unavailable				715.0	825.6	103.2%	68.8%
N-1: Hemingway-Grassland 500 kV	AMPS (65025)	% Δ Volts			Contingency Unavailable				0.970	0.910		-6.19%
N-1: Hemingway-Grassland 500 kV	PTRSNFLT (62030)	% Δ Volts			Contingency Unavailable				0.963	0.892		-7.37%
N-1: Hemingway-Grassland 500 kV	PTRSNFUR (62386)	% Δ Volts			Contingency Unavailable				0.980	0.905		-7.65%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	2400.0	3200.0	Contingency Unavailable				1737.7	2925.7	121.9%	91.4%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	2400.0	3800.0	Contingency Unavailable				1744.6	2945.5	122.7%	77.5%

Appendix A - 16hs2a_2250idnw_N Base Case Post-Transient Contingency Results

					1200 HS Case				2250 HS Case			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM11 (90099)	% Δ Volts			Contingency Unavailable				1.101	1.191		8.17%
N-1: Hemingway-Grassland 500 kV + FACRI	CAPPON16 (90142)	% Δ Volts			Contingency Unavailable				1.099	1.169		6.37%
N-1: Hemingway-Grassland 500 kV + FACRI	GRIMAL21 (90068)	% Δ Volts			Contingency Unavailable				1.098	1.161		5.74%
N-1: Hemingway-Grassland 500 kV + FACRI	CAPPON14 (90140)	% Δ Volts			Contingency Unavailable				1.078	1.134		5.19%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	Contingency Unavailable				1118.5	1360.9	110.0%	97.5%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	Contingency Unavailable				775.1	1000.4	108.7%	95.6%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	Contingency Unavailable				715.0	826.8	103.3%	68.9%
N-1: Hemingway-Summer Lake 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1329.3	107.5%	95.2%	No Violations			
N-1: Hemingway-Summer Lake 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	983.0	106.8%	93.9%	No Violations			
N-1: Hemingway-Summer Lake 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	717.0	801.7	100.2%	66.8%	No Violations			
N-1: Hemingway-Summer Lake 500 kV	AMPS (65025)	% Δ Volts			0.963	0.914		-5.09%	No Violations			
N-1: Hemingway-Summer Lake 500 kV	PTRSNFUR (62386)	% Δ Volts			0.966	0.907		-6.11%	No Violations			
N-1: Hemingway-Summer Lake 500 kV	PTRSNFLT (62030)	% Δ Volts			0.957	0.900		-5.96%	No Violations			
N-1: Hill Top 345/230 Xfmr	No Violations											
N-1: Horse Hv-McNary 230 kV	No Violations											
N-1: Hot Springs-Taft 500 kV	No Violations											
N-1: Humboldt-Coyote Ck 345 kV	No Violations											
N-1: Huntington-Pinto-Four Corners 345 kV	No Violations											
N-1: Ing500-CusterW 500 kV	No Violations											
N-1: John Day-Marion 500 kV	No Violations											
N-1: John Day-Rock Ck 500 kV	No Violations											
N-1: John Day-Slatt 500 kV	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at SLATT	Branch Amp	2900.0	4350.0	2217.4	2906.7	100.2%	66.8%	No Violations			
N-1: Kfalls-Meridian 500 kV	No Violations											
N-1: Knight-Wautoma 500 kV	No Violations											
N-1: LaGrande-North Powder 230 kV	No Violations											
N-1: Lanes-Marion 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1018.9	1083.7	107.4%	84.3%	No Violations			
N-1: Lit Goose-Central Ferry 500 kV	No Violations											
N-1: Lit Goose-Low Mon 500 kV	No Violations											
N-1: Low Gran-Central Ferry 500 kV	No Violations											
N-1: Low Mon-Sac Tap 500 kV	No Violations											
N-1: Malin 500/230 Xfmr	No Violations											
N-1: Malin-Hilltop 230 kV	No Violations											
N-1: Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	2442.0	3235.5	1658.5	2877.3	117.8%	88.9%	1646.9	2850.2	116.7%	88.1%
N-1: Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	2199.9	3280.0	1658.1	2877.3	130.8%	87.7%	1646.9	2850.2	129.6%	86.9%
N-1: Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	2666.9	4000.0	1658.5	2871.6	107.7%	71.8%	1646.1	2843.3	106.6%	71.1%
N-1: Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	2667.0	4000.0	1647.4	2858.8	107.2%	71.5%	1637.4	2833.0	106.2%	70.8%
N-1: Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	2699.7	4000.0	1614.4	2852.1	105.6%	71.3%	1602.4	2823.7	104.6%	70.6%
N-1: Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at ROUND MT	Branch Amp	2699.7	4000.0	1604.6	2836.6	105.1%	70.9%	1595.2	2810.9	104.1%	70.3%
N-1: Malin-Summer Lake 500 kV	No Violations											
N-1: Maple Vly-Rocky RH 345 kV	No Violations											
N-1: Marion-Pearl 500 kV	No Violations											
N-1: Marion-Santiam 500 kV	No Violations											
N-1: McLouglin-Ostrander 230 kV	No Violations											
N-1: McNary 500/230 kV Xfmr	No Violations											

Appendix A - 16hs2a_2250idnw_N Base Case Post-Transient Contingency Results

					1200 HS Case				2250 HS Case			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-1: McNary S2-McNary S3 230 kV	No Violations											
N-1: McNary-Board T1 230 kV	No Violations											
N-1: McNary-John Day 500 kV	No Violations											
N-1: McNary-Longhorn 500 kV	No Violations											
N-1: McNary-Ross 345 kV	No Violations											
N-1: McNary-Roundup 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1251.2	101.1%	89.6%	No Violations			
N-1: McNary-Sac Tap-Low Mon 500 kV	No Violations											
N-1: Midpoint-Hemingway 500 kV	No Violations											
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	No Violations											
N-1: Midpoint-Humboldt 345 kV	No Violations											
N-1: Napavine-Paul 500 kV	No Violations											
N-1: Olympia-Paul 500 kV	No Violations											
N-1: Ontario-Caldwell 230 kV	No Violations											
N-1: Ostrander-Knight 500 kV	No Violations											
N-1: Ostrander-Pearl 500 kV	No Violations											
N-1: Ostrander-Troutdale 500 kV	No Violations											
N-1: Oxbow-Brownlee #2 230 kV	No Violations											
N-1: Oxbow-Lolo 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1275.0	103.1%	91.3%	1118.5	1262.0	102.0%	90.4%
N-1: Paul-Satsop 500 kV	No Violations											
N-1: Pearl-Keeler 500 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	320.0	370.0	275.2	363.4	113.6%	98.2%	270.1	351.8	109.9%	95.1%
N-1: Pearl-Keeler 500 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	950.0	1286.0	653.3	1240.8	130.6%	96.5%	650.5	1185.6	124.8%	92.2%
N-1: Pearl-Keeler 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	320.0	370.0	275.2	339.1	106.0%	91.6%	270.1	327.4	102.3%	88.5%
N-1: Pearl-Keeler 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	950.0	1286.0	653.3	1094.7	115.2%	85.1%	650.5	1040.3	109.5%	80.9%
N-1: Pinto-Four Corner 345 kV	No Violations											
N-1: Ponderosa A 500/230 kV Xfmr	No Violations											
N-1: Ponderosa B 500/230 kV Xfmr	No Violations											
N-1: Raver-Paul 500 kV	No Violations											
N-1: Raver-Tacoma 500 kV	No Violations											
N-1: Red Butte-Harry Allen 345 kV	No Violations											
N-1: Robinson-Harry Allen 500 kV	No Violations											
N-1: Rock Ck-Wautoma 500 kV	No Violations											
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	2199.9	3280.5	1810.8	3262.0	148.3%	99.4%	1802.9	3244.0	147.5%	98.9%
N-1: Round Mtn-Table Mtn 500 kV	ROUND MT (30005) -> ROUTAB21 (30018) CKT 2 at ROUTAB21	Branch Amp	2667.0	4000.0	1810.8	3262.0	122.3%	81.5%	1802.9	3244.0	121.6%	81.1%
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB22 (30019) -> TABLE MT (30015) CKT 2 at ROUTAB22	Branch Amp	2667.0	4000.0	1799.4	3246.7	121.7%	81.2%	1793.3	3230.5	121.1%	80.8%
N-1: Roundup-Lagrande 230 kV	No Violations											
N-1: Schultz-Sickler 500 kV	No Violations											
N-1: Schultz-Vantage 500 kV	No Violations											
N-1: Schultz-Wautoma 500 kV	No Violations											
N-1: Sigurd-Glen Canyon 230 kV	No Violations											
N-1: Slatt 500/230 kV Xfmr	No Violations											
N-1: Slatt-Longhorn 500 kV	No Violations											
N-1: Snok Tap-Snoking 500 kV	No Violations											
N-1: Table Mtn-Tesla 500 kV	TABLE MT (30015) -> TABVAC11 (30031) CKT 1 at TABLE MT	Branch Amp	2667.0	4000.0	2011.7	2981.7	111.8%	74.5%	1971.2	2954.1	110.8%	73.9%
N-1: Table Mtn-Tesla 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2477.9	4000.0	2011.7	2981.7	120.3%	74.5%	1971.2	2954.1	119.2%	73.9%

Appendix A - 16hs2a_2250idnw_N Base Case Post-Transient Contingency Results

					1200 HS Case				2250 HS Case			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-1: Table Mtn-Tesla 500 kV	TABVAC12 (30032) -> VACA-DIX (30030) CKT 1 at TABVAC12	Branch Amp	2667.0	4000.0	1984.8	2960.1	111.0%	74.0%	1945.3	2934.0	110.0%	73.4%
N-1: Table Mtn-Tesla 500 kV	VACTES11 (30044) -> TESLA (30040) CKT 1 at VACTES11	Branch Amp	2230.0	3555.9	No Violations				1388.1	2293.8	102.9%	64.5%
N-1: Table Mtn-Vaca Dixon 500 kV	TABTES11 (30041) -> TABTES12 (30043) CKT 1 at TABTES11	Branch Amp	2230.0	3555.9	1480.0	2673.3	119.9%	75.2%	1500.9	2664.4	119.5%	74.9%
N-1: Table Mtn-Vaca Dixon 500 kV	TABLE MT (30015) -> TABTES11 (30041) CKT 1 at TABTES11	Branch Amp	2667.0	4000.0	1480.0	2673.3	100.2%	66.8%	No Violations			
N-1: Vantage 500/230 kV Xfmr #1	No Violations											
N-1: Vantage 500/230 kV Xfmr #2	No Violations											
N-1: Walla Walla-Talbot 230 kV	No Violations											
N-1: Walla Walla-Wallula 230 kV	No Violations											
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations											
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations											
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations											
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	No Violations											
N-2: Ashe-Marion & Slatt-John Day 500 kV	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at SLATT	Branch Amp	2900.0	4350.0	2217.4	3260.5	112.4%	75.0%	No Violations			
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations											
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	No Violations											
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	717.0	834.0	104.2%	69.5%	715.0	811.7	101.5%	67.6%
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	AMPS (65025)	% Δ Volts			0.963	0.897		-6.85%	0.970	0.920		-5.15%
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	PTRSNFLT (62030)	% Δ Volts			0.957	0.878		-8.25%	0.963	0.903		-6.23%
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	PTRSNFUR (62386)	% Δ Volts			0.966	0.884		-8.49%	0.980	0.917		-6.43%
N-2: Bethel - Cedar Spring 500 kV / Bethel - Round Butte 230 kV	No Violations											
N-2: Bethel - Cedar Spring 500 kV / Bethel - Santiam 230 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	Contingency Unavailable				901.8	1032.7	102.3%	80.4%
N-2: Bethel - Cedar Spring 500 kV / Santiam - Mikkalo 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	Contingency Unavailable				901.8	1018.0	100.9%	79.2%
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations											
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations											
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations											
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	BROONT12 (61981) -> ONTARIO (60265) CKT 1 at BROONT12	Branch Amp	1590.0	2147.0	949.3	1593.5	100.2%	74.2%	No Violations			
N-2: Bridger-Populus #1 & #2 345 kV	No Violations											
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	No Violations											
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	No Violations											
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	No Violations											
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	983.6	106.9%	94.0%	775.1	952.0	103.5%	90.9%
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations											
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations											
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations											
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations											
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations											
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations											
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations											
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations											
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations											
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	No Violations											
N-2: DC-BIPOLE	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	2400.0	3200.0	1968.1	3178.6	132.4%	99.3%	1737.7	2814.2	117.3%	87.9%
N-2: DC-BIPOLE	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	2400.0	3800.0	1974.4	3193.5	133.1%	84.0%	1744.6	2829.2	117.9%	74.5%

Appendix A - 16hs2a_2250idnw_N Base Case Post-Transient Contingency Results

					1200 HS Case				2250 HS Case			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-2: DC-BIPOLE	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	2199.9	3280.5	1810.8	2442.7	111.0%	74.5%	1802.9	2424.6	110.2%	73.9%
N-2: DC-BIPOLE	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	2199.9	3280.5	1795.5	2422.0	110.1%	73.8%	1787.6	2404.1	109.3%	73.3%
N-2: DC-BIPOLE	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	2199.9	3280.0	1658.1	2343.8	106.5%	71.5%	1646.9	2320.3	105.5%	70.7%
N-2: DC-BIPOLE	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	2134.0	3499.9	No Violations				1559.3	2266.1	106.2%	64.7%
N-2: DC-BIPOLE	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2477.9	4000.0	2011.7	2635.6	106.4%	65.9%	1971.2	2589.0	104.5%	64.7%
N-2: DC-BIPOLE	MIDWAY (30060) -> MIDVIN11 (30061) CKT 1 at MIDWAY	Branch Amp	2134.0	3499.9	No Violations				1539.5	2234.0	104.7%	63.8%
N-2: DC-BIPOLE	MIDVIN12 (30062) -> VINCENT (24156) CKT 1 at MIDVIN12	Branch Amp	2134.0	3499.9	No Violations				1517.5	2204.7	103.3%	63.0%
N-2: DC-BIPOLE	HESPERUS (79071) -> COYOTE G (79191) CKT 1 at HESPERUS	Branch Amp	431.8	441.8	391.4	459.3	106.4%	104.0%	No Violations			
N-2: DC-BIPOLE	TL TAP (66557) -> DIXCLTP (65467) CKT 1 at DIXCLTP	Branch Amp	234.3	234.3	230.1	235.6	100.6%	100.6%	No Violations			
N-2: Double Palo Verde	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM14	Branch Amp	2400.0	3200.0	1968.1	2957.8	123.2%	92.4%	1737.7	2603.9	108.5%	81.4%
N-2: Double Palo Verde	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	2400.0	3800.0	1974.4	2977.1	124.0%	78.3%	1744.6	2623.4	109.3%	69.0%
N-2: Double Palo Verde	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	2199.9	3280.5	1810.8	2234.5	101.6%	68.1%	1802.9	2220.0	100.9%	67.7%
N-2: Double Palo Verde	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	2199.9	3280.5	1795.5	2215.6	100.7%	67.5%	1787.6	2201.2	100.1%	67.1%
N-2: Double Palo Verde	HESPERUS (79071) -> COYOTE G (79191) CKT 1 at HESPERUS	Branch Amp	431.8	441.8	391.4	477.5	110.6%	108.1%	No Violations			
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations											
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations											
N-2: Garrison-Taft #1 & #2 500 kV + RAS	No Violations											
N-2: Grassland - Cedar Spring 500 kV / Slatt - Buckley 500 kV	No Violations											
N-2: Grassland - Coyote 500 kV / Slatt - Longhorn 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	Contingency Unavailable				1118.5	1239.0	100.2%	88.8%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	2400.0	3800.0	1974.4	3774.1	157.3%	99.3%	1744.6	3351.4	139.6%	88.2%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM11	Branch Amp	2700.0	4000.0	1349.3	3274.6	121.3%	81.9%	1414.8	3221.7	119.3%	80.5%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	GRIZZ R3 (40488) -> PONDROSA (40837) CKT 1 at GRIZZ R3	Branch Amp	3780.0	3780.0	2082.4	3971.7	105.1%	105.1%	No Violations			
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	GRIZZLY (40489) -> GRIZZ R3 (40488) CKT 1 at GRIZZ R3	Branch Amp	3780.0	3780.0	2087.3	3971.7	105.1%	105.1%	No Violations			
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONDROSA (40837) -> PONSUM11 (90099) CKT 1 at PONDROSA	Branch Amp	3780.0	3780.0	1992.5	3788.2	100.2%	100.2%	No Violations			
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1018.9	1057.9	104.8%	82.3%	No Violations			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	2400.0	3800.0	1724.7	3647.0	152.0%	96.0%	1632.9	3170.8	132.1%	83.4%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON12	Branch Amp	2400.0	3800.0	1709.0	3633.9	151.4%	95.6%	1618.4	3157.2	131.5%	83.1%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	GRIZZLY (40489) -> PONDROSB (40834) CKT 1 at PONDROSB	Branch Amp	3500.0	3500.0	1834.0	3836.5	109.6%	109.6%	No Violations			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	PONDROSB (40834) -> CAPPON16 (90142) CKT 1 at PONDROSB	Branch Amp	3500.0	3500.0	1740.0	3659.8	104.6%	104.6%	No Violations			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON15 (90141) -> CAPPON14 (90140) CKT 1 at CAPPON15	Branch Amp	3500.0	3500.0	1724.7	3647.0	104.2%	104.2%	No Violations			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON13 (90139) -> CAPPON12 (90138) CKT 1 at CAPPON13	Branch Amp	3500.0	3500.0	1718.1	3646.2	104.2%	104.2%	No Violations			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON11 (90137) -> CAPTJACK (45035) CKT 1 at CAPPON11	Branch Amp	3220.0	3220.0	1709.0	3633.9	112.9%	112.9%	No Violations			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1252.9	101.3%	89.8%	No Violations			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1018.9	1057.1	104.8%	82.2%	No Violations			
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	2400.0	3800.0	1724.7	3271.1	136.3%	86.1%	1632.9	3187.7	132.8%	83.9%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON12	Branch Amp	2400.0	3800.0	1709.0	3259.6	135.8%	85.8%	1618.4	3177.3	132.4%	83.6%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON11 (90137) -> CAPTJACK (45035) CKT 1 at CAPPON11	Branch Amp	3220.0	3220.0	1709.0	3259.6	101.2%	101.2%	No Violations			
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations											
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations											
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations											
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations											
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	2900.0	4350.0	2217.4	3850.3	132.8%	88.5%	1856.1	3167.7	109.2%	72.8%
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1395.9	1116.2	1257.0	101.6%	90.0%	No Violations			

Appendix A - 16hs2a_2250idnw_N Base Case Post-Transient Contingency Results

					1200 HS Case				2250 HS Case			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1018.9	1086.5	107.7%	84.5%	No Violations			
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	JOHN DAY (40585) -> GRIJOH12 (90065) CKT 1 at JOHN DAY	Branch Amp	3500.0	3500.0	2040.9	4012.6	114.6%	114.6%	1891.3	3540.0	101.1%	101.1%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH11 (90064) -> GRIZZLY (40489) CKT 1 at GRIJOH11	Branch Amp	3500.0	3500.0	2035.4	4007.5	114.5%	114.5%	1882.9	3532.5	100.9%	100.9%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH11	Branch Amp	3000.0	4050.0	2035.4	4007.5	133.6%	99.0%	1882.9	3532.5	117.7%	87.2%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1018.9	1049.6	104.0%	81.7%	No Violations			
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations											
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations											
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations											
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	320.0	370.0	275.2	359.7	112.4%	97.2%	270.1	348.3	108.8%	94.1%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	950.0	1286.0	653.3	1240.9	130.6%	96.5%	650.5	1185.8	124.8%	92.2%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	94.0	139.0	82.1	100.4	106.8%	72.2%	79.4	96.5	102.6%	69.4%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	KEELER (40597) -> FOR GROV (40427) CKT 2 at KEELER	Branch Amp	850.0	850.0	589.2	876.7	103.1%	103.1%	578.0	846.2	99.6%	99.6%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	CARLTON (40181)	% Δ Volts			No Violations				1.026	0.971		-5.36%
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations											
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations											
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations											
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	DRYGULCH (48113) -> DRYGULCH (45097) CKT 1 at DRYGULCH	Branch MVA	20.0	20.0	14.5	20.9	104.7%	104.7%	No Violations			
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	795.4	1017.6	110.6%	97.2%	775.1	1016.3	110.5%	97.1%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	2667.4	4099.2	1814.9	3755.2	140.8%	91.6%	1814.6	3725.7	139.7%	90.9%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI11	Branch Amp	2667.4	4099.2	1783.4	3647.4	136.7%	89.0%	1781.5	3618.1	135.6%	88.3%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPOLI11	Branch Amp	2667.4	4099.2	1783.4	3647.4	136.7%	89.0%	1781.5	3618.1	135.6%	88.3%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	2993.0	4514.9	1956.4	3206.7	107.1%	71.0%	1971.1	3202.0	107.0%	70.9%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	2993.0	4514.9	1956.4	3206.7	107.1%	71.0%	1971.1	3202.0	107.0%	70.9%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at OLIMAX12	Branch Amp	2993.0	4514.9	1924.7	3172.8	106.0%	70.3%	1941.6	3169.7	105.9%	70.2%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	2993.0	4514.9	1924.7	3172.8	106.0%	70.3%	1941.6	3169.7	105.9%	70.2%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	2993.0	4514.9	1902.5	3135.0	104.7%	69.4%	1920.3	3132.7	104.7%	69.4%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations											
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	HORSE HV (40547)	% Δ Volts			1.031	0.979		-5.04%	1.032	0.980		-5.04%
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations											
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations											
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	PTRSNFUR (62386)	% Δ Volts			No Violations				0.980	0.929		-5.20%
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations											
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	No Violations											
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	No Violations											
N-2: Paul-Raver & Raver-Covingt4 500 kV	No Violations											
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	320.0	370.0	275.2	340.8	106.5%	92.1%	270.1	329.3	102.9%	89.0%
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	950.0	1286.0	653.3	1099.6	115.8%	85.5%	650.5	1045.8	110.1%	81.3%
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations											
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	No Violations											
N-2: Raver-Covington #1 & #2 500 kV	No Violations											
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations											
N-2: Raver-Paul & Napavine-Paul 500 kV	No Violations											
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations											
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations											

Appendix A - 16hs2a_2250idnw_N Base Case Post-Transient Contingency Results

					1200 HS Case				2250 HS Case			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-2: Raver-Schultz #1 & #2 500 kV	No Violations											
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations											
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations											
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	DELEVN (30114) -> CORTINA (30450) CKT 1 at CORTINA	Branch Amp	830.9	953.9	703.3	925.6	111.4%	97.0%	688.9	910.6	109.6%	95.5%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	BRDGVLLE (31110) -> FRUTLDJT (31120) CKT 1 at BRDGVLLE	Branch Amp	328.1	371.4	292.6	333.2	101.5%	89.7%	290.3	330.7	100.8%	89.0%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	2667.4	4099.2	1814.9	3468.3	130.0%	84.6%	1814.6	3448.3	129.3%	84.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI12	Branch Amp	2667.4	4099.2	1783.4	3374.0	126.5%	82.3%	1781.5	3355.8	125.8%	81.9%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPTJACK	Branch Amp	2667.4	4099.2	1783.4	3362.9	126.1%	82.0%	1781.5	3342.8	125.3%	81.5%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	2993.0	4514.9	1956.4	3500.6	117.0%	77.5%	1971.1	3501.4	117.0%	77.6%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	2993.0	4514.9	1956.4	3500.6	117.0%	77.5%	1971.1	3501.4	117.0%	77.6%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at OLIMAX12	Branch Amp	2993.0	4514.9	1924.7	3481.3	116.3%	77.1%	1941.6	3483.0	116.4%	77.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	2993.0	4514.9	1924.7	3481.3	116.3%	77.1%	1941.6	3483.0	116.4%	77.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	2993.0	4514.9	1902.5	3448.4	115.2%	76.4%	1920.3	3450.7	115.3%	76.4%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	FRUTLDJT (31120) -> FTSWRDJT (31122) CKT 1 at FRUTLDJT	Branch Amp	303.1	339.7	265.1	304.6	100.5%	89.7%	No Violations			
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	No Violations											
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	No Violations											
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHE (30790) -> MCMULLN1 (30825) CKT 1 at MCMULLN1	Branch Amp	825.9	976.5	285.9	922.0	111.6%	94.4%	285.6	921.2	111.5%	94.3%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	MCMULLN1 (30825) -> KEARNEY (30830) CKT 1 at MCMULLN1	Branch Amp	825.1	975.0	232.8	863.4	104.6%	88.6%	232.5	862.6	104.5%	88.5%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHEJ (34159) -> HAMMONDS (34160) CKT 1 at HAMMONDS	Branch Amp	462.9	579.9	396.9	474.8	102.6%	81.9%	389.2	466.5	100.8%	80.4%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2477.9	4000.0	2011.7	2549.7	102.9%	63.7%	1971.2	2544.4	102.7%	63.6%
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	No Violations											
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	No Violations											
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	No Violations											
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	No Violations											
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	No Violations											
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	No Violations											
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations											
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations											
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations											

Appendix A - 16hs2a_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Brownlee		Hanford		Hemingway		Humbolt		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 11L12 MERIDIAN-KLAM FALLS 500 KV+KFGEN2+ST	0.82	-1153	0.89	-3838	0.74	-2642	0.70	-454	0.97	-2224	0.80	-3220	0.91	-1649	0.75	-588	0.75	-349
BF 11L22 CAPT JACK-KLAM FALLS 500 KV+KFGEN2+ST	0.82	-1138	0.88	-3946	0.74	-2598	0.70	-450	0.97	-2992	0.76	-3254	0.89	-2079	0.76	-582	0.75	-344
BF 11R1 MERIDIAN-KLAM FALLS 500 KV & MERIDIAN 500/230 KV XFMR	0.81	-1170	0.88	-4071	0.73	-2682	0.70	-454	0.97	-3076	0.81	-3339	0.93	-1581	0.75	-600	0.75	-351
BF 11R6 MERIDIAN-DIXONVILLE 500 KV & MERIDIAN 500/230 KV XFMR	0.82	-1131	0.88	-4024	0.74	-2561	0.70	-444	0.97	-2252	0.87	-2498	0.85	-2319	0.76	-582	0.75	-338
BF 4003 HANFORD-VANTAGE & HANFORD CAPS	0.81	-1162	0.84	-3641	0.73	-2686	0.70	-457	0.98	-2857	0.83	-3288	0.85	-2410	0.76	-578	0.75	-344
BF 4019 CAPTJACK-MALIN #2 & MALIN 500/230 XFMR	0.82	-1170	0.87	-4200	0.74	-2672	0.70	-420	0.97	-2516	0.82	-3334	0.85	-2509	0.75	-602	0.75	-353
BF 4028 TAFT-DWORSHAK & TAFT REACTOR 500KV	0.81	-1212	0.87	-4023	0.74	-2746	0.70	-459	0.97	-2597	0.81	-3512	0.84	-2650	0.78	-531	0.76	-294
BF 4046 JOHN DAY-GRIZZLY #2 & GRIZZLY-MALIN #2 500 KV	0.83	-1059	0.90	-3552	0.75	-2360	0.70	-432	0.98	-1698	0.84	-2509	0.87	-1941	0.77	-550	0.76	-316
BF 4064 CAPTJACK-MALIN & MALIN-ROUND MTN #1 500 KV	0.82	-1151	0.87	-4089	0.74	-2590	0.70	-444	0.97	-3019	0.81	-2861	0.85	-2418	0.75	-591	0.75	-345
BF 4072 GRIZZLY-MALIN #2 & MALIN-ROUND MTN #2 500 KV	0.83	-1093	0.89	-3805	0.74	-2408	0.70	-428	0.98	-1941	0.82	-2393	0.87	-2119	0.76	-566	0.76	-326
BF 4095 LOW MON-HANFORD & HANFORD-WAUTOMA 500 KV	0.81	-1177	0.85	-3910	0.73	-2714	0.70	-457	0.97	-2498	0.82	-3435	0.84	-2586	0.75	-600	0.75	-352
BF 4104 ASHE-HANFORD & HANFORD-WAUTOMA 500 KV	0.81	-1176	0.84	-3732	0.74	-2717	0.70	-458	0.97	-2469	0.82	-3409	0.85	-2542	0.75	-590	0.75	-347
BF 4111 HOT SPRINGS-TAFT & TAFT-DWORSHAK 500 KV	0.81	-1212	0.88	-3966	0.74	-2745	0.70	-459	0.97	-2592	0.81	-3514	0.84	-2648	0.78	-524	0.76	-293
BF 4114 GARRISON-TAFT #1 +TAFT REACTOR 500KV	0.81	-1192	0.87	-4363	0.73	-2744	0.70	-458	0.97	-2634	0.81	-3521	0.84	-2683	0.75	-614	0.75	-352
BF 4119 GARRISON-TAFT #1 & TAFT-BELL 500 KV	0.81	-1190	0.87	-4102	0.73	-2737	0.70	-458	0.97	-2571	0.81	-3467	0.84	-2637	0.78	-540	0.75	-354
BF 4131 SLATT-JOHN DAY & JOHN DAY-GRIZZLY #2 500 KV	0.82	-1105	0.89	-3747	0.74	-2481	0.70	-444	0.97	-2463	0.84	-2849	0.86	-2163	0.76	-574	0.75	-333
BF 4143 (OR 4134) JOHN DAY-GRIZZLY #1 & JOHN DAY CAPS 500 KV	0.82	-1100	0.90	-3550	0.74	-2487	0.70	-445	0.97	-1700	0.85	-2687	0.88	-2011	0.76	-567	0.76	-329
BF 4148 HOT SPRINGS-TAFT & GARRISON-TAFT #2 500 KV	0.81	-1187	0.87	-4218	0.73	-2730	0.70	-458	0.97	-2602	0.81	-3494	0.84	-2665	0.77	-542	0.75	-335
BF 4170 JOHN DAY-MARION & JOHN DAY CAPS 500 KV	0.82	-1159	0.89	-3799	0.73	-2641	0.70	-453	0.97	-2637	0.83	-3048	0.84	-2093	0.75	-596	0.75	-350
BF 4186 (OR 4582) MALIN-ROUND MTN 500 KV & MALIN 500/230 XFMR	0.82	-1137	0.88	-4019	0.74	-2531	0.70	-404	0.97	-2266	0.83	-2697	0.86	-2279	0.76	-586	0.75	-342
BF 4194 ROCK CK-JOHN DAY & BIG EDDY-JOHN DAY 500 KV	0.82	-1145	0.88	-3666	0.74	-2653	0.70	-455	0.97	-2065	0.84	-3202	0.86	-2317	0.76	-570	0.76	-331
BF 4197 JOHN DAY-BIG EDDY #1 & JOHN DAY CAPS 500 KV	0.81	-1171	0.88	-3981	0.73	-2677	0.70	-456	0.96	-2243	0.83	-3216	0.86	-2411	0.75	-601	0.75	-353
BF 4202 JOHN DAY-BIG EDDY#2 & BIG EDDY-OSTRANDER 500 KV	0.81	-1185	0.87	-4155	0.73	-2716	0.70	-458	0.96	-3135	0.81	-3377	0.84	-2527	0.75	-607	0.75	-357
BF 4231 MCNARY-LONGHORN 500 KV & MCNARY 500/230 KV XFMR	0.81	-1111	0.87	-4138	0.74	-2708	0.70	-459	0.97	-2533	0.81	-3455	0.84	-2596	0.75	-598	0.75	-348
BF 4234 MCNARY-LONGHORN & MCNARY-HERMCALP 500 KV	0.81	-1175	0.88	-3873	0.73	-2794	0.70	-467	0.97	-2512	0.82	-3572	0.84	-2602	0.75	-594	0.75	-356
BF 4247 LIT GOOS-LOW MON #2 & LOW MON-MCNARY 500 KV	0.81	-1166	0.88	-3678	0.74	-2703	0.70	-458	0.97	-2354	0.82	-3357	0.85	-2467	0.76	-574	0.76	-330
BF 4259 LIT GOOS-LOW MON #2 & LOW MON-HANFORD 500 KV	0.81	-1178	0.85	-3975	0.73	-2719	0.70	-458	0.97	-3201	0.82	-3447	0.84	-2605	0.75	-599	0.75	-352
BF 4268 MONROE-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.81	-1184	0.88	-4064	0.73	-2732	0.70	-458	0.97	-2582	0.81	-3488	0.84	-2643	0.75	-595	0.75	-352
BF 4276 ING500-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.81	-1184	0.87	-4210	0.73	-2731	0.70	-458	0.97	-3268	0.81	-3481	0.84	-2656	0.75	-602	0.75	-354
BF 4280 KEELER-PEARL & PEARL-MARION 500 KV + RAS	0.81	-1192	0.88	-3787	0.73	-2794	0.70	-466	0.97	-3068	0.84	-3343	0.80	-1982	0.75	-602	0.75	-366
BF 4280 KEELER-PEARL & PEARL-OSTRANDER 500 KV + RAS	0.81	-1194	0.88	-3824	0.73	-2811	0.70	-467	0.98	-3030	0.82	-3593	0.83	-2358	0.75	-602	0.75	-366
BF 4287 PEARL-OSTRANDER 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.81	-1177	0.88	-4055	0.73	-2702	0.70	-457	0.98	-2243	0.83	-3294	0.84	-2401	0.75	-603	0.75	-354
BF 4293 SCHULTZ-RAVER & RAVER COVINGTON5 500 KV	0.81	-1184	0.87	-4106	0.73	-2729	0.70	-458	0.97	-2553	0.81	-3467	0.84	-2621	0.75	-605	0.75	-355
BF 4336 CHIEF JO-SICKLER 500 KV & SICKLER 500/230 XFMR	0.81	-1182	0.88	-3919	0.73	-2731	0.70	-458	0.97	-2562	0.81	-3481	0.84	-2621	0.75	-597	0.75	-352
BF 4336 SICKLER-SCHULTZ 500 KV & SICKLER 500/230 XFMR	0.81	-1182	0.88	-3916	0.73	-2730	0.70	-458	0.97	-2550	0.81	-3474	0.84	-2614	0.75	-597	0.75	-352
BF 4377 ASHE-MARION & MARION-ALVEY 500 KV + RAS	0.81	-1159	0.88	-3872	0.73	-2717	0.70	-459	0.98	-2145	0.86	-2927	0.83	-2246	0.74	-610	0.75	-371
BF 4386 BUCKLEY-MARION & MARION-SANTIAM 500 KV	0.81	-1175	0.88	-4075	0.73	-2684	0.70	-456	0.97	-2365	0.82	-3300	0.81	-2231	0.75	-604	0.75	-355
BF 4432 OSTRANDER-TROUTDALE & SPLIT OSTRANDER 500 KV	0.81	-1186	0.87	-4239	0.73	-2731	0.70	-458	0.98	-2427	0.81	-3473	0.84	-2606	0.75	-607	0.75	-356
BF 4439 BIG EDDY-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.81	-1184	0.87	-4174	0.73	-2721	0.70	-458	0.98	-3035	0.82	-3404	0.84	-2518	0.75	-606	0.75	-356
BF 4442 BIG EDDY-OSTRANDER 500 KV & OSTRANDER-MCLOUGHLIN 230 KV	0.81	-1183	0.87	-4194	0.73	-2719	0.70	-457	0.98	-2360	0.81	-3415	0.83	-2532	0.75	-606	0.75	-356
BF 4448 KNIGHT-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.81	-1179	0.88	-4092	0.73	-2709	0.70	-457	0.98	-2297	0.82	-3353	0.84	-2458	0.75	-604	0.75	-354
BF 4450 KNIGHT-OSTRANDER & OSTRANDER-PEARL 500 KV	0.81	-1178	0.88	-4111	0.73	-2706	0.70	-457	0.98	-2230	0.82	-3355	0.84	-2468	0.75	-603	0.75	-354
BF 4502 PAUL-ALLSTON & ALLSTON-KEELER 500 KV + RAS	0.81	-1219	0.91	-3482	0.73	-2973	0.70	-481	0.98	-2662	0.82	-4064	0.85	-2568	0.73	-622	0.74	-393

Appendix A - 16hs2a_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Brownlee		Hanford		Hemingway		Humbolt		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 4510 PEARL-MARION 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.81	-1169	0.88	-3945	0.73	-2661	0.70	-456	0.97	-2205	0.85	-3006	0.81	-1825	0.75	-597	0.75	-350
BF 4526 CUSTERW-MONROE & MONROE-ECHO LAKE 500 KV + RAS	0.81	-1237	0.88	-4196	0.73	-2974	0.70	-480	0.97	-3539	0.80	-4145	0.82	-2989	0.72	-654	0.74	-407
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV	0.81	-1158	0.89	-3583	0.74	-2667	0.70	-455	0.98	-2129	0.83	-3278	0.86	-2402	0.76	-577	0.75	-339
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV + RAS	0.81	-1213	0.89	-3822	0.73	-2901	0.70	-473	0.97	-2805	0.80	-3963	0.83	-2868	0.74	-623	0.74	-383
BF 4540 PAUL-NAPAVINE & PAUL-SATSOP 500 KV	0.81	-1178	0.88	-4099	0.73	-2716	0.70	-457	0.97	-2481	0.81	-3419	0.84	-2561	0.75	-599	0.75	-352
BF 4542 PAUL-ALLSTON 500 KV & CENTER G2	0.81	-1190	0.88	-3896	0.73	-2783	0.70	-463	0.97	-2511	0.82	-3564	0.84	-2553	0.75	-601	0.75	-361
BF 4542 PAUL-NAPAVINE 500 KV & CENTER G1	0.81	-1194	0.89	-3996	0.73	-2795	0.70	-464	0.97	-2622	0.81	-3640	0.84	-2672	0.75	-605	0.75	-364
BF 4550 OLYMPIA-PAUL & PAUL-ALLSTON 500 KV	0.81	-1176	0.87	-4076	0.74	-2707	0.70	-457	0.97	-3090	0.82	-3377	0.85	-2486	0.75	-596	0.75	-350
BF 4554 OLYMPIA-PAUL 500 KV & TONO 500/115 XFMR	0.81	-1188	0.87	-4316	0.73	-2738	0.70	-458	0.97	-3314	0.81	-3520	0.84	-2686	0.75	-608	0.75	-357
BF 4572 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.81	-1083	0.87	-3684	0.74	-2692	0.70	-458	0.98	-2335	0.82	-3414	0.85	-2477	0.76	-574	0.76	-329
BF 4630 CEN FERRY-LIT GOOS #1 & LIT GOOS-LOW MON #1 500 KV	0.81	-1180	0.87	-4204	0.73	-2725	0.70	-458	0.97	-2559	0.81	-3465	0.84	-2625	0.75	-601	0.75	-352
BF 4652 TAFT-DWORSHAK & TAFT-HATWAI 500 KV + RAS	0.81	-1260	0.87	-4209	0.73	-2918	0.70	-473	0.97	-3651	0.80	-3965	0.82	-2935	0.77	-564	0.75	-354
BF 4672 MONROE-CHIEF JO 500 KV & MONROE CAPS	0.81	-1179	0.89	-3664	0.73	-2714	0.70	-458	0.97	-3120	0.82	-3403	0.85	-2546	0.75	-595	0.75	-351
BF 4676 LIT GOOS-LOW MON & LOW MON-ASHE 500 KV	0.81	-1173	0.87	-4031	0.73	-2715	0.70	-457	0.97	-2509	0.82	-3444	0.84	-2585	0.75	-597	0.75	-349
BF 4690 PAUL-ALLSTON 500 KV & ALLSTON 500/230 XFMR	0.81	-1174	0.88	-4032	0.73	-2703	0.70	-457	0.97	-2379	0.82	-3357	0.85	-2449	0.75	-595	0.75	-349
BF 4700 HATWAI 500KV & 230 KV + RAS	0.81	-1276	0.87	-4154	0.73	-2927	0.70	-475	0.97	-2936	0.80	-3918	0.82	-2906	0.77	-557	0.75	-348
BF 4708 HATWAI 500 KV BUS	0.82	-1202	0.88	-3723	0.74	-2727	0.70	-460	0.97	-2562	0.82	-3498	0.84	-2614	0.80	-454	0.77	-255
BF 4728 COULEE-CHIEF JO 500 KV & CHEIF JO 500/230 XFMR	0.81	-1185	0.87	-4098	0.73	-2732	0.70	-458	0.97	-3265	0.81	-3481	0.84	-2647	0.75	-602	0.75	-354
BF 4775 CEN FERRY-LOW GRAN #1 & #2 500 KV + RAS	0.81	-1169	0.87	-4124	0.73	-2825	0.70	-466	0.97	-2854	0.80	-3832	0.83	-2842	0.75	-609	0.75	-353
BF 4776 HATWAI-LOW GRAN & LOW GRAN-CEN FERRY 500 KV	0.81	-1121	0.87	-3987	0.74	-2698	0.70	-457	0.97	-2627	0.82	-3545	0.84	-2674	0.78	-520	0.76	-303
BF 4870 JOHN DAY-BIG EDDY 500 KV & BIG EDDY 500/230 KV	0.81	-1188	0.87	-4216	0.73	-2729	0.70	-458	0.95	-2638	0.82	-3446	0.84	-2611	0.75	-608	0.75	-357
BF 4888 ASHE-SLATT & CGS 500 KV	0.81	-1191	0.87	-3700	0.73	-2864	0.70	-472	0.97	-2692	0.81	-3805	0.83	-2737	0.75	-589	0.75	-358
BF 4891 LOW MON-ASHE & ASHE-SLATT 500 KV	0.81	-1146	0.86	-3378	0.74	-2682	0.70	-458	0.98	-2134	0.84	-3234	0.86	-2331	0.76	-564	0.76	-328
BF 4901 LOW MON-ASHE & ASHE-HANFORD 500 KV	0.81	-1150	0.85	-3623	0.74	-2710	0.70	-458	0.98	-2331	0.82	-3387	0.86	-2441	0.76	-567	0.76	-329
BF 4940 LOW MON-ASHE & ASHE-MARION 500 KV	0.82	-1134	0.88	-3472	0.74	-2607	0.70	-452	0.98	-1853	0.85	-2991	0.86	-2045	0.76	-576	0.75	-336
BF 4957 SUMMER L-MALIN & SUMMER L-HEMINGWAY 500 KV	0.84	-1032	0.88	-3953	0.75	-1865	0.70	-448	0.97	-2835	0.81	-2638	0.86	-2259	0.77	-554	0.76	-320
BF 4959 GRIZZLY-SUMMER L & SUMMER L-MALIN 500 KV	0.83	-1056	0.89	-3811	0.76	-1916	0.70	-450	0.98	-2591	0.82	-2481	0.87	-2122	0.77	-553	0.76	-319
BF 4996 CAPTJACK-MALIN #1 & #2 500 KV	0.82	-1170	0.87	-4271	0.73	-2679	0.70	-454	0.97	-2572	0.71	-3330	0.84	-2634	0.75	-601	0.75	-352
BF 5003 SLATT-BUCKLEY & SLATT-BOARDMAN 500 KV	0.82	-1129	0.89	-3781	0.74	-2552	0.70	-449	0.98	-1920	0.84	-3010	0.86	-2191	0.76	-582	0.75	-338
BF 5006 SLATT-LONGHORN & SLATT-GRASSLAND 500 KV	0.82	-1166	0.87	-4080	0.73	-2616	0.70	-453	0.97	-2359	0.82	-3384	0.85	-2543	0.75	-606	0.75	-356
BF 5015 ASHE-SLATT & SLATT-BUCKLEY 500 KV	0.82	-1107	0.88	-3337	0.74	-2554	0.70	-448	0.98	-1755	0.86	-2887	0.87	-2018	0.77	-554	0.76	-321
BF 5018 ASHE-SLATT & SLATT-JOHN DAY 500 KV	0.82	-1143	0.87	-3563	0.74	-2637	0.70	-455	0.97	-1991	0.84	-3216	0.86	-2313	0.76	-570	0.76	-330
BF 5021 SLATT-JOHN DAY & SLATT-LONGHORN 500 KV	0.82	-1163	0.88	-4003	0.74	-2642	0.70	-453	0.97	-2864	0.82	-3347	0.85	-2473	0.75	-602	0.75	-353
BF 5028 BUCKLEY-GRIZZLY & GRIZZLY-SUMMER LAKE 500 KV	0.83	-1022	0.90	-3518	0.75	-2290	0.70	-444	0.98	-2309	0.83	-2539	0.88	-1951	0.77	-531	0.76	-305
BF 5040 GRIZZLY-JOHN DAY & GRIZZLY-ROUND BU 500 KV	0.82	-1114	0.89	-3845	0.74	-2523	0.70	-447	0.97	-2012	0.83	-2879	0.86	-2220	0.76	-573	0.75	-332
BF 5114 ECHO LAKE-RAVER & ECHO LAKE- SNOK TAP 500 KV	0.81	-1181	0.88	-3905	0.73	-2727	0.70	-458	0.97	-2531	0.82	-3467	0.84	-2608	0.75	-591	0.75	-350
BF 5117 ECHO LAKE-MAPLE VALLEY & ECHO LAKE-RAVER 500 KV	0.81	-1181	0.88	-3910	0.73	-2723	0.70	-458	0.97	-2500	0.82	-3453	0.84	-2593	0.75	-597	0.75	-352
BF 5148 COULEE-SCHULTZ & ECHO LAKE-SCHULTZ 500 KV	0.81	-1176	0.88	-3702	0.74	-2710	0.70	-457	0.97	-2445	0.82	-3407	0.85	-2550	0.76	-583	0.75	-345
BF 5170 WAUTOMA-SCHULTZ & SCHULTZ-RAVER 500 KV	0.81	-1172	0.86	-3725	0.74	-2708	0.70	-458	0.97	-2375	0.82	-3378	0.85	-2480	0.76	-576	0.75	-341
BF 5179 VANTAGE-SCHULTZ & SCHULTZ-RAVER #4	0.81	-1184	0.87	-3916	0.73	-2727	0.70	-458	0.97	-3199	0.82	-3454	0.84	-2595	0.75	-594	0.75	-350
BF 5187 MCNARY-LONGHORN & LONGHORN-SLATT 500 KV	0.81	-1153	0.87	-4072	0.74	-2691	0.70	-458	0.97	-2409	0.82	-3374	0.84	-2532	0.75	-595	0.75	-347
BF 5193 GRASSLAND-COYOTE & COYOTE-LONGHORN 500 KV	0.81	-1173	0.88	-3920	0.74	-2759	0.70	-467	0.97	-2436	0.82	-3477	0.85	-2536	0.75	-592	0.75	-352
BF 5211 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.81	-1083	0.87	-3684	0.74	-2692	0.70	-458	0.98	-2335	0.82	-3413	0.85	-2477	0.76	-574	0.76	-329
BF 5214 LOW MON-MCNARY & CALPINE PH 500 KV	0.81	-1179	0.89	-3381	0.74	-2763	0.70	-466	0.98	-2206	0.83	-3429	0.85	-2430	0.76	-572	0.75	-337

Appendix A - 16hs2a_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Brownlee		Hanford		Hemingway		Humbolt		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 5250 HANFORD-WAUTOMA#1 & WAUTOMA-KNIGHT 500 KV	0.82	-1142	0.87	-3594	0.74	-2640	0.70	-454	0.98	-1991	0.84	-3168	0.86	-2259	0.76	-571	0.75	-332
BF 5259 HANFORD-WAUTOMA#2 & WAUTOMA-ROCK CK 500 KV	0.82	-1141	0.87	-3561	0.74	-2651	0.70	-455	0.98	-2048	0.84	-3225	0.86	-2306	0.76	-565	0.76	-329
BF 5266 SLATT-BUCKLY 500 KV	0.82	-1134	0.89	-3825	0.74	-2581	0.70	-447	0.98	-1986	0.84	-3071	0.86	-2222	0.76	-585	0.75	-342
BF 5339 VANTAGE-SCHULTZ 500 KV & VANTAGE 500/230 XFMR #1	0.81	-1184	0.86	-4033	0.73	-2731	0.70	-458	0.97	-2546	0.82	-3464	0.84	-2612	0.75	-596	0.75	-351
BF 5345 VANTAGE-HANFORD 500 KV & VANTAGE 500/230 XFMR #1	0.81	-1174	0.84	-3922	0.73	-2725	0.70	-458	0.97	-2480	0.81	-3439	0.84	-2564	0.75	-588	0.75	-348
BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.87	-709	0.91	-3444	0.73	-1977	0.70	-490	0.98	-2300	0.86	-2377	0.89	-1914	0.80	-440	0.77	-245
BF IPC HEMINGWAY-SUMMER L 500 KV & HEMINGWAY 500/230 XFMR	0.86	-905	0.87	-4234	0.71	-1910	0.70	-467	0.97	-3215	0.82	-3167	0.84	-2599	0.76	-580	0.75	-338
BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.88	-652	0.87	-4205	0.70	-1824	0.70	-502	0.97	-3233	0.82	-3120	0.85	-2581	0.78	-492	0.76	-287
BF IPC POPULUS-CHILL-HEMINGWAY 500 KV & HEM 500/230 XFMR	0.86	-956	0.87	-4272	0.70	-2399	0.70	-457	0.97	-3258	0.82	-3398	0.84	-2640	0.75	-596	0.75	-346
BF LOLO 230KV	0.82	-1174	0.88	-4050	0.73	-2719	0.70	-463	0.97	-2396	0.82	-3304	0.85	-2515	0.76	-583	0.75	-335
BF MCNARY 230 KV SECT 1	0.81	-1212	0.87	-4098	0.73	-2815	0.70	-465	0.97	-2704	0.81	-3676	0.83	-2725	0.75	-603	0.75	-362
BF MCNARY 230 KV SECT 2	0.81	-1198	0.87	-4152	0.73	-2770	0.70	-462	0.97	-3301	0.80	-3606	0.96	-1952	0.75	-604	0.75	-359
BF MCNARY 230 KV SECT 3	0.81	-1184	0.88	-3994	0.73	-2746	0.70	-460	0.97	-3200	0.82	-3500	0.84	-2593	0.75	-604	0.75	-358
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.845	-844	0.93	-2916	0.79	-1877	0.70	-485	0.98	-1886	0.88	-2002	0.90	-1463	0.80	-422	0.78	-234
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV+PTSN	0.846	-850	0.93	-2938	0.78	-1892	0.70	-485	0.98	-1902	0.88	-2045	0.90	-1478	0.81	-437	0.78	-239
BF PGE GRASSLAND-COYOTE SP 500KV & CARTY GAS PLANT	0.813	-1160	0.88	-4088	0.74	-2690	0.70	-461	0.97	-3051	0.82	-3325	0.84	-2490	0.76	-593	0.76	-345
BF PGE GRASSLAND-SLATT 500KV & BOARDMAN PLANT	0.815	-1182	0.88	-3942	0.73	-2754	0.70	-467	0.97	-3126	0.81	-3553	0.84	-2605	0.75	-594	0.75	-357
BUS: ALVEY 500 KV + RAS	0.81	-1171	0.88	-4318	0.73	-2742	0.70	-458	0.97	-2619	0.88	-2704	0.82	-2621	0.74	-620	0.75	-377
BUS: BELL BPA 500 KV	0.81	-1184	0.87	-4090	0.73	-2731	0.70	-458	0.97	-2568	0.81	-3462	0.84	-2635	0.78	-537	0.75	-359
BUS: BUCKLEY 500 KV	0.82	-1109	0.90	-3554	0.74	-2504	0.70	-443	0.98	-2384	0.84	-2797	0.85	-1876	0.76	-578	0.75	-336
BUS: DIXONVILLE 500 KV	0.82	-1119	0.88	-4024	0.74	-2533	0.70	-441	0.97	-2917	0.86	-2498	0.85	-2346	0.76	-577	0.75	-334
BUS: HOT SPRINGS 500 KV	0.81	-1183	0.87	-4218	0.73	-2726	0.70	-458	0.97	-2584	0.81	-3477	0.84	-2655	0.76	-573	0.75	-350
BUS: KEELER 500 KV + RAS	0.81	-1220	0.92	-3336	0.73	-2965	0.70	-481	0.98	-2414	0.83	-3816	0.85	-2309	0.73	-625	0.74	-395
BUS: ROCK CREEK 500 KV	0.82	-1140	0.88	-3561	0.74	-2647	0.70	-455	0.98	-1987	0.84	-3198	0.86	-2284	0.76	-564	0.76	-329
BUS: SICKLER 500 KV	0.81	-1181	0.88	-3866	0.73	-2729	0.70	-458	0.97	-2542	0.82	-3471	0.84	-2609	0.75	-596	0.75	-352
BUS: SUMMER LAKE 500 KV	0.84	-1017	0.89	-3745	0.75	-1835	0.70	-444	0.98	-1887	0.82	-2439	0.87	-2096	0.77	-549	0.76	-316
N-1: ALLSTON-KEELER 500 KV + RAS	0.81	-1222	0.90	-3545	0.73	-2980	0.70	-481	0.97	-3463	0.82	-4100	0.84	-2610	0.73	-625	0.74	-395
N-1: ALLSTON-NAPAVINE 500 KV	0.81	-1175	0.88	-4034	0.73	-2703	0.70	-457	0.97	-2384	0.82	-3359	0.85	-2454	0.75	-595	0.75	-350
N-1: ALLSTON-PAUL #2 500 KV	0.81	-1174	0.88	-4039	0.73	-2703	0.70	-457	0.97	-3060	0.82	-3359	0.85	-2457	0.75	-595	0.75	-349
N-1: ALVERY-DIXONVILLE 500 KV	0.82	-1118	0.88	-3995	0.74	-2525	0.70	-441	0.97	-2868	0.87	-2363	0.85	-2373	0.76	-577	0.75	-334
N-1: ALVEY-MARION 500 KV	0.82	-1130	0.89	-3880	0.74	-2555	0.70	-445	0.97	-2774	0.86	-2586	0.85	-2253	0.76	-582	0.75	-339
N-1: ASHE-HANFORD 500 KV	0.81	-1182	0.84	-3881	0.73	-2729	0.70	-458	0.97	-2530	0.82	-3448	0.84	-2584	0.75	-595	0.75	-350
N-1: ASHE-LOW MON 500 KV	0.81	-1176	0.87	-4079	0.73	-2720	0.70	-457	0.97	-2532	0.82	-3454	0.84	-2602	0.75	-601	0.75	-351
N-1: ASHE-MARION 500 KV	0.82	-1141	0.88	-3664	0.74	-2617	0.70	-452	0.98	-1910	0.85	-3019	0.85	-2094	0.76	-580	0.75	-339
N-1: ASHE-SLATT 500 KV	0.81	-1149	0.87	-3628	0.74	-2688	0.70	-458	0.98	-2174	0.83	-3280	0.85	-2393	0.76	-568	0.76	-329
N-1: BELL-COULEE 500 KV	0.81	-1182	0.87	-4168	0.73	-2726	0.70	-458	0.97	-2577	0.81	-3470	0.84	-2643	0.77	-548	0.75	-348
N-1: BELL-TAFT 500 KV	0.81	-1186	0.87	-4182	0.73	-2733	0.70	-458	0.97	-3247	0.81	-3459	0.84	-2636	0.77	-548	0.75	-363
N-1: BIG EDDY-CELILO 500 KV	0.81	-1185	0.87	-4274	0.73	-2731	0.70	-458	0.97	-3265	0.81	-3478	0.84	-2658	0.75	-606	0.75	-355
N-1: BIG EDDY-JOHN DAY 500 KV	0.81	-1186	0.87	-4234	0.73	-2729	0.70	-458	0.96	-3273	0.82	-3458	0.84	-2624	0.75	-607	0.75	-356
N-1: BIG EDDY-KNIGHT 500 KV	0.81	-1171	0.88	-4043	0.73	-2700	0.70	-457	0.98	-2249	0.82	-3386	0.84	-2531	0.75	-594	0.75	-347
N-1: BIG EDDY-OSTRANDER 500 KV	0.81	-1183	0.87	-4208	0.73	-2720	0.70	-457	0.98	-2348	0.81	-3428	0.83	-2563	0.75	-606	0.75	-356
N-1: BOISE BENCH-BROWNLEE #3 230 KV	0.81	-1107	0.87	-4227	0.74	-2617	0.70	-458	0.97	-2552	0.81	-3440	0.84	-2620	0.75	-601	0.75	-352
N-1: BRADY-ANTELOPE 230 KV	0.81	-1182	0.87	-4257	0.74	-2716	0.70	-458	0.97	-3258	0.81	-3469	0.84	-2644	0.75	-565	0.75	-352
N-1: BROADVIEW-GARRISON #1 500 KV	0.81	-1189	0.87	-4239	0.74	-2731	0.70	-458	0.97	-2609	0.81	-3499	0.84	-2670	0.81	-470	0.78	-278

Appendix A - 16hs2a_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Brownlee		Hanford		Hemingway		Humbolt		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: BROWNLEE-ONTARIO 230 KV	0.82	-1073	0.87	-4201	0.75	-2517	0.70	-457	0.97	-3204	0.82	-3422	0.84	-2604	0.75	-599	0.75	-350
N-1: BUCKLEY-GRIZZLY 500 KV	0.82	-1137	0.88	-3983	0.74	-2598	0.70	-449	0.97	-2196	0.82	-3129	0.85	-2351	0.76	-584	0.75	-340
N-1: BUCKLEY-MARION 500 KV	0.81	-1177	0.88	-4116	0.73	-2692	0.70	-456	0.97	-2401	0.82	-3333	0.81	-2260	0.75	-604	0.75	-355
N-1: BUCKLEY-SLATT 500 KV	0.82	-1134	0.89	-3825	0.74	-2581	0.70	-447	0.98	-1986	0.84	-3071	0.86	-2220	0.76	-585	0.75	-342
N-1: CAPTAIN JACK-OLINDA 500 KV	0.83	-1105	0.89	-3862	0.74	-2426	0.70	-429	0.97	-2100	0.82	-2324	0.87	-2198	0.76	-570	0.76	-329
N-1: CAPTJACK-KFALLS 500 KV	0.82	-1136	0.87	-4189	0.74	-2572	0.70	-447	0.97	-3071	0.74	-3267	0.88	-2441	0.76	-584	0.75	-340
N-1: CASCADE CROSSING 500 KV	0.82	-1165	0.89	-3892	0.73	-2640	0.70	-451	0.98	-2091	0.84	-3117	0.85	-2113	0.75	-603	0.75	-354
N-1: CHIEF JO-COULEE 500 KV	0.81	-1185	0.87	-4172	0.73	-2733	0.70	-458	0.97	-2591	0.81	-3479	0.84	-2656	0.75	-606	0.75	-356
N-1: CHIEF JO-MONROE 500 KV	0.81	-1182	0.87	-4028	0.73	-2726	0.70	-458	0.97	-3225	0.81	-3463	0.84	-2617	0.75	-601	0.75	-353
N-1: CHIEF JO-SICKLER 500 KV	0.81	-1183	0.87	-4052	0.73	-2728	0.70	-458	0.97	-2571	0.81	-3473	0.84	-2637	0.75	-597	0.75	-351
N-1: COULEE-HANFORD 500 KV	0.81	-1175	0.86	-3652	0.74	-2722	0.70	-458	0.97	-3134	0.83	-3435	0.85	-2541	0.76	-561	0.75	-334
N-1: COULEE-SCHULTZ 500 KV	0.81	-1178	0.88	-3874	0.73	-2718	0.70	-458	0.97	-3181	0.82	-3453	0.84	-2589	0.76	-585	0.75	-345
N-1: COVINGTON4-RAVER 500 KV	0.81	-1186	0.87	-4252	0.73	-2733	0.70	-458	0.97	-2598	0.81	-3483	0.84	-2658	0.75	-607	0.75	-356
N-1: COVINGTON5-RAVER 500 KV	0.81	-1186	0.87	-4250	0.73	-2733	0.70	-458	0.97	-3276	0.81	-3483	0.84	-2657	0.75	-607	0.75	-356
N-1: COYOTE-LONGHORN 500 KV	0.81	-1171	0.87	-4185	0.73	-2721	0.70	-460	0.97	-3185	0.82	-3431	0.84	-2596	0.75	-598	0.75	-349
N-1: CUSTERW-MONROE 500 KV	0.81	-1184	0.88	-4075	0.73	-2732	0.70	-458	0.97	-2587	0.81	-3487	0.84	-2643	0.75	-596	0.75	-353
N-1: DIXONVILLE-MERIDIAN 500 KV	0.82	-1130	0.88	-4043	0.74	-2564	0.70	-444	0.97	-2954	0.84	-2701	0.84	-2381	0.76	-582	0.75	-338
N-1: DRYCREEK-LOLO 230 KV	0.81	-1184	0.87	-4275	0.73	-2731	0.70	-458	0.97	-2592	0.81	-3479	0.84	-2659	0.75	-606	0.75	-355
N-1: DRYCREEK-N LEWISTON 230 KV	0.81	-1186	0.87	-4268	0.73	-2732	0.70	-458	0.97	-3266	0.81	-3476	0.84	-2657	0.75	-605	0.75	-355
N-1: DRYCREEK-WALA AVA 230 KV	0.81	-1186	0.87	-4263	0.73	-2731	0.70	-458	0.97	-3266	0.81	-3476	0.84	-2656	0.75	-604	0.75	-354
N-1: DWORSHAK-HATWAI 500 KV + RAS	0.81	-1219	0.89	-3748	0.74	-2740	0.70	-459	0.97	-3241	0.82	-3510	0.84	-2617	0.77	-549	0.77	-270
N-1: DWORSHAK-HATWAI 500 KV + RAS+PTSN	0.81	-1223	0.89	-3764	0.74	-2758	0.70	-459	0.97	-3253	0.81	-3519	0.84	-2625	0.77	-561	0.77	-274
N-1: DWORSHAK-TAFT 500 KV	0.81	-1211	0.87	-3945	0.74	-2739	0.70	-459	0.97	-2584	0.81	-3506	0.84	-2635	0.80	-464	0.77	-282
N-1: ECHO LAKE-MAPLE VALLEY 500 KV	0.81	-1186	0.87	-4157	0.73	-2734	0.70	-458	0.97	-3251	0.81	-3477	0.84	-2638	0.75	-607	0.75	-356
N-1: ECHO LAKE-RAVER 500 KV	0.81	-1183	0.87	-4171	0.73	-2728	0.70	-458	0.97	-3252	0.81	-3475	0.84	-2633	0.75	-602	0.75	-354
N-1: ECHO LAKE-SCHULTZ 500 KV	0.81	-1183	0.87	-4082	0.73	-2726	0.70	-458	0.97	-3221	0.81	-3459	0.84	-2616	0.75	-604	0.75	-355
N-1: ECHO LAKE-SNOK TAP 500 KV	0.81	-1182	0.88	-3943	0.73	-2728	0.70	-458	0.97	-2544	0.82	-3470	0.84	-2614	0.75	-592	0.75	-351
N-1: GARRISON-TAFT #2 500 KV	0.81	-1188	0.87	-4281	0.73	-2736	0.70	-458	0.97	-2609	0.81	-3493	0.84	-2669	0.76	-576	0.75	-345
N-1: GOLDHILL-PLACER 115 KV	0.81	-1189	0.87	-4317	0.73	-2740	0.70	-459	0.97	-3308	0.82	-3528	0.84	-2682	0.75	-608	0.75	-356
N-1: GRASSLAND-COYOTE 500 KV	0.81	-1160	0.88	-4091	0.74	-2689	0.70	-461	0.97	-2376	0.82	-3324	0.85	-2486	0.75	-593	0.75	-346
N-1: GRASSLAND-SLATT 500 KV	0.81	-1183	0.87	-4230	0.73	-2696	0.70	-458	0.97	-3216	0.81	-3456	0.84	-2630	0.75	-604	0.75	-354
N-1: GRIZZLY-JOHN DAY #2 500 KV	0.82	-1118	0.89	-3876	0.74	-2541	0.70	-447	0.97	-2732	0.83	-2908	0.86	-2252	0.76	-575	0.75	-333
N-1: GRIZZLY-MALIN 500 KV	0.83	-1107	0.89	-3828	0.74	-2483	0.70	-436	0.98	-2631	0.82	-2737	0.87	-2158	0.76	-575	0.75	-333
N-1: GRIZZLY-PONDEROSA A-SUMMER L 500 KV	0.83	-1069	0.89	-3854	0.74	-2415	0.70	-453	0.97	-2065	0.83	-2840	0.86	-2200	0.77	-552	0.76	-318
N-1: GRIZZLY-PONDEROSA B-CAPT JACK 500 KV	0.83	-1104	0.89	-3807	0.74	-2472	0.70	-435	0.98	-2608	0.82	-2700	0.87	-2137	0.76	-574	0.75	-333
N-1: GRIZZLY-ROUND BU 500 KV	0.81	-1184	0.86	-4241	0.73	-2723	0.70	-458	0.97	-3226	0.81	-3462	0.84	-2637	0.75	-606	0.75	-355
N-1: HANFORD-LOW MON 500 KV	0.81	-1182	0.86	-4035	0.73	-2724	0.70	-458	0.97	-2546	0.81	-3456	0.84	-2619	0.75	-602	0.75	-354
N-1: HANFORD-VANTAGE 500 KV	0.81	-1174	0.84	-3920	0.73	-2725	0.70	-458	0.97	-3159	0.81	-3439	0.84	-2564	0.75	-588	0.75	-348
N-1: HANFORD-WAUTOMA 500 KV	0.81	-1181	0.86	-4162	0.73	-2723	0.70	-458	0.97	-3221	0.81	-3460	0.84	-2616	0.75	-603	0.75	-353
N-1: HATWAI 500/230 KV XFMR + RAS	0.82	-1202	0.87	-4204	0.73	-2746	0.70	-460	0.97	-2541	0.82	-3432	0.84	-2613	0.75	-607	0.75	-350
N-1: HATWAI-LOLO 230 KV	0.81	-1188	0.87	-4232	0.73	-2734	0.70	-459	0.97	-3246	0.81	-3460	0.84	-2638	0.75	-603	0.75	-353
N-1: HATWAI-LOW GRAN 500 KV	0.81	-1122	0.87	-4015	0.74	-2700	0.70	-457	0.97	-3326	0.81	-3569	0.84	-2685	0.78	-520	0.76	-303
N-1: HATWAI-N LEWISTON 230 KV	0.81	-1186	0.87	-4268	0.73	-2732	0.70	-458	0.97	-2589	0.81	-3477	0.84	-2657	0.75	-605	0.75	-355
N-1: HELLS CANYON-BROWNLEE 230 KV	0.81	-1057	0.88	-3979	0.74	-2608	0.70	-466	0.97	-3012	0.82	-3247	0.85	-2456	0.76	-575	0.75	-336

Appendix A - 16hs2a_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Brownlee		Hanford		Hemingway		Humbolt		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: HELLS CANYON-WALLA WALLA 230 KV	0.82	-1205	0.87	-4142	0.73	-2736	0.70	-460	0.97	-2481	0.82	-3379	0.84	-2567	0.75	-596	0.75	-349
N-1: HEMINGWAY-GRASSLAND 500 KV	0.84	-867	0.91	-3446	0.78	-1938	0.70	-488	0.98	-1639	0.85	-2387	0.89	-1913	0.80	-452	0.77	-247
N-1: HEMINGWAY-GRASSLAND 500 KV + FACRI	0.82	-1071	0.86	-4464	0.74	-2348	0.70	-504	0.97	-3720	0.84	-4124	0.82	-2973	0.76	-552	0.76	-318
N-1: HEMINGWAY-GRASSLAND 500 KV + PTSN SHUNT	0.83	-923	0.90	-3510	0.78	-2073	0.70	-496	0.98	-1703	0.85	-2470	0.88	-1972	0.80	-469	0.77	-254
N-1: HEMINGWAY-SUMMER LAKE 500 KV	0.83	-1079	0.87	-4226	0.74	-1970	0.70	-466	0.97	-2518	0.82	-3147	0.84	-2586	0.76	-578	0.75	-335
N-1: HILL TOP 345/230 XFMR	0.82	-1161	0.87	-4264	0.74	-2635	0.70	-375	0.97	-3269	0.82	-3400	0.84	-2660	0.75	-598	0.75	-350
N-1: HORSE HV-MCNARY 230 KV	0.81	-1177	0.87	-4211	0.73	-2719	0.70	-457	0.97	-3225	0.81	-3457	0.84	-2616	0.75	-605	0.75	-355
N-1: HOT SPRINGS-TAFT 500 KV	0.81	-1183	0.87	-4218	0.73	-2726	0.70	-458	0.97	-2584	0.81	-3477	0.84	-2655	0.76	-573	0.75	-350
N-1: HUMBOLDT-COYOTE CK 345 KV	0.81	-1240	0.87	-4175	0.74	-2755	0.70	-208	0.97	-3132	0.82	-3188	0.85	-2526	0.75	-616	0.75	-361
N-1: HUNTINGTON-PINTO-FOUR CORNERS 345 KV	0.81	-1196	0.87	-4304	0.73	-2760	0.70	-456	0.97	-2603	0.81	-3467	0.84	-2664	0.75	-612	0.75	-360
N-1: ING500-CUSTERW 500 KV	0.81	-1185	0.87	-4216	0.73	-2732	0.70	-458	0.97	-3269	0.81	-3482	0.84	-2656	0.75	-602	0.75	-354
N-1: JOHN DAY-MARION 500 KV	0.81	-1174	0.87	-4084	0.73	-2690	0.70	-456	0.97	-3004	0.82	-3288	0.82	-2253	0.75	-602	0.75	-353
N-1: JOHN DAY-ROCK CK 500 KV	0.82	-1144	0.88	-3698	0.74	-2655	0.70	-455	0.98	-2050	0.84	-3232	0.86	-2331	0.76	-569	0.76	-330
N-1: JOHN DAY-SLATT 500 KV	0.82	-1170	0.87	-4079	0.73	-2663	0.70	-453	0.97	-2246	0.82	-3398	0.84	-2531	0.75	-604	0.75	-354
N-1: KFALLS-MERIDIAN 500 KV	0.81	-1174	0.88	-4134	0.73	-2695	0.70	-455	0.97	-2459	0.79	-3504	0.91	-1742	0.75	-602	0.75	-352
N-1: KNIGHT-WAUTOMA 500 KV	0.82	-1144	0.87	-3655	0.74	-2645	0.70	-454	0.98	-2015	0.84	-3182	0.86	-2278	0.76	-573	0.75	-333
N-1: LAGRANDE-NORTH POWDER 230 KV	0.82	-1129	0.87	-4227	0.73	-2713	0.70	-460	0.97	-2537	0.82	-3417	0.84	-2610	0.75	-600	0.75	-351
N-1: LANES-MARION 500 KV	0.81	-1175	0.88	-4122	0.73	-2694	0.70	-456	0.97	-2407	0.83	-3255	0.84	-2433	0.75	-602	0.75	-353
N-1: LIT GOOSE-CENTRAL FERRY 500 KV	0.81	-1183	0.87	-4254	0.73	-2729	0.70	-458	0.97	-2582	0.81	-3475	0.84	-2646	0.75	-604	0.75	-354
N-1: LIT GOOSE-LOW MON 500 KV	0.81	-1182	0.87	-4223	0.73	-2727	0.70	-458	0.97	-3248	0.81	-3470	0.84	-2640	0.75	-603	0.75	-353
N-1: LOW GRAN-CENTRAL FERRY 500 KV	0.81	-1181	0.87	-4237	0.73	-2728	0.70	-458	0.97	-3257	0.81	-3476	0.84	-2644	0.75	-601	0.75	-352
N-1: LOW MON-SAC TAP 500 KV	0.81	-1172	0.87	-3800	0.74	-2718	0.70	-458	0.97	-3108	0.82	-3399	0.84	-2525	0.76	-579	0.75	-332
N-1: MALIN 500/230 XFMR	0.82	-1171	0.87	-4203	0.74	-2677	0.70	-420	0.97	-3200	0.83	-3343	0.84	-2516	0.75	-602	0.75	-353
N-1: MALIN-HILLTOP 230 KV	0.82	-1155	0.87	-4215	0.74	-2618	0.70	-373	0.97	-3225	0.82	-3375	0.84	-2614	0.75	-596	0.75	-349
N-1: MALIN-ROUND MTN #1 500 KV	0.82	-1152	0.87	-4095	0.74	-2594	0.70	-445	0.97	-3028	0.82	-2863	0.85	-2425	0.75	-591	0.75	-345
N-1: MALIN-ROUND MTN #2 500 KV	0.82	-1151	0.87	-4087	0.74	-2587	0.70	-444	0.97	-2339	0.82	-2835	0.86	-2413	0.75	-591	0.75	-344
N-1: MALIN-SUMMER LAKE 500 KV	0.82	-1181	0.88	-4046	0.74	-2548	0.70	-430	0.97	-2301	0.80	-2891	0.85	-2365	0.75	-606	0.75	-356
N-1: MAPLE VLY-ROCKY RH 345 KV	0.81	-1184	0.87	-4139	0.73	-2730	0.70	-458	0.97	-3251	0.81	-3474	0.84	-2639	0.75	-605	0.75	-355
N-1: MARION-PEARL 500 KV	0.81	-1174	0.87	-4125	0.74	-2680	0.70	-456	0.97	-3056	0.84	-3093	0.80	-1908	0.75	-600	0.75	-352
N-1: MARION-SANTIAM 500 KV	0.81	-1190	0.86	-4343	0.73	-2750	0.70	-459	0.97	-2694	0.81	-3566	0.83	-2746	0.75	-608	0.75	-356
N-1: MCLOUGLIN-OSTRANDER 230 KV	0.81	-1185	0.87	-4266	0.73	-2732	0.70	-458	0.97	-2578	0.81	-3466	0.84	-2629	0.75	-606	0.75	-356
N-1: MCNARY 500/230 KV XFMR	0.81	-1125	0.87	-4269	0.73	-2724	0.70	-458	0.97	-2621	0.81	-3525	0.83	-2674	0.75	-607	0.75	-356
N-1: MCNARY S2-MCNARY S3 230 KV	0.81	-1184	0.87	-4249	0.73	-2730	0.70	-458	0.97	-2592	0.81	-3480	0.84	-2658	0.75	-606	0.75	-356
N-1: MCNARY-BOARD T1 230 KV	0.81	-1179	0.87	-4276	0.73	-2712	0.70	-457	0.97	-3241	0.81	-3434	0.84	-2634	0.75	-605	0.75	-353
N-1: MCNARY-JOHN DAY 500 KV	0.82	-1152	0.88	-3995	0.73	-2657	0.70	-454	0.97	-2887	0.83	-3309	0.85	-2450	0.75	-598	0.75	-350
N-1: MCNARY-LONGHORN 500 KV	0.81	-1156	0.87	-4135	0.74	-2718	0.70	-460	0.97	-2491	0.81	-3427	0.84	-2580	0.75	-595	0.75	-346
N-1: MCNARY-ROSS 345 KV	0.81	-1174	0.87	-4177	0.73	-2713	0.70	-457	0.97	-2496	0.81	-3426	0.84	-2571	0.75	-606	0.75	-355
N-1: MCNARY-ROUNDUP 230 KV	0.85	-1020	0.87	-4176	0.74	-2656	0.70	-461	0.97	-2471	0.81	-3351	0.84	-2560	0.75	-592	0.75	-346
N-1: MCNARY-SAC TAP-LOW MON 500 KV	0.81	-1170	0.88	-3738	0.74	-2708	0.70	-458	0.97	-2380	0.82	-3369	0.85	-2481	0.76	-578	0.75	-332
N-1: MIDPOINT-HEMINGWAY 500 KV	0.84	-1046	0.87	-4211	0.70	-2143	0.70	-486	0.97	-3186	0.82	-3186	0.85	-2562	0.77	-527	0.76	-303
N-1: MIDPOINT-HEMINGWAY 500 KV + PTSN SHUNT	0.84	-1051	0.87	-4230	0.70	-2151	0.70	-486	0.97	-3199	0.82	-3197	0.84	-2571	0.77	-540	0.76	-306
N-1: MIDPOINT-HUMBOLDT 345 KV	0.81	-1242	0.87	-4143	0.73	-2779	0.70	-305	0.97	-3092	0.82	-3123	0.85	-2497	0.75	-616	0.75	-361
N-1: NAPAVINE-PAUL 500 KV	0.81	-1179	0.87	-4162	0.73	-2719	0.70	-457	0.97	-2504	0.82	-3440	0.84	-2589	0.75	-600	0.75	-352
N-1: OLYMPIA-PAUL 500 KV	0.81	-1187	0.87	-4315	0.73	-2736	0.70	-458	0.97	-2627	0.81	-3514	0.84	-2683	0.75	-607	0.75	-356

Appendix A - 16hs2a_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Brownlee		Hanford		Hemingway		Humbolt		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: ONTARIO-CALDWELL 230 KV	0.82	-1143	0.86	-4230	0.74	-2619	0.70	-457	0.97	-2557	0.81	-3443	0.84	-2623	0.75	-602	0.75	-353
N-1: OSTRANDER-KNIGHT 500 KV	0.81	-1178	0.87	-4130	0.73	-2707	0.70	-457	0.98	-2989	0.82	-3367	0.84	-2488	0.75	-603	0.75	-354
N-1: OSTRANDER-PEARL 500 KV	0.81	-1184	0.87	-4256	0.73	-2726	0.70	-458	0.98	-2378	0.81	-3484	0.83	-2625	0.75	-606	0.75	-355
N-1: OSTRANDER-TROUTDALE 500 KV	0.81	-1187	0.87	-4232	0.73	-2734	0.70	-458	0.97	-2565	0.81	-3466	0.84	-2613	0.75	-607	0.75	-356
N-1: OXBOW-BROWNLEE #2 230 KV	0.81	-1171	0.87	-4270	0.73	-2722	0.70	-458	0.97	-2585	0.81	-3473	0.84	-2655	0.75	-605	0.75	-354
N-1: OXBOW-LOLO 230 KV	0.82	-1164	0.88	-4056	0.73	-2713	0.70	-463	0.97	-3078	0.82	-3303	0.85	-2515	0.76	-583	0.75	-335
N-1: PAUL-SATSOP 500 KV	0.81	-1184	0.87	-4207	0.73	-2729	0.70	-458	0.97	-2562	0.81	-3463	0.84	-2617	0.75	-605	0.75	-355
N-1: PEARL-KEELER 500 KV	0.81	-1171	0.88	-3964	0.73	-2689	0.70	-457	0.98	-2876	0.83	-3259	0.85	-2297	0.75	-591	0.75	-347
N-1: PEARL-KEELER 500 KV + RAS	0.81	-1196	0.88	-3843	0.73	-2818	0.70	-467	0.98	-2412	0.82	-3610	0.84	-2468	0.74	-603	0.75	-367
N-1: PINTO-FOUR CORNER 345 KV	0.81	-1188	0.87	-4272	0.73	-2736	0.70	-456	0.97	-2583	0.81	-3453	0.84	-2653	0.75	-607	0.75	-357
N-1: PONDEROSA A 500/230 KV XFMR	0.81	-1186	0.87	-4275	0.73	-2731	0.70	-458	0.97	-2590	0.81	-3473	0.84	-2658	0.75	-606	0.75	-356
N-1: PONDEROSA B 500/230 KV XFMR	0.81	-1184	0.87	-4277	0.73	-2730	0.70	-458	0.97	-3271	0.81	-3478	0.84	-2660	0.75	-606	0.75	-355
N-1: RAVER-PAUL 500 KV	0.81	-1160	0.89	-3622	0.74	-2672	0.70	-456	0.98	-2162	0.83	-3305	0.85	-2456	0.76	-579	0.75	-340
N-1: RAVER-TACOMA 500 KV	0.81	-1185	0.87	-4182	0.73	-2731	0.70	-458	0.97	-2575	0.81	-3475	0.84	-2639	0.75	-605	0.75	-355
N-1: RED BUTTE-HARRY ALLEN 345 KV	0.81	-1194	0.86	-4232	0.73	-2759	0.70	-452	0.97	-3230	0.81	-3396	0.84	-2616	0.75	-611	0.75	-361
N-1: ROBINSON-HARRY ALLEN 500 KV	0.82	-1163	0.87	-4278	0.74	-2626	0.70	-368	0.97	-3279	0.81	-3498	0.84	-2665	0.75	-602	0.75	-353
N-1: ROCK CK-WAUTOMA 500 KV	0.82	-1144	0.88	-3622	0.74	-2656	0.70	-455	0.98	-2744	0.84	-3237	0.86	-2322	0.76	-566	0.76	-329
N-1: ROUND MTN-TABLE MTN 500 KV	0.82	-1163	0.87	-4160	0.74	-2647	0.70	-449	0.97	-2460	0.82	-3109	0.85	-2537	0.75	-595	0.75	-348
N-1: ROUNDUP-LAGRANDE 230 KV	0.82	-1110	0.87	-4196	0.73	-2703	0.70	-461	0.97	-3173	0.82	-3386	0.84	-2580	0.75	-596	0.75	-349
N-1: SCHULTZ-SICKLER 500 KV	0.81	-1182	0.88	-3975	0.73	-2729	0.70	-458	0.97	-2549	0.81	-3473	0.84	-2614	0.75	-596	0.75	-352
N-1: SCHULTZ-VANTAGE 500 KV	0.81	-1186	0.86	-4031	0.73	-2732	0.70	-458	0.97	-2556	0.81	-3466	0.84	-2618	0.75	-597	0.75	-351
N-1: SCHULTZ-WAUTOMA 500 KV	0.81	-1174	0.86	-3822	0.73	-2712	0.70	-458	0.97	-2402	0.82	-3390	0.85	-2507	0.76	-579	0.75	-342
N-1: SIGURD-GLEN CANYON 230 KV	0.81	-1184	0.87	-4277	0.73	-2726	0.70	-458	0.97	-3273	0.81	-3480	0.84	-2661	0.75	-606	0.75	-355
N-1: SLATT 500/230 KV XFMR	0.81	-1195	0.87	-3955	0.73	-2816	0.70	-467	0.97	-2598	0.81	-3659	0.84	-2660	0.75	-599	0.75	-362
N-1: SLATT-LONGHORN 500 KV	0.81	-1174	0.87	-4168	0.73	-2705	0.70	-457	0.97	-3149	0.81	-3415	0.84	-2576	0.75	-604	0.75	-354
N-1: SNOK TAP-SNOKING 500 KV	0.81	-1185	0.87	-4231	0.73	-2732	0.70	-458	0.97	-3271	0.81	-3482	0.84	-2656	0.75	-606	0.75	-355
N-1: TABLE MTN-TESLA 500 KV	0.82	-1163	0.87	-4178	0.74	-2655	0.70	-451	0.97	-2493	0.82	-3173	0.84	-2564	0.75	-595	0.75	-347
N-1: TABLE MTN-VACA DIXON 500 KV	0.82	-1152	0.88	-4125	0.74	-2610	0.70	-447	0.97	-2416	0.82	-2941	0.85	-2504	0.75	-589	0.75	-343
N-1: VANTAGE 500/230 KV XFMR #1	0.81	-1184	0.87	-4291	0.73	-2731	0.70	-458	0.97	-2586	0.81	-3478	0.84	-2657	0.75	-606	0.75	-355
N-1: VANTAGE 500/230 KV XFMR #2	0.81	-1184	0.87	-4291	0.73	-2731	0.70	-458	0.97	-3264	0.81	-3478	0.84	-2657	0.75	-606	0.75	-355
N-1: WALLA WALLA-TALBOT 230 KV	0.81	-1192	0.87	-4220	0.73	-2729	0.70	-458	0.97	-3250	0.81	-3469	0.84	-2640	0.75	-599	0.75	-351
N-1: WALLA WALLA-WALLULA 230 KV	0.82	-1165	0.87	-4262	0.73	-2730	0.70	-458	0.97	-3267	0.81	-3474	0.84	-2657	0.75	-605	0.75	-355
N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.82	-1084	0.89	-2886	0.75	-2536	0.70	-452	0.98	-2125	0.88	-2664	0.89	-1733	0.78	-521	0.76	-301
N-2: ASHE-MARION & BUCKLEY-MARION 500 KV	0.82	-1128	0.90	-3433	0.74	-2567	0.70	-449	0.98	-1674	0.86	-2781	0.83	-1697	0.76	-578	0.75	-338
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.83	-1066	0.92	-2992	0.74	-2400	0.70	-439	0.98	-1276	0.89	-2416	0.89	-1575	0.77	-551	0.76	-320
N-2: ASHE-MARION & SLATT-COYOTE TAP-LONGHORN 500 KV	0.82	-1127	0.89	-3539	0.74	-2583	0.70	-451	0.98	-1788	0.85	-2926	0.86	-2011	0.76	-578	0.75	-337
N-2: ASHE-MARION & SLATT-JOHN DAY 500 KV	0.82	-1120	0.89	-3441	0.74	-2533	0.70	-447	0.98	-1612	0.86	-2900	0.86	-1958	0.76	-576	0.75	-337
N-2: ASHE-SLATT & MCNARY-JOHN DAY 500 KV	0.82	-1113	0.88	-3388	0.74	-2613	0.70	-454	0.98	-1821	0.85	-3056	0.87	-2160	0.76	-557	0.76	-323
N-2: ASHE-SLATT & SLATT-COYOTE TAP-LONGHORN 500 KV	0.82	-1131	0.88	-3504	0.74	-2649	0.70	-456	0.98	-2012	0.84	-3168	0.86	-2270	0.76	-561	0.76	-325
N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.81	-1237	0.88	-4109	0.74	-2797	0.70	-465	0.97	-2826	0.80	-3762	0.83	-2823	0.87	-274	0.78	-218
N-2: BETHEL-CEDAR SP 500KV & BETHEL-ROUND BUTTE 230 KV	0.814	-1175	0.88	-4053	0.73	-2674	0.70	-453	0.98	-2936	0.83	-3287	0.84	-2202	0.75	-607	0.75	-356
N-2: BETHEL-CEDAR SP 500KV & BETHEL-SANTIAM 230KV	0.814	-1174	0.88	-4061	0.73	-2672	0.70	-453	0.98	-2939	0.83	-3291	0.84	-2277	0.75	-606	0.75	-356
N-2: BETHEL-CEDAR SP 500KV & SANTIAM-MIKKALO 500KV	0.814	-1168	0.89	-3911	0.73	-2648	0.70	-451	0.98	-2814	0.83	-3143	0.85	-2122	0.75	-603	0.75	-354
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-CHEMAWA 230 KV	0.81	-1182	0.87	-4178	0.73	-2714	0.70	-457	0.98	-2996	0.82	-3382	0.83	-2494	0.75	-605	0.75	-355

Appendix A - 16hs2a_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Brownlee		Hanford		Hemingway		Humbolt		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-TROUTDALE 230 KV	0.81	-1183	0.87	-4201	0.73	-2718	0.70	-457	0.98	-2352	0.81	-3419	0.83	-2539	0.75	-606	0.75	-356
N-2: BOISE BENCH-BROWNLEE #1 & #2 230 KV	0.79	-893	0.87	-4124	0.77	-2270	0.70	-459	0.97	-2412	0.82	-3289	0.85	-2523	0.75	-585	0.75	-339
N-2: BOISE BENCH-BROWNLEE #3 & BOISE BENCH-HORSEFLAT#4 230 KV	0.79	-892	0.87	-4122	0.77	-2264	0.70	-459	0.97	-2409	0.82	-3285	0.85	-2521	0.75	-584	0.75	-339
N-2: BRIDGER-POPULUS #1 & #2 345 KV	0.82	-1147	0.87	-4195	0.75	-2413	0.70	-457	0.97	-2533	0.82	-3420	0.84	-2607	0.74	-608	0.74	-381
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV	0.83	-1118	0.87	-4154	0.78	-2112	0.70	-451	0.97	-3171	0.82	-3380	0.84	-2577	0.74	-580	0.74	-385
N-2: BROADVIEW-GARRISONT #1 & #2 500 KV + RAS	0.81	-1197	0.88	-4309	0.72	-2853	0.70	-483	0.97	-2974	0.80	-3967	0.82	-2941	0.70	-579	0.82	-413
N-2: BROWNLEE-HELLS CANYON & OXBOW-LOLO 230 KV	0.81	-1073	0.89	-3612	0.74	-2502	0.70	-472	0.98	-1934	0.85	-2885	0.87	-2181	0.77	-538	0.76	-305
N-2: BROWNLEE-OXBOW & BROWNLEE-HELLS CANYON 230 KV	0.81	-1048	0.88	-3973	0.74	-2598	0.70	-466	0.97	-2329	0.82	-3239	0.85	-2450	0.76	-575	0.75	-336
N-2: BUCKLEY-MARION & JOHN DAY-MARION 500 KV	0.82	-1165	0.89	-3868	0.73	-2648	0.70	-453	0.97	-2125	0.84	-3082	0.79	-1757	0.75	-601	0.75	-353
N-2: CHIEF JO-MONROE & CHIEF JO-SICKLER 500 KV	0.81	-1179	0.88	-3741	0.73	-2719	0.70	-458	0.97	-2504	0.82	-3450	0.84	-2589	0.76	-587	0.75	-347
N-2: CHIEF JO-MONROE 500 KV & CHIEF JO-SNOHOMS4 345 KV	0.81	-1181	0.88	-3905	0.73	-2722	0.70	-458	0.97	-3196	0.82	-3454	0.84	-2601	0.75	-598	0.75	-352
N-2: CHIEF JO-MONROE 500 KV & MONROE-SAMMAMSH 230 KV	0.81	-1182	0.87	-3984	0.73	-2726	0.70	-458	0.97	-2538	0.82	-3461	0.84	-2611	0.75	-600	0.75	-353
N-2: CHIEF JO-SICKLER 500 KV & CHIEF J3-SNOHOMS3 345 KV	0.81	-1182	0.88	-3944	0.73	-2725	0.70	-458	0.97	-2548	0.81	-3466	0.84	-2616	0.75	-594	0.75	-350
N-2: COULEE-CHIEF JO 500 KV & CHIEF J4-SNOHOMS4 345 KV	0.81	-1185	0.87	-4060	0.73	-2731	0.70	-458	0.97	-2578	0.81	-3476	0.84	-2640	0.75	-605	0.75	-356
N-2: COULEE-HANFORD & HANFORD-VANTAGE 500 KV	0.81	-1151	0.85	-3142	0.74	-2709	0.70	-459	0.98	-2916	0.83	-3366	0.86	-2373	0.78	-507	0.76	-313
N-2: COULEE-SCHULTZ #1 & #2 500 KV	0.81	-1162	0.90	-3068	0.74	-2686	0.70	-457	0.97	-2311	0.83	-3349	0.85	-2459	0.77	-532	0.76	-320
N-2: CUSTERW-ING500 & CUSTERW-MONROE 500 KV	0.81	-1183	0.88	-4006	0.73	-2732	0.70	-458	0.97	-3252	0.81	-3486	0.84	-2639	0.75	-591	0.75	-351
N-2: CUSTERW-MONROE #1 & #2 500 KV + RAS	0.81	-1242	0.86	-4735	0.73	-2978	0.70	-479	0.97	-3876	0.78	-4254	0.80	-3164	0.73	-646	0.74	-400
N-2: DC-BIPOLE	0.84	-1016	0.89	-3938	0.76	-2267	0.70	-401	0.96	-2411	0.84	-2335	0.86	-2315	0.76	-575	0.75	-343
N-2: DOUBLE PALO VERDE	0.84	-613	0.96	-1699	0.78	-2156	0.70	-414	0.99	-1308	0.92	-2209	0.92	-1643	0.81	-424	0.77	-272
N-2: ECHOLAKE-MAPLE VLY 500 KV & COVINGTON-MAPLE VLY 230 KV	0.81	-1186	0.87	-4156	0.73	-2734	0.70	-458	0.97	-2572	0.81	-3476	0.84	-2638	0.75	-607	0.75	-356
N-2: ECHOLAKE-MAPLE VLY 500 KV & ROCKY RH-MAPLE VLY 345 KV	0.81	-1184	0.88	-4004	0.73	-2730	0.70	-458	0.97	-2540	0.82	-3464	0.84	-2612	0.75	-605	0.75	-355
N-2: GARRISON-TAFT #1 & #2 500 KV + RAS	0.81	-1200	0.87	-4263	0.72	-2823	0.70	-468	0.97	-2773	0.81	-3705	0.83	-2790	0.83	-457	0.74	-456
N-2: GRASSLAND-CEDAR SP 500KV & SLATT-BUCKLEY 500KV	0.83	-1105	0.91	-3394	0.74	-2469	0.70	-438	0.98	-2293	0.87	-2704	0.88	-1747	0.75	-582	0.76	-340
N-2: GRASSLAND-COYOTE 500KV & SLATT-LONGHORN 500KV	0.82	-1079	0.89	-3448	0.75	-2596	0.70	-460	0.98	-2427	0.86	-2929	0.88	-2076	0.76	-565	0.75	-326
N-2: GRIZZLY-MALIN & GRIZZLY-CAPTAIN JACK 500 KV + RAS	0.82	-1100	0.89	-4157	0.74	-2547	0.70	-434	0.97	-2382	0.80	-2765	0.84	-2334	0.73	-625	0.74	-386
N-2: GRIZZLY-MALIN & GRIZZLY-SUMMER LAKE 500 KV + RAS	0.82	-1060	0.89	-4218	0.74	-2498	0.70	-460	0.97	-2465	0.80	-3014	0.84	-2447	0.74	-606	0.75	-370
N-2: GRIZZLY-MALIN & MALIN-SUMMER LAKE 500 KV + RAS	0.82	-1202	0.86	-4824	0.74	-2671	0.70	-423	0.97	-3341	0.79	-2849	0.83	-2541	0.72	-656	0.74	-412
N-2: HANFORD-ASHE & HANFORD-LOW MON 500 KV	0.81	-1183	0.82	-3160	0.74	-2725	0.70	-459	0.97	-2483	0.82	-3413	0.84	-2552	0.76	-586	0.75	-349
N-2: HANFORD-WAUTOMA #1 & #2 500 KV	0.82	-1153	0.84	-3620	0.74	-2670	0.70	-455	0.97	-2983	0.82	-3340	0.85	-2453	0.75	-588	0.75	-341
N-2: JOHN DAY-BIG EDDY #1 & #2 500 KV	0.81	-1200	0.91	-3827	0.73	-2725	0.70	-459	0.90	-3140	0.82	-3294	0.89	-2305	0.74	-617	0.75	-365
N-2: JOHN DAY-BIG EDDY & JOHN DAY-MARION 500 KV	0.81	-1175	0.88	-4050	0.73	-2685	0.70	-456	0.96	-3002	0.82	-3246	0.82	-2227	0.75	-603	0.75	-354
N-2: JOHN DAY-GRIZZLY #1 & #2 500 KV + RAS	0.82	-1050	0.91	-3836	0.75	-2483	0.70	-453	0.98	-2642	0.84	-2775	0.84	-2156	0.75	-590	0.75	-356
N-2: JOHN DAY-GRIZZLY #2 & BUCKLEY-GRIZZLY 500 KV + RAS	0.82	-1095	0.90	-3973	0.74	-2562	0.70	-465	0.97	-2758	0.82	-3030	0.86	-2286	0.75	-591	0.75	-353
N-2: JOHN DAY-MARION & BUCKLEY-MARION 500 KV	0.82	-1165	0.89	-3868	0.73	-2648	0.70	-453	0.97	-2125	0.84	-3082	0.79	-1757	0.75	-601	0.75	-353
N-2: JOHN DAY-MARION & MARION-PEARL 500 KV	0.82	-1155	0.89	-3849	0.74	-2604	0.70	-452	0.97	-2100	0.85	-2721	0.79	-1366	0.75	-591	0.75	-347
N-2: JOHN DAY-ROCK CREEK 500 KV & MCNARY-ROSS 345 KV	0.82	-1132	0.88	-3608	0.74	-2636	0.70	-454	0.98	-2631	0.84	-3152	0.86	-2254	0.76	-569	0.76	-330
N-2: KEELER-PEARL 500 & SHERWOOD-CARLTON 230 KV	0.81	-1171	0.88	-3959	0.73	-2687	0.70	-457	0.98	-2191	0.83	-3246	0.85	-2282	0.75	-592	0.75	-347
N-2: KNIGHT-OSTRANDER & OSTRANDER-BIG EDDY 500 KV	0.81	-1176	0.88	-4046	0.73	-2694	0.70	-456	0.98	-2165	0.83	-3270	0.84	-2295	0.75	-604	0.75	-355
N-2: KNIGHT-OSTRANDER 500 KV & MCNARY-ROSS 345 KV	0.81	-1166	0.88	-4031	0.73	-2687	0.70	-456	0.98	-2216	0.83	-3291	0.85	-2395	0.75	-603	0.75	-354
N-2: KNIGHT-OSTRANDER 500 KV & MIDWAY-BONNEVILLE 230 KV	0.81	-1171	0.88	-4001	0.73	-2689	0.70	-456	0.98	-2908	0.83	-3297	0.85	-2431	0.75	-598	0.75	-351
N-2: LOWER GRANITE-CENTRAL FERRY #1 & #2 500 KV	0.81	-1107	0.87	-3824	0.74	-2683	0.70	-456	0.97	-2588	0.81	-3537	0.84	-2635	0.78	-520	0.76	-292
N-2: MALIN-ROUND MTN #1 & #2 500 KV	0.82	-1179	0.87	-4788	0.74	-2607	0.70	-427	0.97	-2961	0.79	-2344	0.85	-2768	0.73	-644	0.74	-388
N-2: MCNARY-JOHN DAY & ROCK CREEK-JOHN DAY 500 KV	0.82	-1093	0.89	-3343	0.74	-2550	0.70	-449	0.98	-1648	0.86	-2958	0.88	-2027	0.77	-553	0.76	-320

Appendix A - 16hs2a_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Brownlee		Hanford		Hemingway		Humbolt		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-HORSE HEAVEN 230 KV	0.82	-1139	0.88	-3900	0.74	-2635	0.70	-453	0.97	-2155	0.83	-3267	0.85	-2399	0.75	-596	0.75	-348
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-ROSS 345 KV	0.82	-1136	0.88	-3869	0.74	-2631	0.70	-452	0.98	-2017	0.84	-3220	0.86	-2340	0.75	-597	0.75	-349
N-2: MCNARY-ROSS 345 KV & MCNARY-HORSE HEAVEN 230 KV	0.81	-1164	0.88	-4112	0.73	-2697	0.70	-456	0.97	-2436	0.82	-3386	0.84	-2530	0.75	-605	0.75	-354
N-2: MIDPOINT-SUMMER LAKE 500 KV & MIDPOINT-KING 230 KV	0.84	-1043	0.87	-4200	0.73	-2087	0.70	-486	0.97	-2501	0.82	-3175	0.85	-2557	0.77	-517	0.76	-299
N-2: MONROE-CUSTERW & CHIEF JO-MONROE 500 KV	0.81	-1181	0.89	-3803	0.73	-2725	0.70	-458	0.97	-3195	0.82	-3461	0.84	-2599	0.75	-590	0.75	-350
N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV + RAS	0.81	-1131	0.94	-1990	0.75	-2728	0.70	-473	0.99	-1126	0.92	-2671	0.93	-1373	0.76	-545	0.75	-355
N-2: PAUL-NAPAVINE & PAUL-ALLSTON #2 500 KV + RAS	0.81	-1131	0.94	-2003	0.75	-2734	0.70	-473	0.99	-1163	0.92	-2753	0.93	-1420	0.76	-545	0.75	-355
N-2: PAUL-RAVER & RAVER-COVINGT4 500 KV	0.81	-1160	0.89	-3567	0.74	-2671	0.70	-456	0.98	-2151	0.83	-3302	0.86	-2428	0.76	-579	0.75	-340
N-2: PEARL-KEELER 500 KV & PEARL-SHERWOOD 230 KV + RAS	0.81	-1196	0.88	-3842	0.73	-2820	0.70	-467	0.98	-2413	0.82	-3608	0.84	-2462	0.74	-604	0.75	-367
N-2: PEARL-OSTRANDER 500 KV & BIG EDDY-MCLOUGLN 230 KV	0.81	-1183	0.87	-4240	0.73	-2723	0.70	-458	0.98	-2377	0.81	-3467	0.83	-2584	0.75	-606	0.75	-355
N-2: PEARL-OSTRANDER 500 KV & OSTRANDER-MCLOUGLN 230 KV	0.81	-1184	0.87	-4239	0.73	-2726	0.70	-458	0.98	-2395	0.81	-3453	0.83	-2547	0.75	-606	0.75	-355
N-2: RAVER-COVINGTON #1 & #2 500 KV	0.81	-1187	0.87	-4212	0.73	-2735	0.70	-458	0.97	-3272	0.82	-3487	0.84	-2655	0.75	-608	0.75	-356
N-2: RAVER-ECHO LAKE & RAVER-SCHULTZ 500 KV	0.81	-1181	0.87	-4028	0.73	-2723	0.70	-458	0.97	-3202	0.82	-3456	0.84	-2608	0.75	-599	0.75	-352
N-2: RAVER-PAUL & NAPAVINE-PAUL 500 KV	0.81	-1158	0.89	-3590	0.74	-2667	0.70	-455	0.98	-2129	0.83	-3282	0.86	-2407	0.76	-576	0.75	-339
N-2: RAVER-PAUL 500 KV & COULEE-OLYMPIA 300 KV	0.81	-1209	0.89	-3589	0.73	-2892	0.70	-473	0.97	-2742	0.80	-3943	0.83	-2835	0.74	-616	0.75	-379
N-2: RAVER-PAUL 500 KV & TACOMA A-CHEHALIS 230 KV	0.81	-1209	0.90	-3711	0.73	-2889	0.70	-473	0.97	-2738	0.80	-3935	0.83	-2843	0.74	-618	0.75	-380
N-2: RAVER-SCHULTZ #1 & #2 500 KV	0.81	-1177	0.88	-3761	0.73	-2707	0.70	-457	0.97	-2431	0.82	-3396	0.85	-2556	0.75	-599	0.75	-352
N-2: RAVER-TACOMA & RAVER-COVINGT4 500 KV	0.81	-1185	0.87	-4125	0.73	-2731	0.70	-458	0.97	-2563	0.81	-3470	0.84	-2624	0.75	-606	0.75	-355
N-2: RAVER-TACOMA 500 KV & TACOMA-CHRISTOP-COVINGTON 230 KV	0.81	-1184	0.87	-4163	0.73	-2730	0.70	-458	0.97	-2567	0.81	-3472	0.84	-2626	0.75	-605	0.75	-355
N-2: ROUND MTN-TABLE MTN #1 & #2 500 KV + RAS	0.81	-1225	0.85	-5189	0.74	-2732	0.70	-434	0.97	-3375	0.78	-2768	0.83	-3121	0.73	-659	0.74	-396
N-2: SCHULTZ-WAUTOMA & VANTAGE-SCHULTZ 500 KV + RAS	0.81	-1239	0.83	-4100	0.73	-2987	0.70	-480	0.97	-3770	0.79	-4226	0.81	-3029	0.74	-619	0.74	-387
N-2: SICKLER-SCHULTZ & SCHULTZ-VANTAGE 500 KV + RAS	0.81	-1212	0.86	-4055	0.73	-2853	0.70	-468	0.97	-2860	0.80	-3837	0.83	-2851	0.74	-614	0.75	-373
N-2: TABLE MTN-TESLA & TABLE MTN-VACA DIXON 500 KV	0.81	-1169	0.91	-3549	0.74	-2861	0.70	-465	0.97	-2808	0.80	-3393	0.83	-2780	0.73	-629	0.74	-404
N-2: TAFT-BELL 500 KV & BELL-LANCASTER 230 KV	0.81	-1182	0.87	-4188	0.73	-2728	0.70	-458	0.97	-2581	0.81	-3476	0.84	-2646	0.79	-495	0.75	-346
N-2: TAFT-BELL 500KV & BELL-BOUNDARY #3 230KV	0.81	-1188	0.87	-4128	0.73	-2737	0.70	-459	0.97	-3252	0.81	-3468	0.84	-2636	0.77	-549	0.75	-364
N-2: TAFT-BELL 500KV & BELL-LANCASTER 230KV	0.81	-1182	0.87	-4188	0.73	-2728	0.70	-458	0.97	-3260	0.81	-3476	0.84	-2646	0.79	-495	0.75	-346
N-2: TAFT-BELL 500KV & BELL-TRENTWOOD #2 115KV	0.81	-1187	0.87	-4181	0.73	-2733	0.70	-458	0.97	-3247	0.81	-3460	0.84	-2636	0.77	-548	0.75	-363
N-2: TAFT-BELL 500KV & LANCASTER-NOXON 230KV	0.81	-1186	0.87	-4184	0.73	-2732	0.70	-458	0.97	-3248	0.81	-3461	0.84	-2637	0.78	-538	0.75	-360
N-2: TAFT-DWORSHAK & GARRISON-TAFT #1 500KV	0.81	-1213	0.88	-3962	0.74	-2741	0.70	-459	0.97	-3275	0.81	-3516	0.84	-2651	0.81	-457	0.77	-275
N-2: WAUTOMA-ROCK CK 500 KV & MIDWAY-BIG EDDY 230 KV	0.82	-1133	0.88	-3502	0.74	-2638	0.70	-454	0.97	-2081	0.84	-3192	0.85	-2269	0.77	-557	0.76	-325
N-2: WAUTOMA-ROCK CK 500 KV & SPRINGCREEK-BIG EDDY 230 KV	0.82	-1133	0.88	-3502	0.74	-2638	0.70	-454	0.97	-2081	0.84	-3192	0.85	-2269	0.77	-557	0.76	-325
N-3: SCHULTZ-RAVER #1 & #2 & #3 500 KV	0.81	-1174	0.88	-3624	0.73	-2700	0.70	-457	0.97	-3048	0.82	-3370	0.85	-2513	0.75	-595	0.75	-351

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

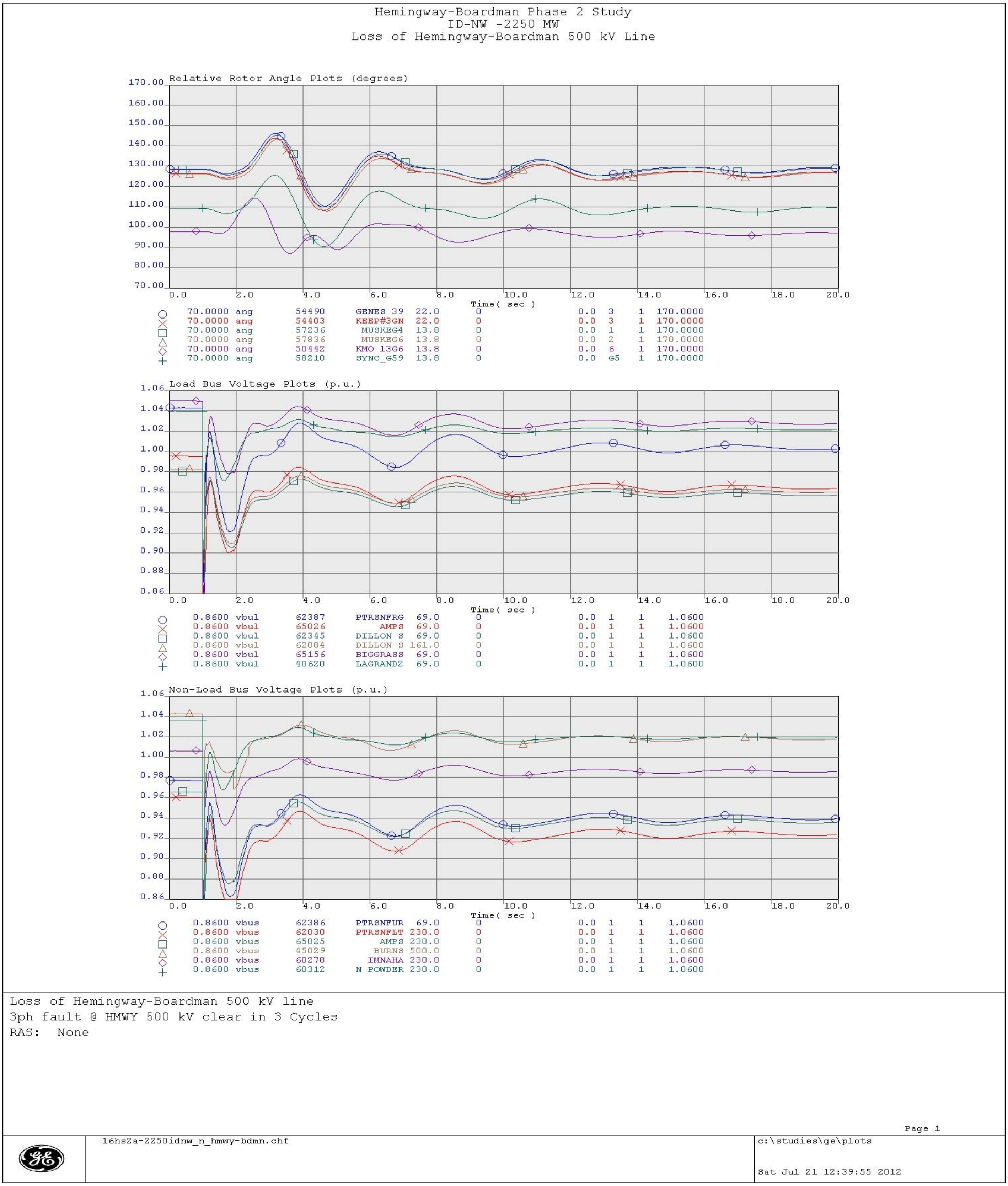


Figure A8: N-1 Loss of Hemingway-Boardman 500 kV Line (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

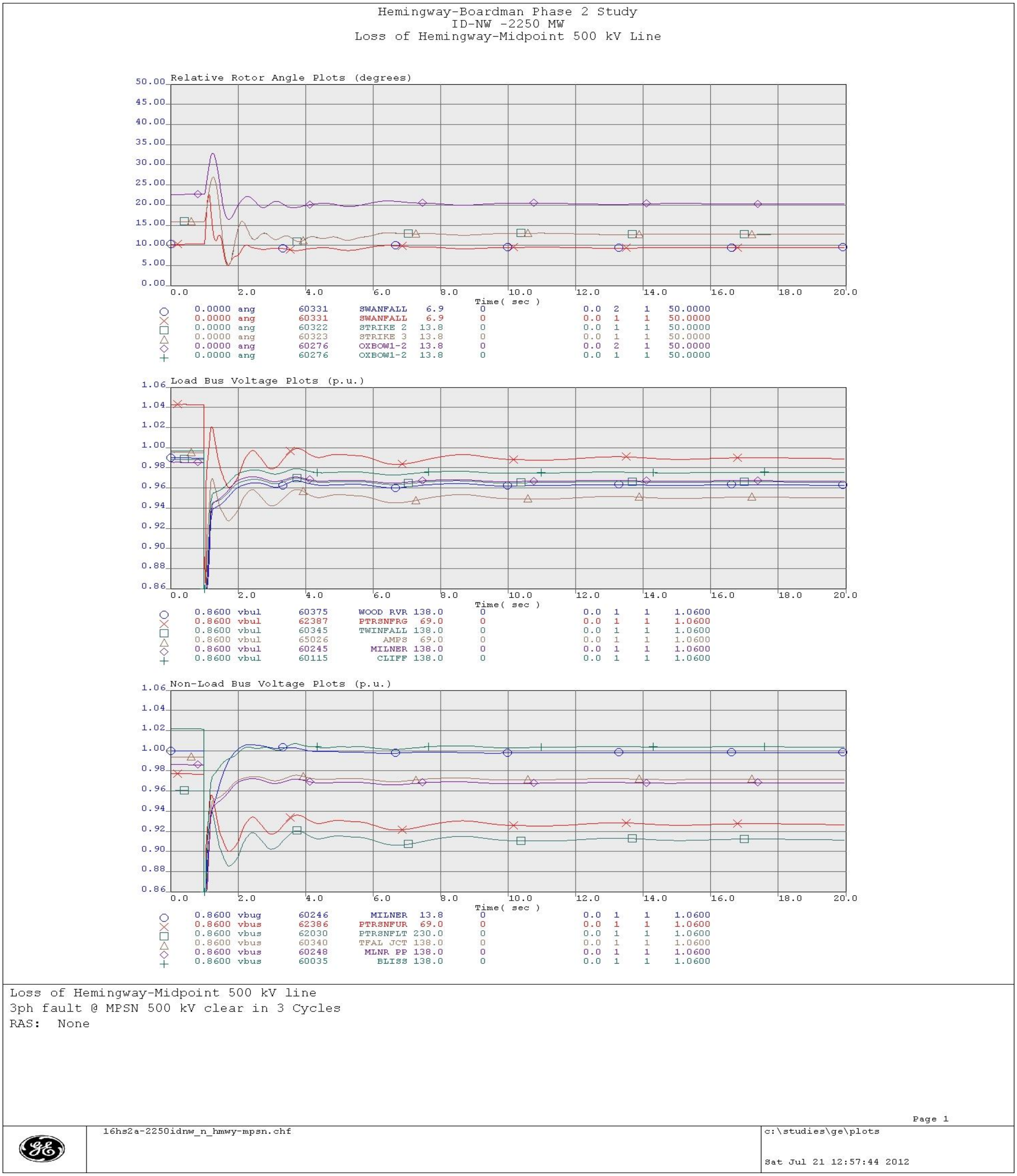
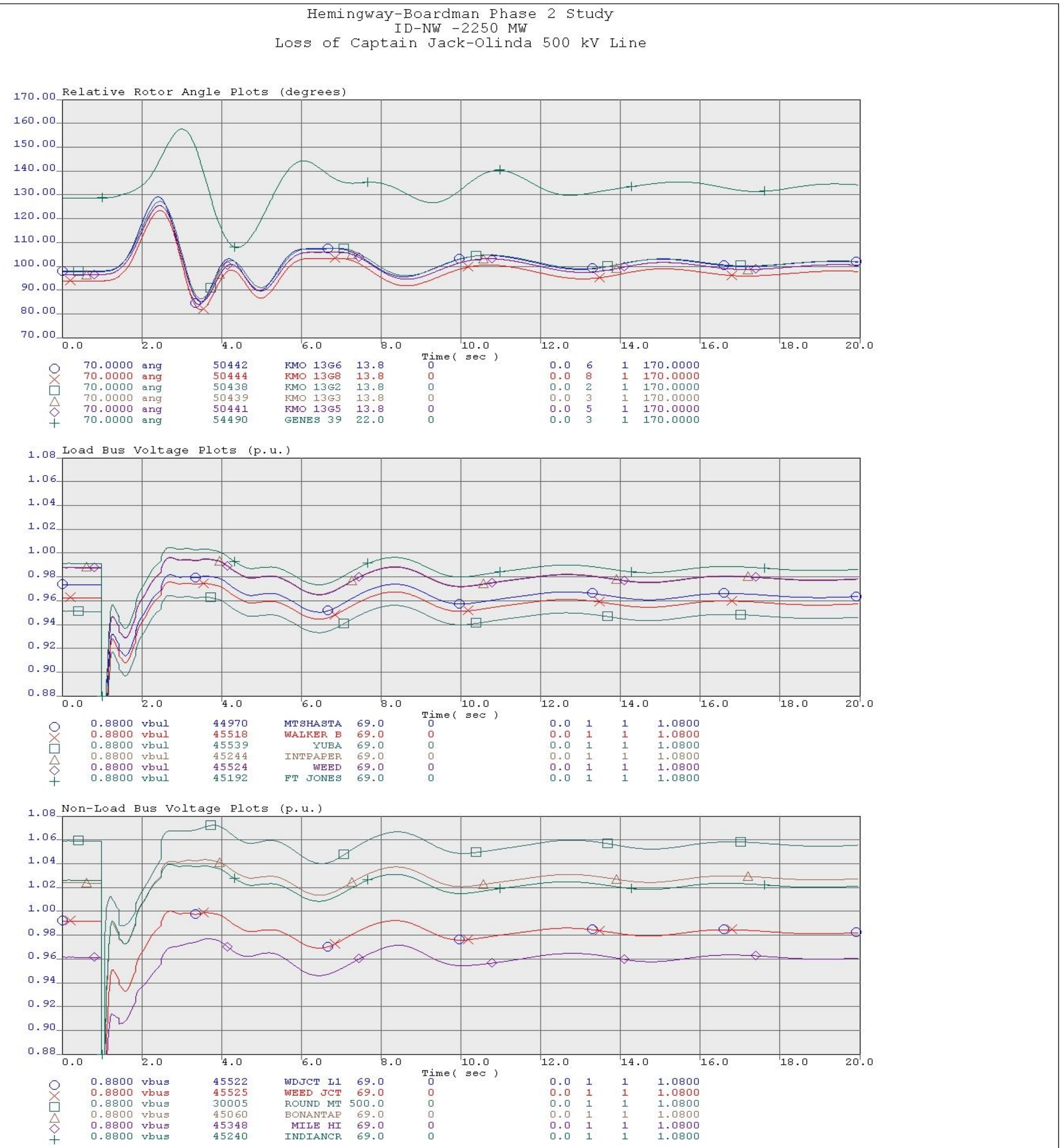


Figure A9: N-1 Loss of Hemingway-Midpoint 500 kV Line (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots



Loss of Captain Jack-Olinda 500 kV line
3-Phase Fault @ Captain Jack 500 kV with 4 Cycle Clearing
RAS: Insert Table Mtn 500 kV shunt Capacitors

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Figure A10: N-1 Loss of Captain Jack-Olinda 500 kV Line (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

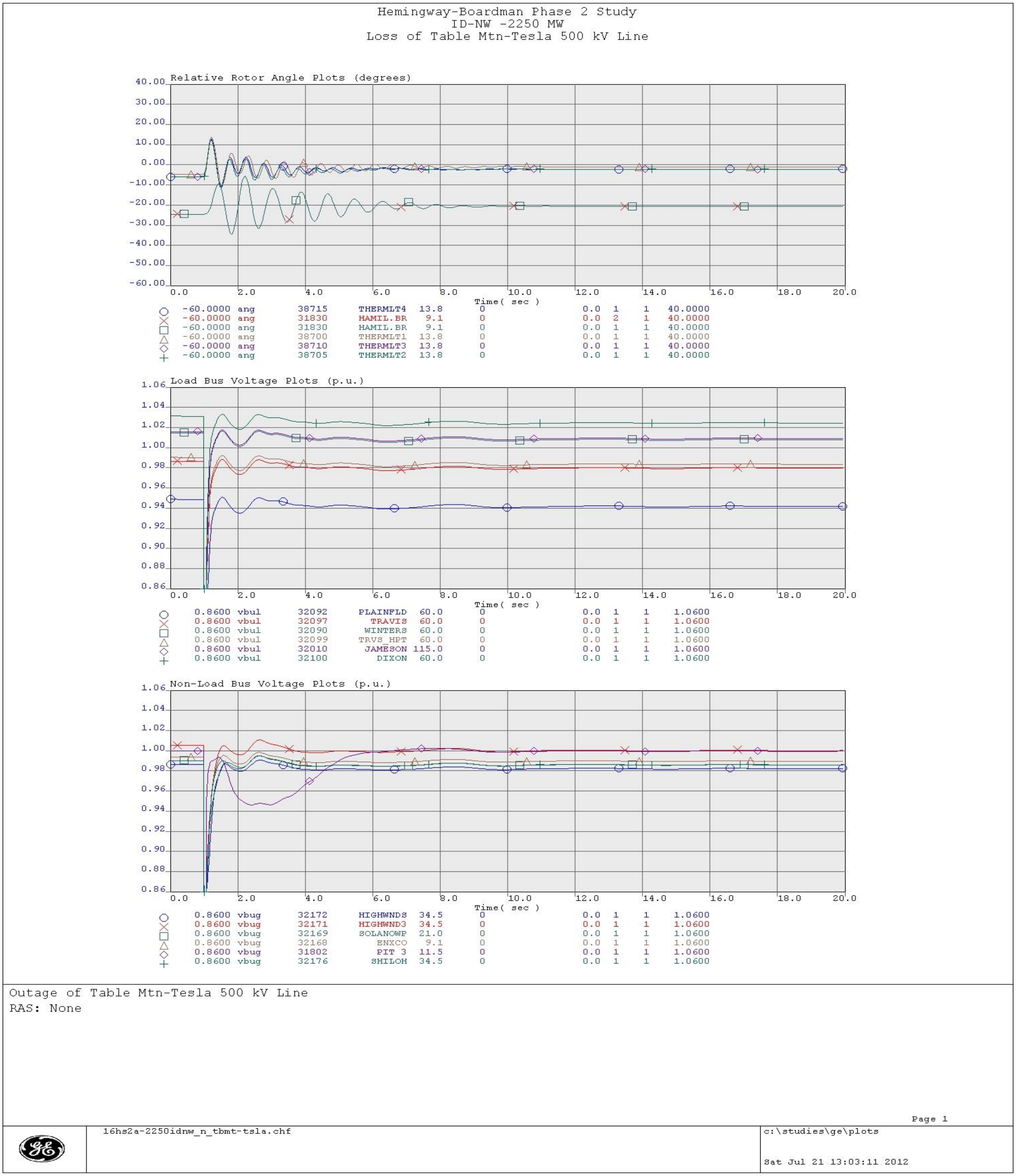


Figure A11: N-1 Loss of Table Mtn-Tesla 500 kV Line (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

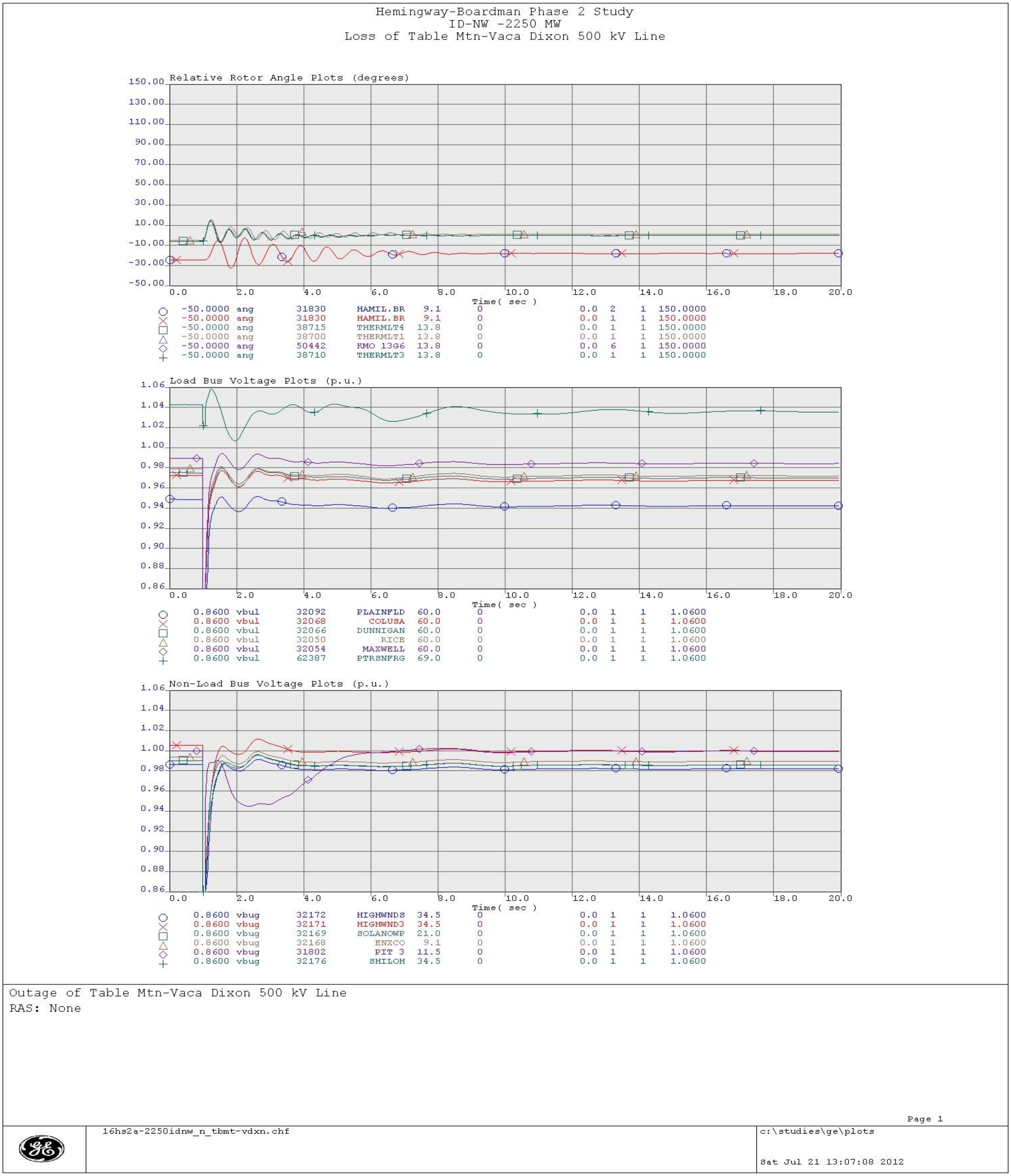


Figure A12: N-1 Loss of Table Mtn-Vaca Dixon 500 kV Line (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

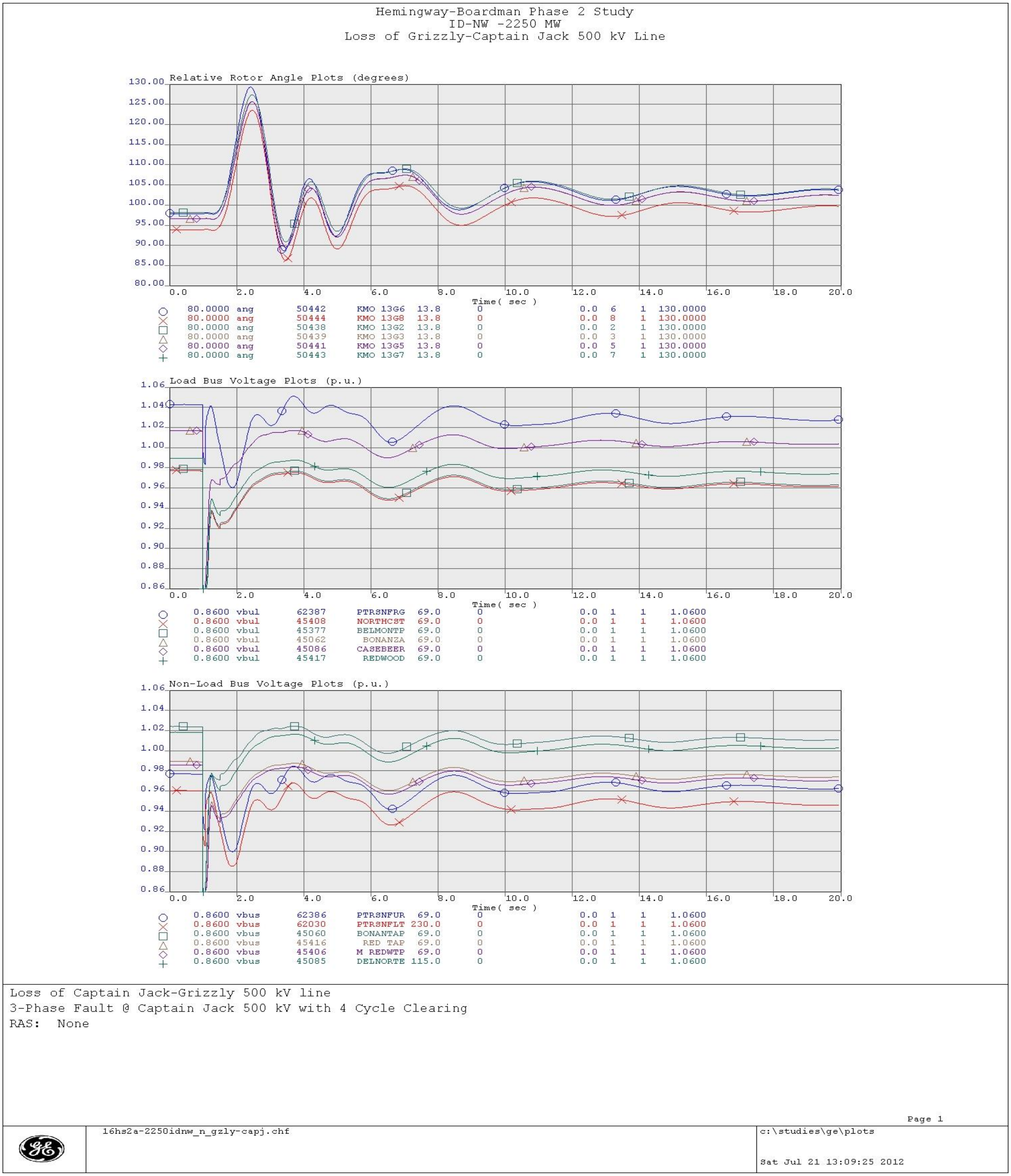


Figure A13: N-1 Loss of Grizzly-Captain Jack 500 kV Line (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

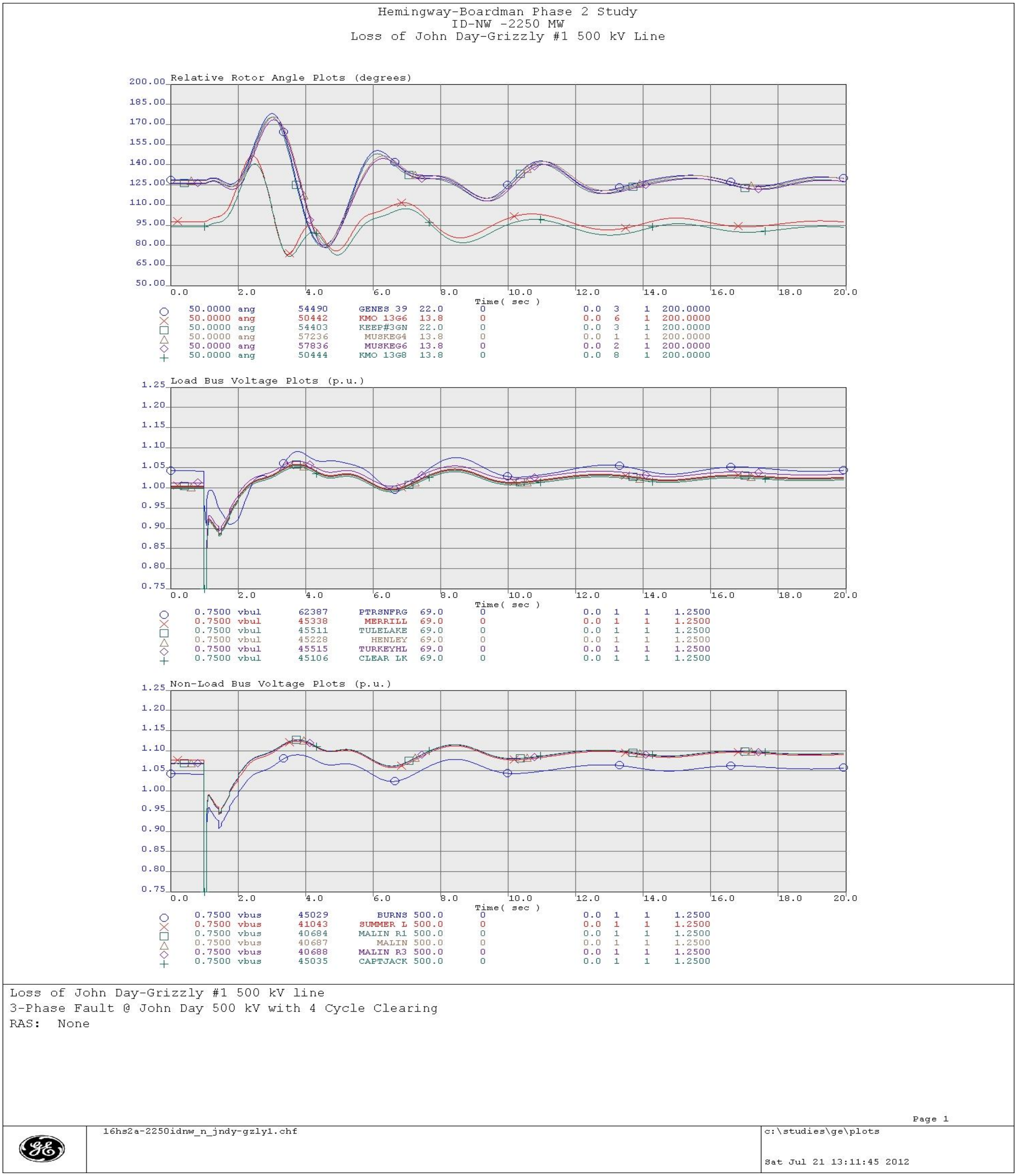


Figure A14: N-1 Loss of John Day-Grizzly #1 500 kV Line (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

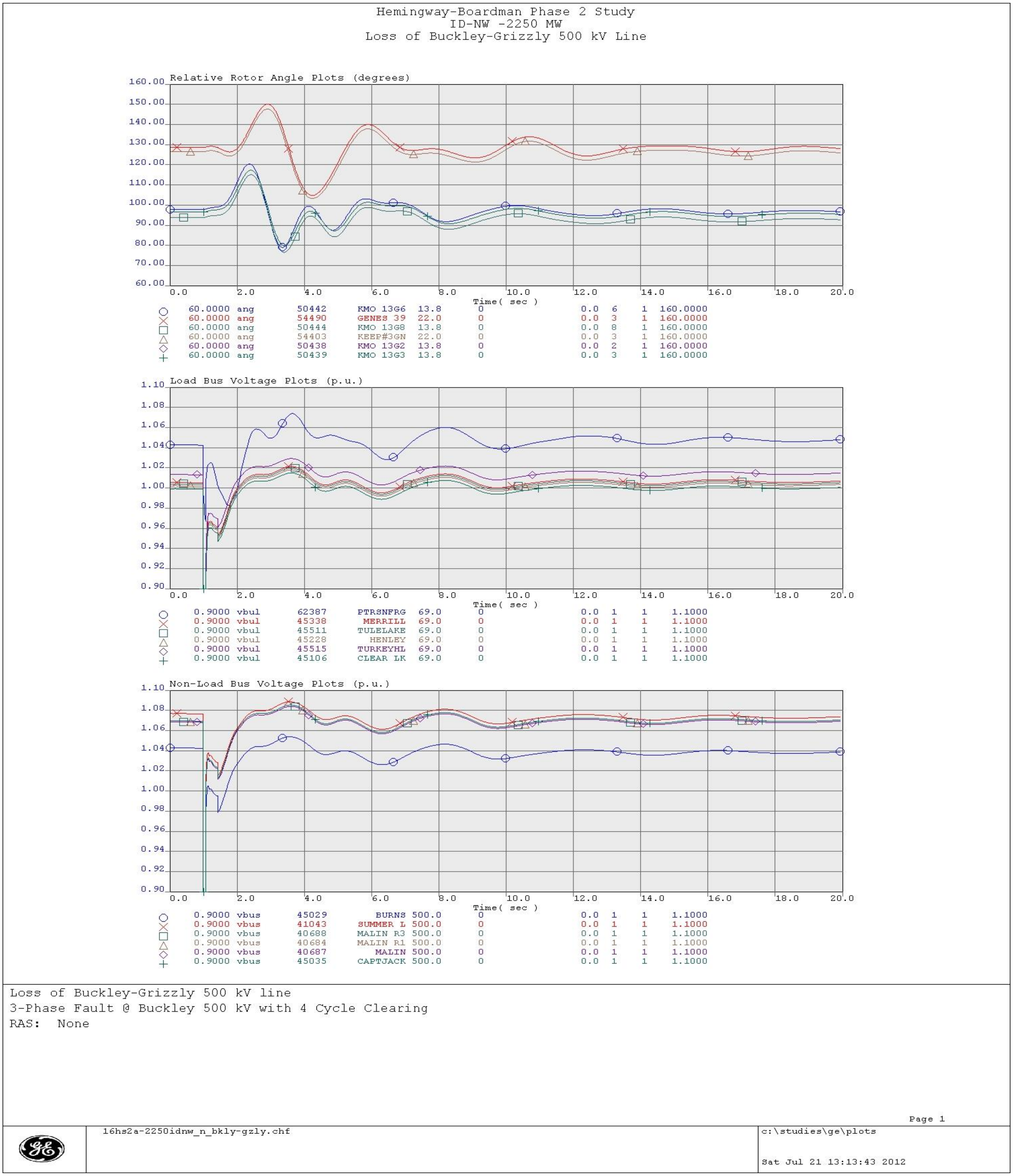
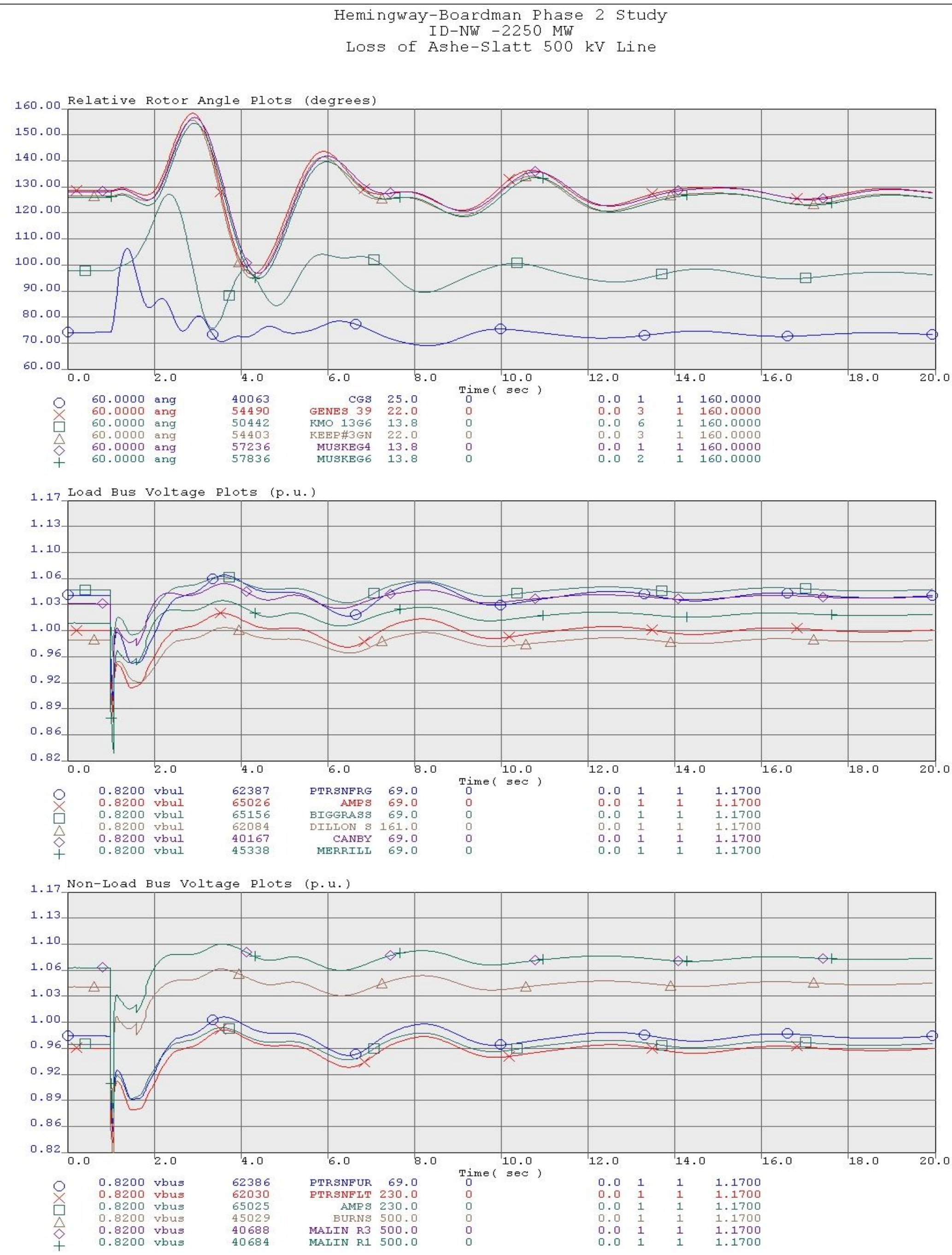


Figure A15: N-1 Loss of Buckley-Grizzly 500 kV Line (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

Figure A16: N-1 Loss of Slatt-Buckley 500 kV Line (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots



Loss of Ashe-Slatt 500 kV line
3-Phase Fault @ Ashe 500 kV with 4 Cycle Clearing
RAS: None

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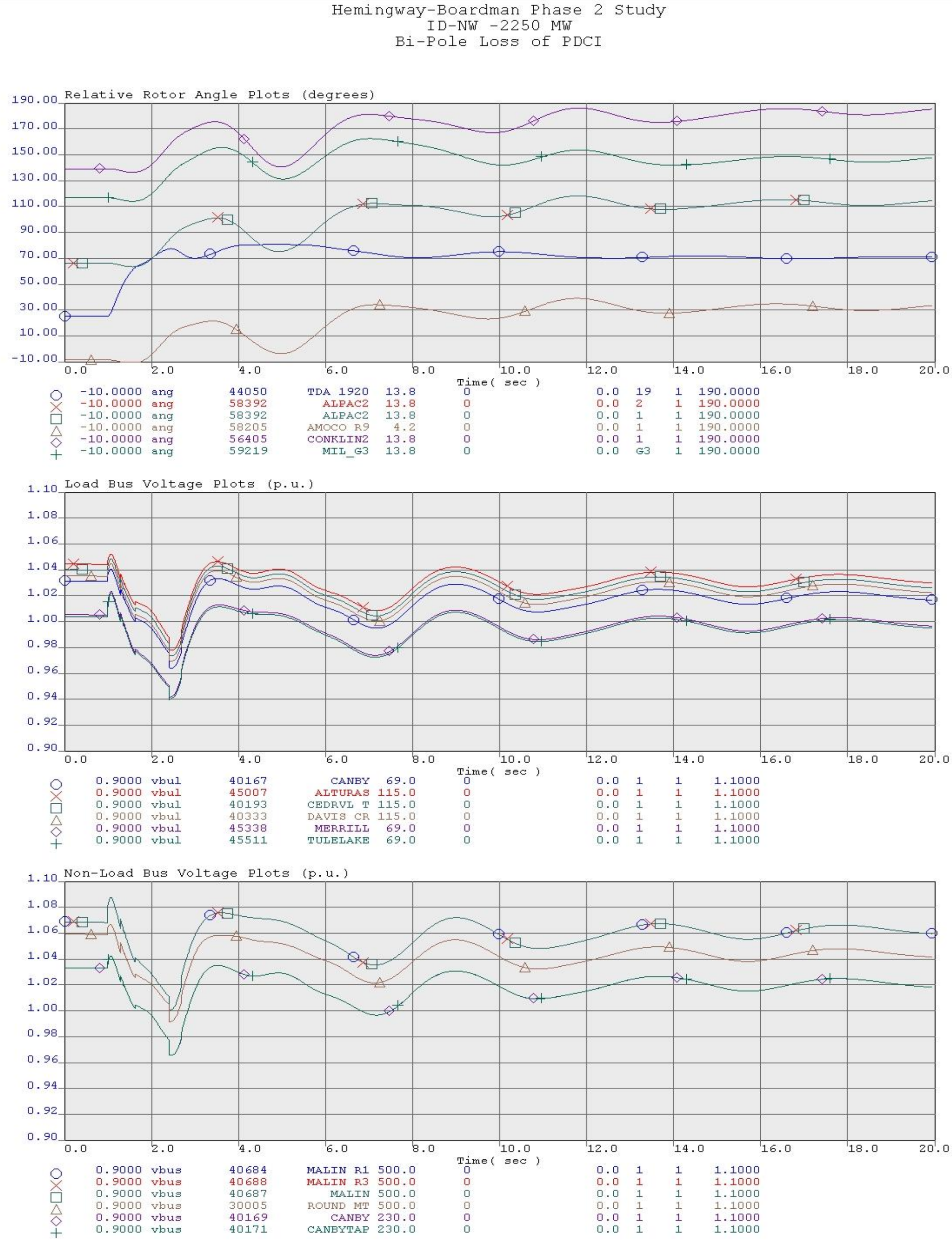
Figure A17: N-1 Loss of Ashe-Slatt 500 kV Line (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots



Bipole loss of Pacific DC Intertie
RAS: FACRI and Tracy/Olinda 500 kV Reactive Switching
Northwest Generation Drop (2550 MW)

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Figure A18: Bi-Pole Loss – Pacific DC Intertie (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

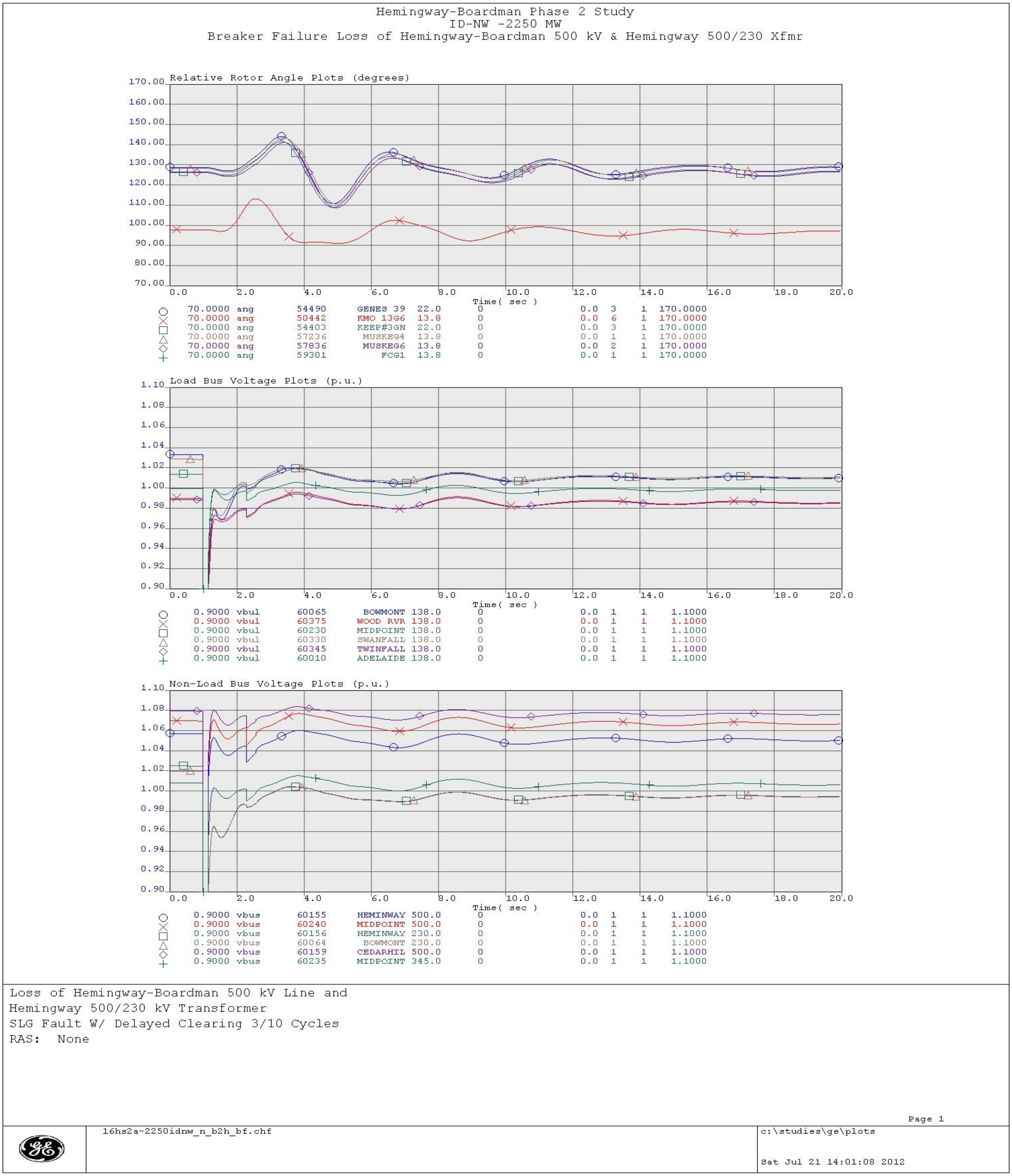
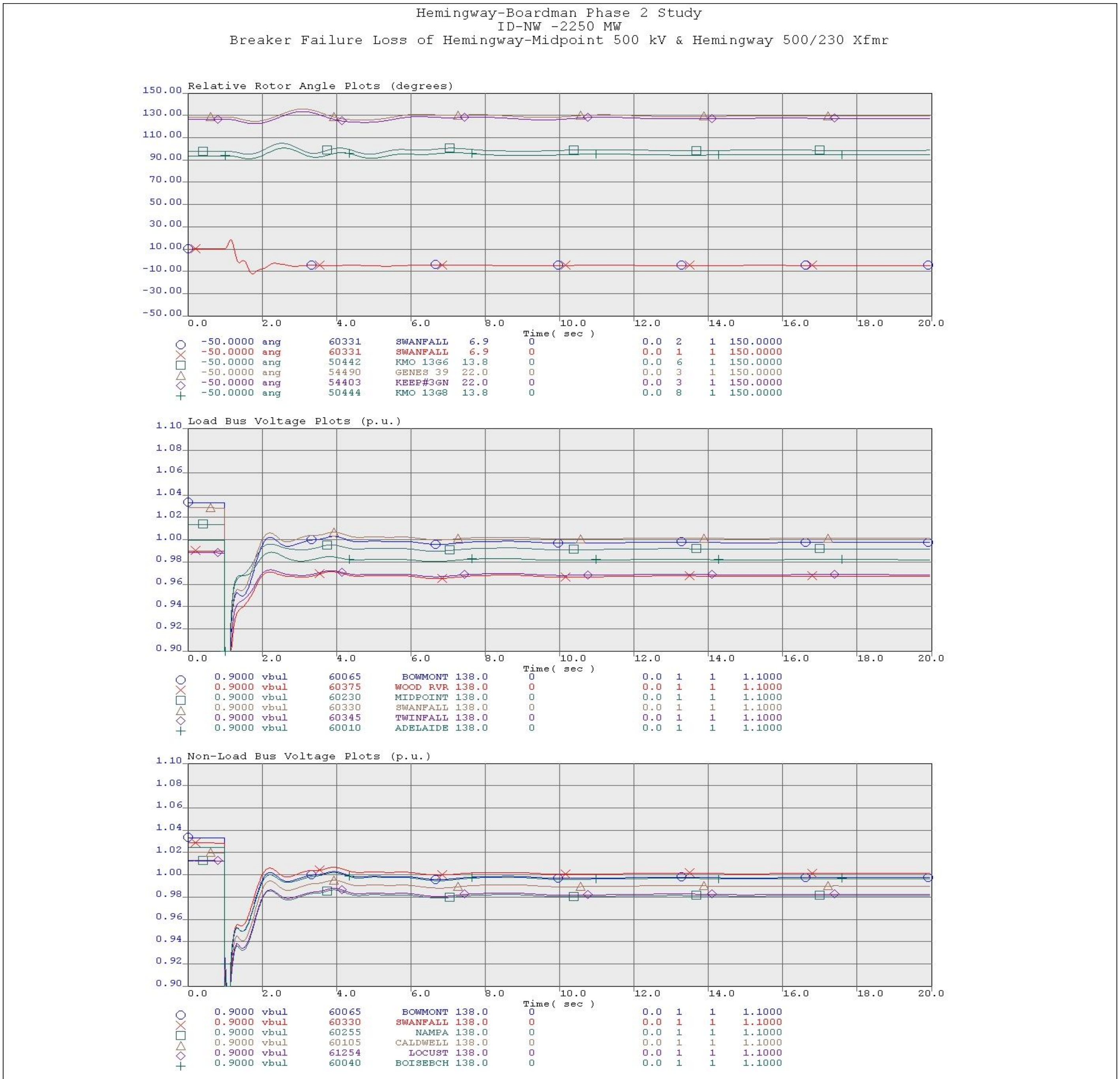


Figure A19: Breaker Failure Loss of Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots



Loss of Hemingway-Midpoint 500 kV Line and
Hemingway 500/230 kV Transformer
SLG Fault W/ Delayed Clearing 3/10 Cycles
RAS: None

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Figure A20: Breaker Failure Loss of Hemingway-Midpoint 500 kV & Hemingway 500/230 Xfmr (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

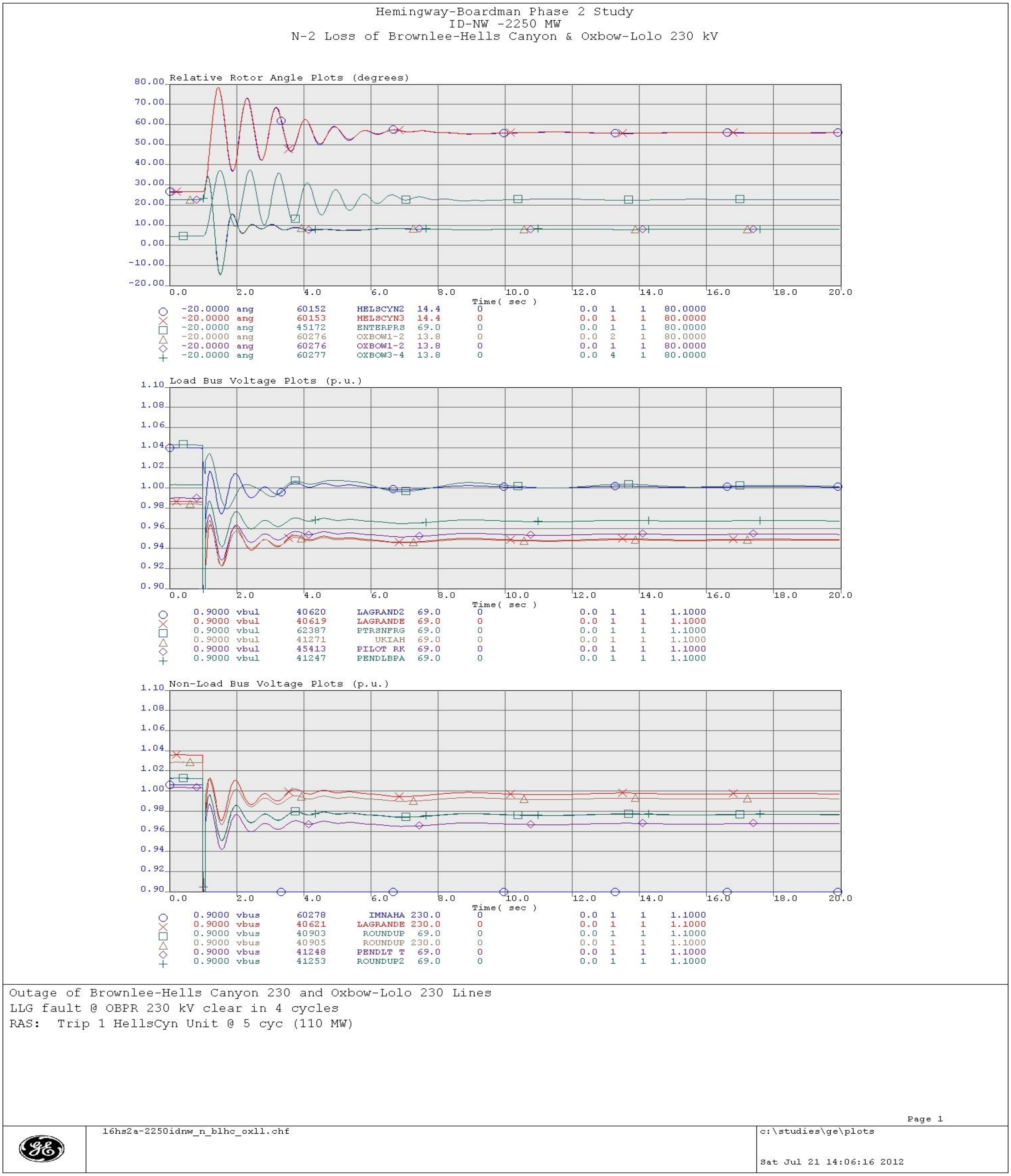


Figure A21: N-2 Loss of Brownlee-Hells Canyon 230 kV & Oxbow-Lolo 230 kV Lines (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

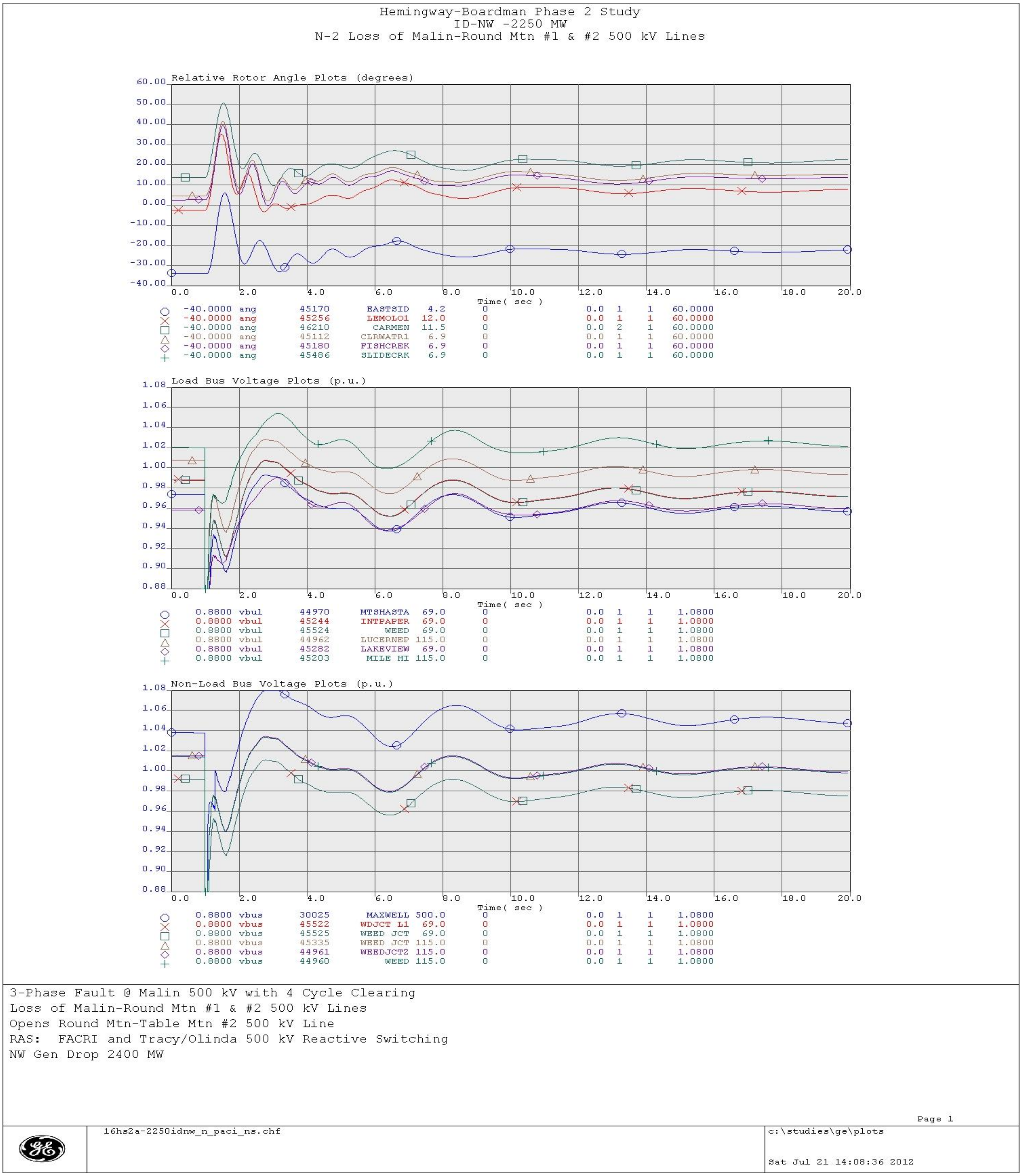


Figure A22: N-2 Loss of Malin-Round Mtn #1 & 2 500 kV Lines (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

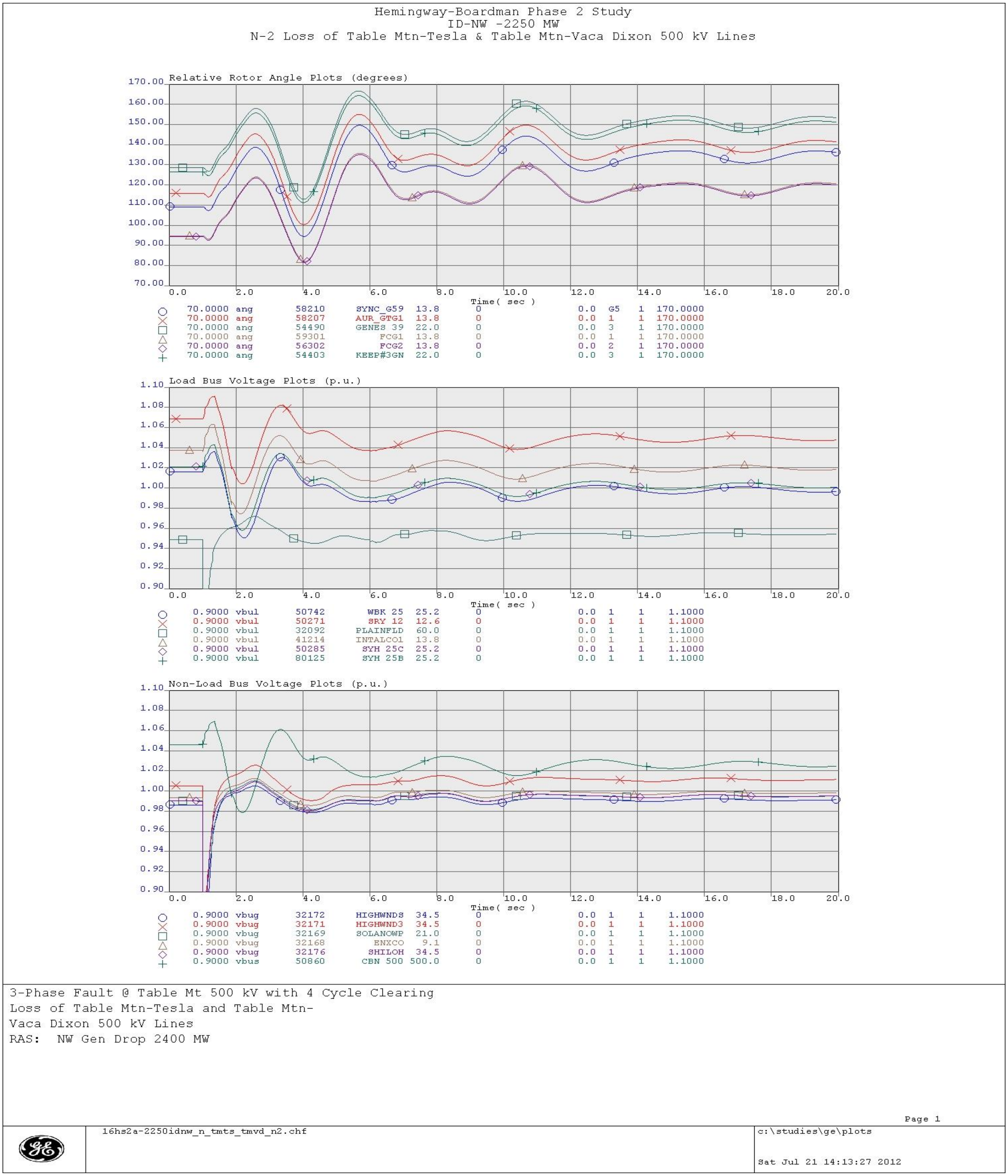
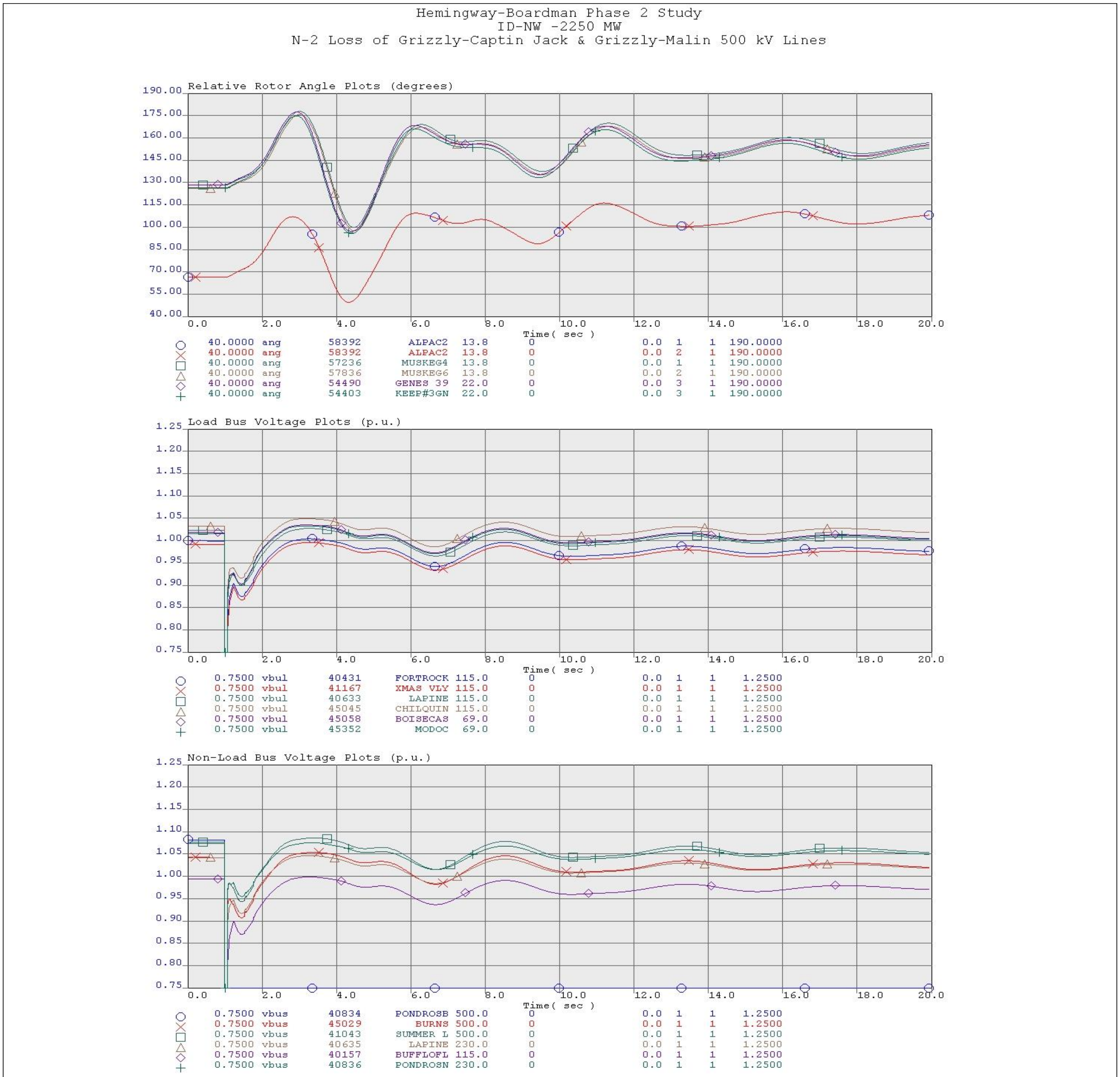


Figure A23: N-2 Loss of Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV Lines (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots



3-Phase Fault @ Grizzly 500 kV with 4 Cycle Clearing
Loss of Grizzly-Captain Jack and
Grizzly-Malin 500 kV Lines
RAS: NW Gen Drop 2400 MW

Page 1

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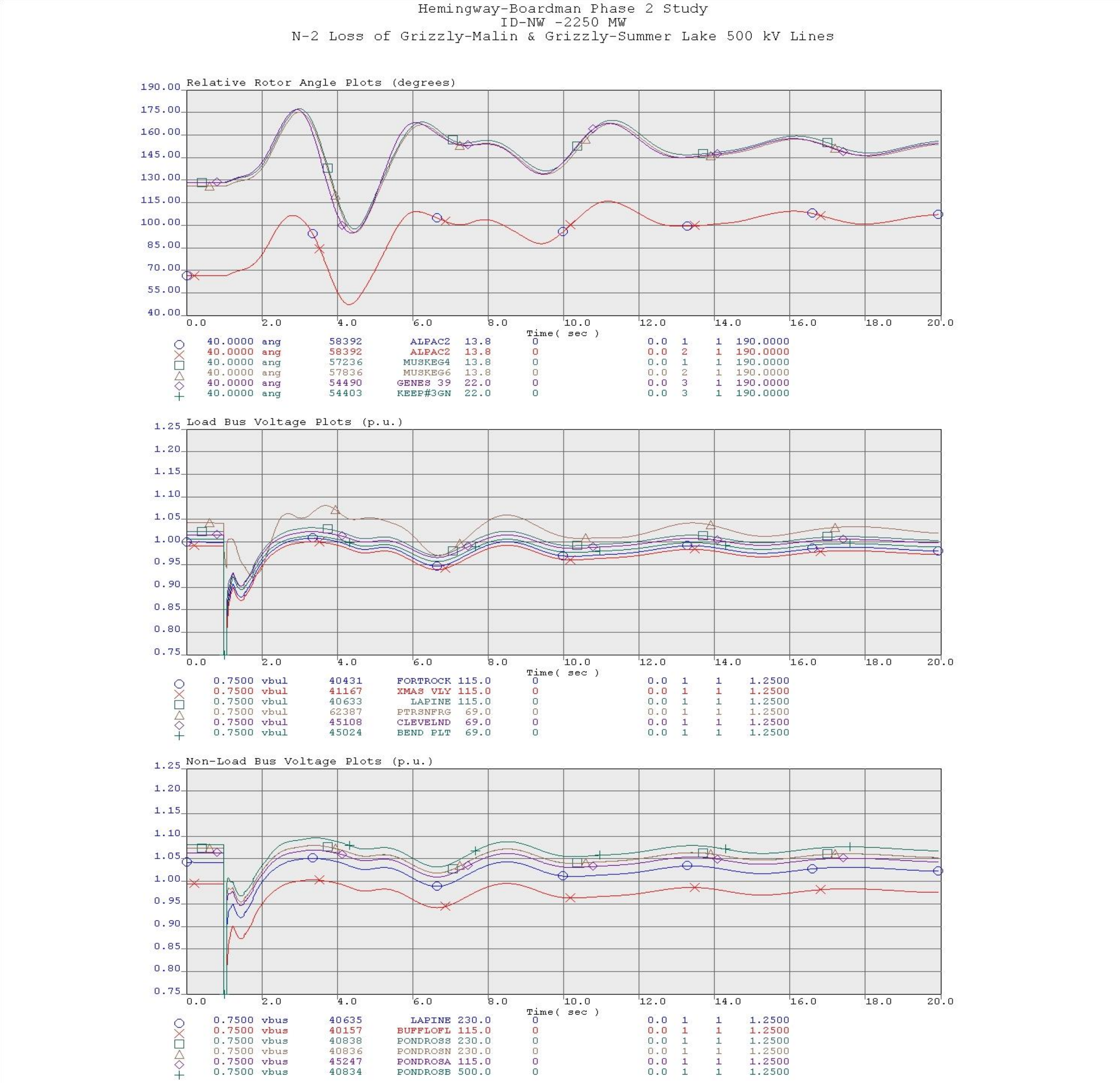
Figure A24: N-2 Loss of Grizzly-Captain Jack & Grizzly-Malin 500 kV Lines (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots



3-Phase Fault @ Grizzly 500 kV with 4 Cycle Clearing
Loss of Grizzly-Summer Lake and
Grizzly-Malin 500 kV Lines
RAS: NW Gen Drop 2400 MW

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Figure A25: N-2 Loss of Grizzly-Malin Jack & Grizzly-Summer Lake 500 kV Lines (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

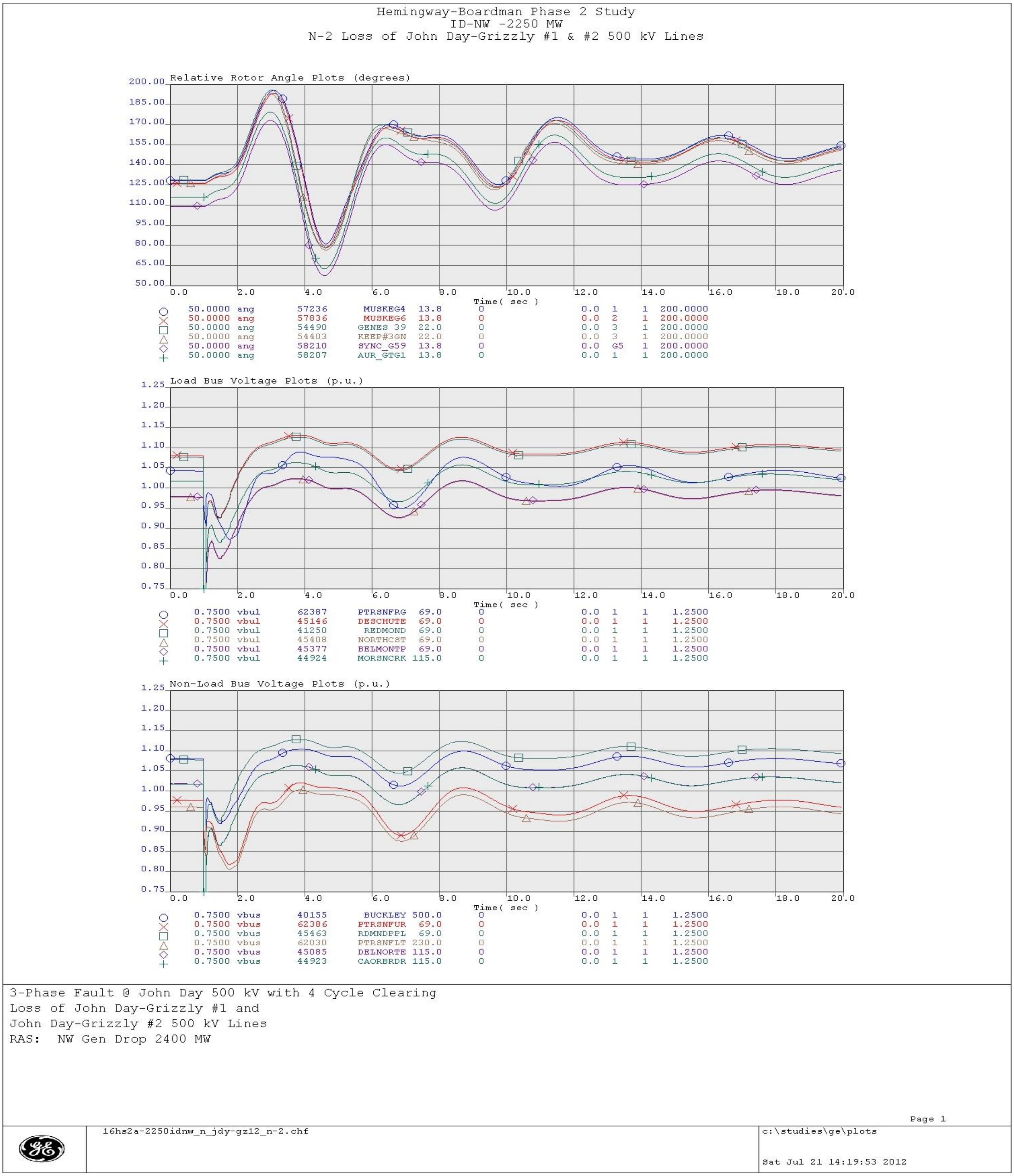


Figure A26: N-2 Loss of John Day-Grizzly #1 & #2 500 kV Lines (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots

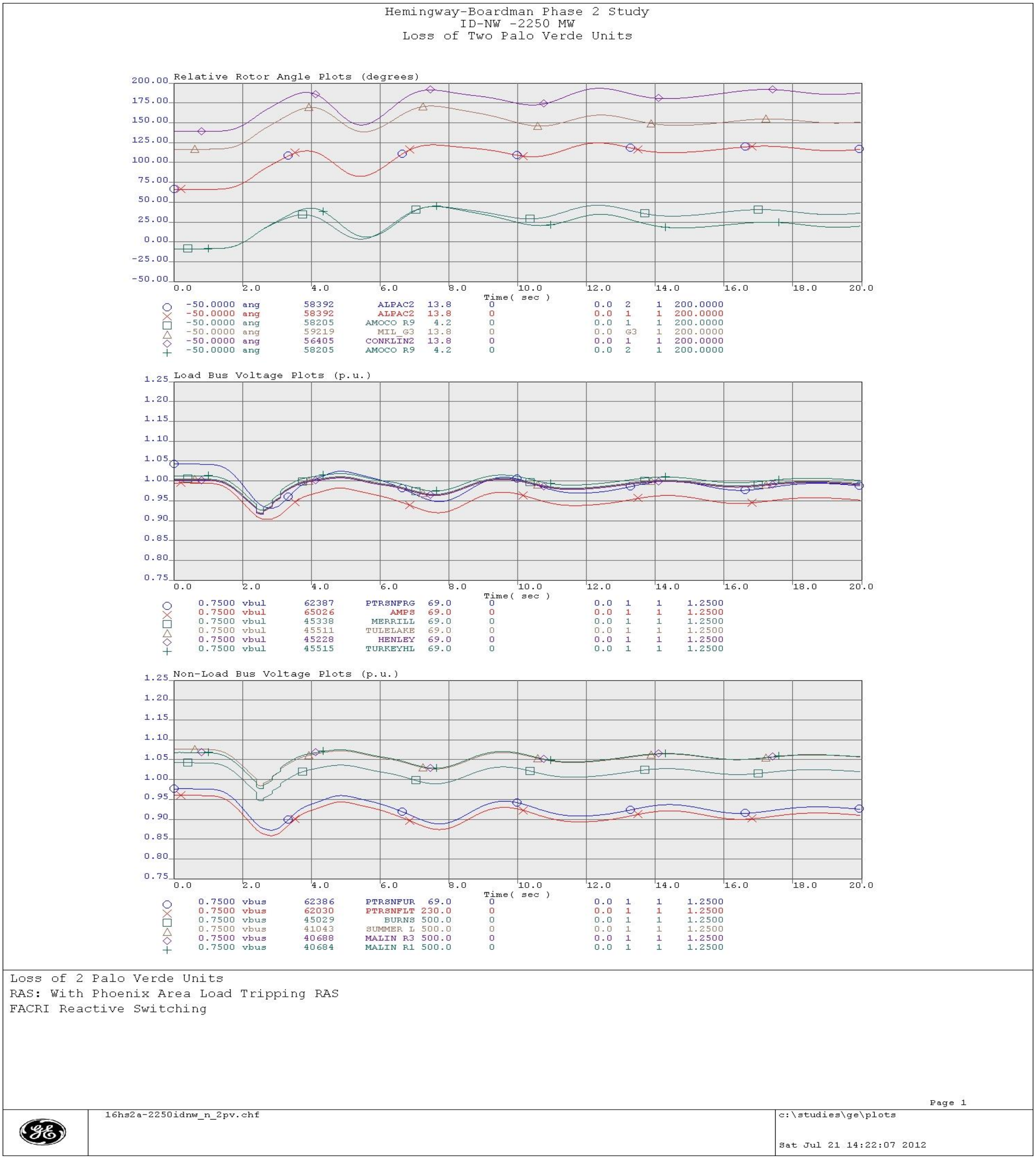
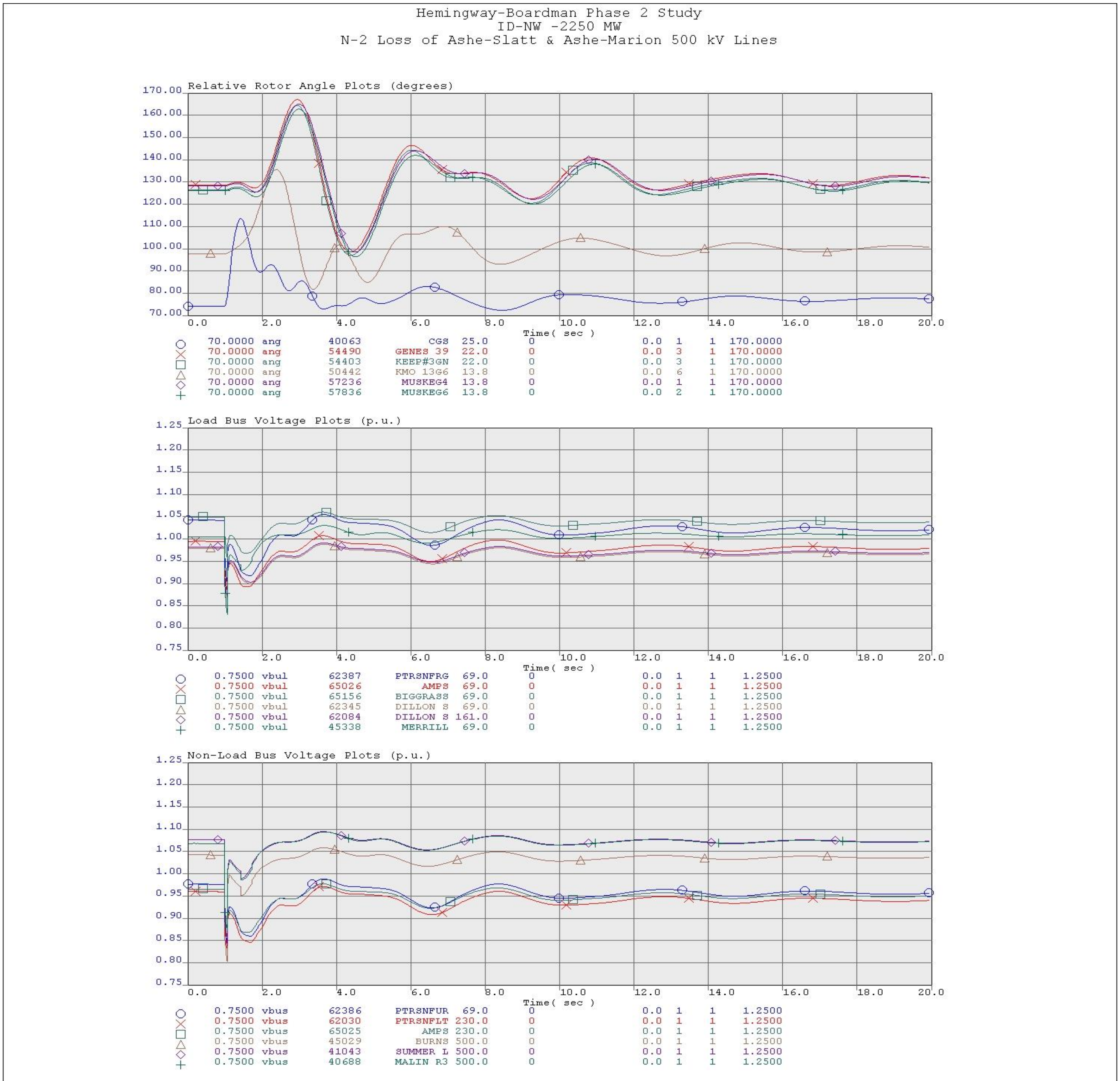


Figure A27: N-2 Loss of Two Palo Verde Units (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots



Loss of Ashe-Slatt and
Slatt-Longhorn 500 kV Lines
3-Phase Fault @ Ashe 500 kV with 4 Cycle Clearing
RAS: None

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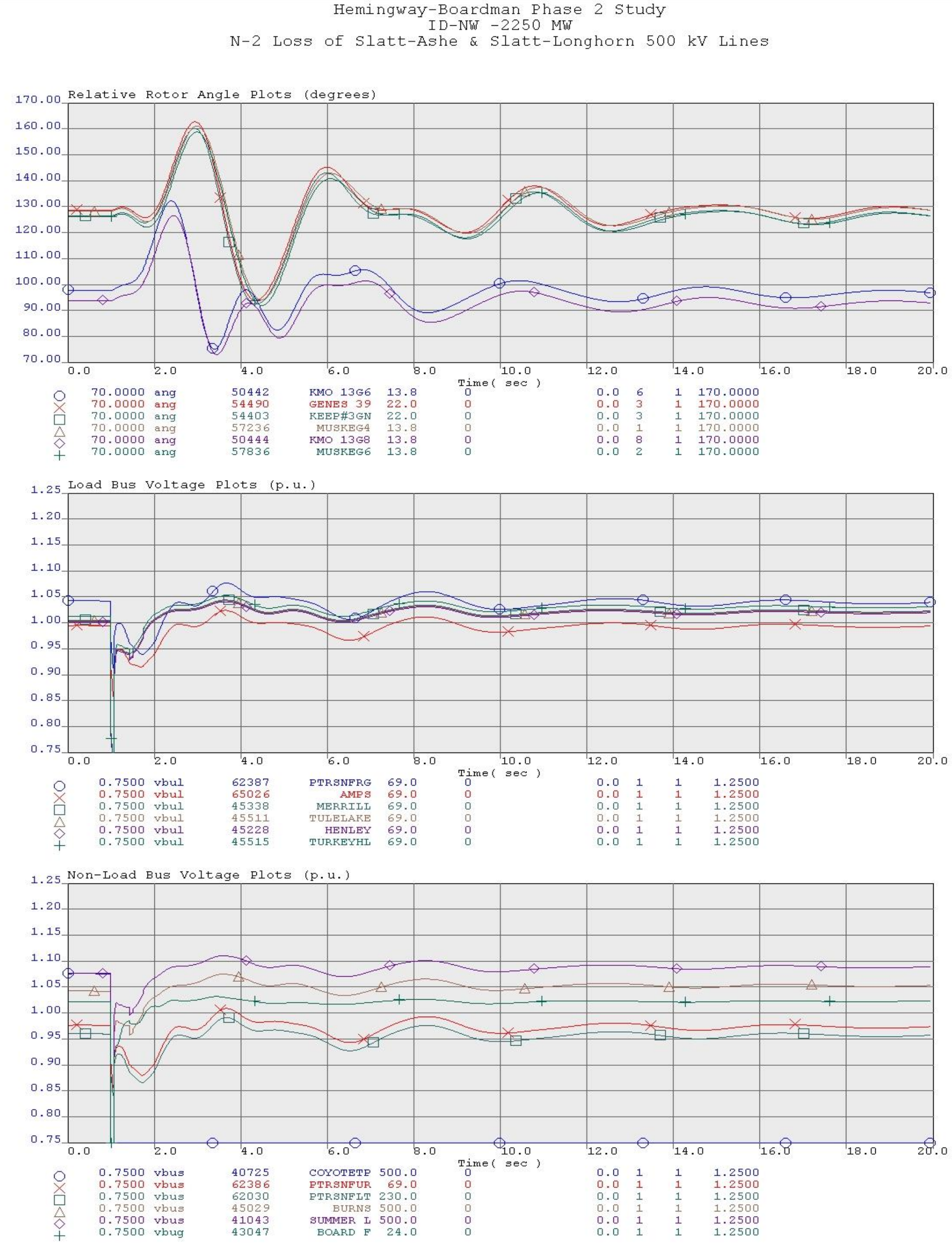
Figure A28: N-2 Loss of Ashe-Slatt & Ashe-Marion 500 kV Lines (Angle & Voltage Plots)

Appendix A – 16la1sa_2250idnw_N Base Case Transient Stability Plots



Loss of Ashe-Slatt and
Slatt-Longhorn 500 kV Lines
3-Phase Fault @ Slatt 500 kV with 4 Cycle Clearing
RAS: None

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Figure A29: N-2 Loss of Slatt-Ashe & Slatt-Longhorn 500 kV Lines (Angle & Voltage Plots)

Appendix A - 16hs2a_2250idnw_N Base Case Transient Stability Results

Fault	Disturbance/Outage	RAS Actions		Lowest Swing Voltage Bus (% change)	Lowest Swing Voltage Bus (absolute value)	Lowest Swing Voltage Load Bus (% change)	Lowest Load Bus Frequency (Hz)	Comments
		Cycles	Remedial Action					
N-1 3 Cy 3PH Hemingway 500 kV	Hemingway-Grassland 500 kV	Var	FACRI insertion of Ft Rock Series Caps and Malin Shunt Cap	Ptrsnflt 230 -11.6%	Ptrsnflt 230 0.850	Ptrsnftrg 69 -11.7%	Muskeg5 & 7 25 59.907	Stable & Damped
N-1 3 Cy 3PH Hemingway 500 kV	Hemingway-Midpoint 500 kV		None	Ptrsnflt 230 -7.8%	Ptrsnflt 230 0.886	Ptrsnftrg 69 -7.9%	Bridger 34.5 59.929	Stable & Damped
N-1 4 Cy 3PH Capt Jack 500 kV	Captain Jack-Olinda 500 kV	Var	FACRI insertion of Ft Rock Series Caps	Round Mt 500 -6.7%	Kl2 12T3 0.889	Clear Lk 69 -6.3%	Kit13b20 13.2 59.863	Stable & Damped
N-1 4 Cy 3PH Table Mt 500 kV	Table Mt-Tesla 500 kV		None	Ptrsnflt 230 -3.1%	Ritzvill 115 0.913	Ptrsnftrg 69 -3.2%	Jeld-Wen 60 59.838	Stable & Damped
N-1 4 Cy 3PH Table Mt 500 kV	Table Mt-Vaca Dixon 500 kV		None	Maxwell 500 -3.5%	Ritzvill 115 0.913	Ptrsnftrg 69 -3.5%	Millwood 60 59.830	Stable & Damped
N-1 4 Cy 3PH Capt Jack 500 kV	Grizzly-Captain Jack 500 kV	Var Note	FACRI insertion of Malin Shunt Cap, Blocked Series Caps	Ptrsnflt 230 -7.8%	Ptrsnflt 230 0.886	Ptrsnftrg 69 -7.9%	Kit13b20 13.2 59.884	Stable & Damped
N-1 4 Cy 3PH John Day 500 kV	John Day-Grizzly #1 500 kV	Var	FACRI insertion of Ft Rock Series Caps and Malin/Captn Jack Shunt Caps	Ptrsnflt 230 -12.6%	Ptrsnflt 230 0.840	Ptrsnftrg 69 -12.8%	Longlk13 25 59.753	Stable & Damped
N-1 4 Cy 3PH Buckley 500 kV	Buckley-Grizzly 500 kV	Var	FACRI insertion of Ft Rock Series Caps	Burns 500 -6.1%	Gardnvly 69 0.903	Ptrsnftrg 69 -5.8%	Kit13b20 13.2 59.871	Stable & Damped

Appendix A - 16hs2a_2250idnw_N Base Case Transient Stability Results

Fault	Disturbance/Outage	RAS Actions		Lowest Swing Voltage Bus (% change)	Lowest Swing Voltage Bus (absolute value)	Lowest Swing Voltage Load Bus (% change)	Lowest Load Bus Frequency (Hz)	Comments
		Cycles	Remedial Action					
N-1 4 Cy 3PH Slatt 500 kV	Slatt-Buckley 500 kV	Var	FACRI insertion of Ft Rock Series Caps and Malin Shunt Cap	Burns 500 -8.6%	Sprague 69 0.881	Ptrsnftrg 69 -8.1%	Kit13b20 13.2 59.824	Stable & Damped
N-1 4 Cy 3PH Ashe 500 kV	Ashe-Slatt 500 kV	Var	FACRI insertion of Ft Rock Series Caps and Malin Shunt Cap	Ptrsnflt 230 -8.6%	Ptrsnflt 230 0.878	Ptrsnftrg 69 -8.7%	Kit13b20 13.2 59.840	Stable & Damped
Bi-pole Block	PDCI Bipole	Var	FACRI Ft Rock Series Caps and Malin/Captn Jack Shunt Caps Tracy&Olinda React Switching NW 2550 MW Gen Drop	Canby 230 -6.5%	Sprague 69 0.894	Canby 69 -6.5%	Longlk13 25 59.767	Stable & Damped
Breaker Failure 3/10 Cy SLG Hemingway 500 kV	Hemingway-Grassland 500 kV Hemingway 500/230 kV Transformer	Var	FACRI insertion of Ft Rock Series Caps and Malin Shunt Cap	Ptrsnflt 230 -10.3%	Ptrsnflt 230 0.862	Ptrsnftrg 69 -10.5%	Bridger 34.5 59.912	Stable & Damped
Breaker Failure 3/10 Cy SLG Hemingway 500 kV	Hemingway-Midpoint 500 kV Hemingway 500/230 kV Transformer		None	Ptrsnflt 230 -9.1%	Ptrsnflt 230 0.873	Ptrsnftrg 69 -9.2%	Strike 138 59.903	Stable & Damped
N-2 4 Cy LLG Oxbow 230 kV	Brownlee-Hells Canyon 230 kV Oxbow-Lolo 230 kV	5	Tripped 1 Hells Cyn Unit (110 MW)	La Grande 230 -6.3%	Ptrsnflt 230 0.903	La Grande 69 -6.5%	Oxbow 138 59.846	Stable & Damped
N-2 4 Cy 3PH Malin 500 kV	Malin-Round Mt #1 500 kV Malin-Round Mt #2 500 kV Round Mt-Table Mt #2 500 kV	Var	Chief Jo Braking Resistor Tracy&Olinda Reactive Switching NW 2400 MW Gen Drop Flash Malin-Round Mt S-Caps	Maxwell 500 -7.4%	Mt Shasta 69 0.897	Mt Shasta 69 -7.9%	Muskeg5 & 7 25 59.798	Stable & Damped
N-2 4 Cy 3PH Table Mt 500 kV	Table Mt-Tesla 500 kV Table Mt-Vaca Dixon 500 kV	Var	Chief Jo Braking Resistor Tracy & Olinda Reactive Switching NW 2400 MW Gen Drop	Custer W 500 -6.4%	SKA 138 138 0.886	WBK 25 25 -6.5%	Millwood 60 59.702	Stable & Damped

Appendix A - 16hs2a_2250idnw_N Base Case Transient Stability Results

Fault	Disturbance/Outage	RAS Actions		Lowest Swing Voltage Bus (% change)	Lowest Swing Voltage Bus (absolute value)	Lowest Swing Voltage Load Bus (% change)	Lowest Load Bus Frequency (Hz)	Comments
		Cycles	Remedial Action					
N-2 4 Cy 3PH Grizzly 500 kV	Grizzly-CaptJack 500 kV Grizzly-Malin 500 kV	Var	FACRI insertion of Malin C1 and CaptJack C1 Shunt Capacitors NW 2400 MW Gen Drop	Summer L 500 -12.4%	Goldhill 69 0.839	Fortrock 115 -12.5%	Longlk13 25 59.697	Stable & Damped
N-2 4 Cy 3PH Grizzly 500 kV	Grizzly-Malin 500 kV Grizzly-Summer Lake 500 kV	Var	FACRI insertion of Malin C1 and CaptJack C1 Shunt Capacitors NW 2400 MW Gen Drop	Bufflofl 115 -12.3%	Sprague 69 0.845	Xmas Vly 115 -12.3%	Longlk13 25 59.691	Stable & Damped
N-2 4 Cy 3PH John Day 500 kV	John Day-Grizzly #1 & #2 500 kV	Var	FACRI insert Ft Rock Series Caps, Malin C1&C2, CaptJack C1 NW 2400 MW Gen Drop	Ptrsnflt 230 -16.2%	Goldhill 69 0.798	Ptrsnftrg 69 -16.5%	Longlk13 25 59.604	Stable & Damped
N-2 4 Cy 3PH Grizzly 500 kV	John Day-Grizzly #2 500 kV Buckley-Grizzly 500 kV	Var	FACRI insert Ft Rock Series Caps, Malin C1, CaptJack C1 NW 2400 MW Gen Drop	CBN 500 500 -10.0%	SKA 138 138 0.853	WBK 25 25 -10.1%	Longlk13 25 59.692	Stable & Damped
N-2	Loss of 2 Palo Verde units	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1&C2 & CaptJack Sh Cap C1	Ptrsnflt 230 -10.5%	Ptrsnflt 230 0.859	Ptrsnftrg 69 -10.7%	Muskeg5 & 7 25 59.753	Stable & Damped
N-2 4 Cy 3PH Ashe 500 kV	Ashe-Slatt 500 kV Ashe-Marion 500 kV	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1 & CaptJack Sh Cap C1	Ptrsnflt 230 -11.9%	Ptrsnflt 230 0.847	Ptrsnftrg 69 -12.0%	Muskeg5 & 7 25 59.835	Stable & Damped
N-2 4 Cy 3PH Slatt 500 kV	Slatt-Ashe 500 kV Slatt-Longhorn 500 kV	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1 & CaptJack Sh Cap C1	Ptrsnflt 230 -9.8%	Ptrsnflt 230 0.867	Ptrsnftrg 69 -9.9%	Kit13B20 13.2 59.824	Stable & Damped

Appendix A - 16hs2a_2250idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Shunt HANFORD_500.0 (40499) #s
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Bus MALIN R3_500.0 (40688)
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Bus HOT SPR_500.0 (40553)
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G1_ 18.0 (47639)

Appendix A - 16hs2a_2250idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP S1_ 18.0 (47641)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G2_ 18.0 (47640)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 2
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN Bus ASHE R1_500.0 (40062)
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Bus SANTIAM_500.0 (40941)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Shunt OSTRNDER_500.0 (40809) #s
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	CLOSE MultiSectionLine PEARL_500.0 (40827) TO KNIGHT_500.0 (41450) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt MONROE_500.0 (40749) #s
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOK TAP_500.0 (41001)

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Contingency Studied	Actions Taken in the Contingency
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOKING_500.0 (41007)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR G2_ 20.0 (47744)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2FG_ 13.8 (47747)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2AX_ 4.2 (47746)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1FG_ 13.8 (47743)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1AX_ 4.2 (47742)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR G1_ 20.0 (47740)
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Transformer TONO_115.0 (42806) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Shunt OLY E_230.0 (40794) #s
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN Shunt MONROE_500.0 (40749) #s
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Transformer ALLSTON_500.0 (40045) TO ALLSTN E_230.0 (40043) CKT 2
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Bus HATWAI_230.0 (40519)
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Bus HATWAI_500.0 (40521)
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line MOSCITYT_115.0 (48245) TO SPULLMAN_115.0 (48413) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line MOSCCITY_115.0 (48243) TO MOSCITYT_115.0 (48245) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS N LEWIST_115.0 (48253) TO 44.4 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line NPULLMAN_115.0 (48291) TO SHAWNEE_115.0 (48383) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS HOT SPR_500.0 (40553) TO -148.3 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	CLOSE Line LEON_115.0 (48183) TO MOSCCITY_115.0 (48243) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4708 Hatwai 500 kV Bus	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4708 Hatwai 500 kV Bus	OPEN Bus HATWAI_500.0 (40521)
BF 4708 Hatwai 500 kV Bus	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Transformer CHIEF JO_500.0 (40233) TO CHIEF J2_230.0 (40232) CKT 3
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1

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Contingency Studied	Actions Taken in the Contingency
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN InjectionGroup RAS Lower Granite Gen Drop
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Transformer BIG EDDY_500.0 (40111) TO BIGEDDY1_230.0 (41341) CKT 2
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Bus CGS_ 25.0 (40063)
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN Bus BURNS_500.0 (45029)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R3_500.0 (40688)
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN Bus ROUND BU_500.0 (43485)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Bus MAPLE VL_500.0 (40693)
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M1_500.0 (43115)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP S1_ 18.0 (47641) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G2_ 18.0 (47640) CKT 1

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Contingency Studied	Actions Taken in the Contingency
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G1_ 18.0 (47639) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 5266 Slatt-Buckly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Bus BURNS_500.0 (45029)
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Bus CEDARHIL_500.0 (60159)
BF Lolo 230kV	OPEN Bus LOLO_230.0 (48197)
BF McNary 230 kV SECT 1	OPEN Bus MCN 02_ 13.8 (44102)
BF McNary 230 kV SECT 1	OPEN Bus IONE_ 69.0 (40575)
BF McNary 230 kV SECT 1	OPEN Bus TOWER RD_115.0 (41324)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2G_ 18.0 (45456)
BF McNary 230 kV SECT 1	OPEN Bus MORRO G1_ 13.8 (47658)
BF McNary 230 kV SECT 1	OPEN Bus MCN 01_ 13.8 (44101)
BF McNary 230 kV SECT 1	OPEN Bus KINZ WW_ 12.5 (47331)
BF McNary 230 kV SECT 1	OPEN Bus MCN 04_ 13.8 (44104)
BF McNary 230 kV SECT 1	OPEN Bus MCN 03_ 13.8 (44103)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1S_ 13.8 (45455)
BF McNary 230 kV SECT 1	OPEN Bus BOARD T1_230.0 (40121)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2S_ 13.8 (45457)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1G_ 18.0 (45454)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN T_ 69.0 (40608)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX2_100.0 (44116)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH2_230.0 (44123)
BF McNary 230 kV SECT 1	OPEN Bus ALKALI C_115.0 (41319)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_ 69.0 (40125)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN_ 69.0 (47332)
BF McNary 230 kV SECT 1	OPEN Bus PORT MOR_115.0 (47335)
BF McNary 230 kV SECT 1	OPEN Bus MORROW 1_115.0 (47334)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_115.0 (40127)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_230.0 (40129)
BF McNary 230 kV SECT 1	OPEN Bus HERMISTN_230.0 (45137)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH1_230.0 (44122)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX1_100.0 (44115)
BF McNary 230 kV SECT 2	OPEN Bus MCNRY S2_230.0 (41352)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH3_230.0 (44124)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH4_230.0 (44126)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX3_100.0 (44117)
BF McNary 230 kV SECT 2	OPEN Bus MCN 05_ 13.8 (44105)
BF McNary 230 kV SECT 2	OPEN Bus MCN 06_ 13.8 (44106)
BF McNary 230 kV SECT 2	OPEN Bus MCN 08_ 13.8 (44108)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX4_100.0 (44118)
BF McNary 230 kV SECT 2	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 52.2 MVR
BF McNary 230 kV SECT 2	OPEN Bus MCN 07_ 13.8 (44107)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH34_230.0 (44125)
BF McNary 230 kV SECT 3	OPEN Bus MCNRY S3_230.0 (41353)
BF McNary 230 kV SECT 3	OPEN Bus MCNARY_345.0 (40721)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX5_100.0 (44119)
BF McNary 230 kV SECT 3	OPEN Bus MCN PH5_230.0 (44127)

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Contingency Studied	Actions Taken in the Contingency
BF McNary 230 kV SECT 3	OPEN Bus MCN 11_ 13.8 (44111)
BF McNary 230 kV SECT 3	OPEN Bus MCN 10_ 13.8 (44110)
BF McNary 230 kV SECT 3	OPEN Bus MCN 09_ 13.8 (44109)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX6_100.0 (44120)
BF McNary 230 kV SECT 3	OPEN Bus MCN 12_ 13.8 (44112)
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	CLOSE Shunt QUARTZ_138.0 (60305) #c1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	CLOSE Shunt QUARTZ_138.0 (60305) #c1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Transformer BOARD CT_ 18.5 (43044) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Gen BOARD CT_ 18.5 (43044) #1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Gen BOARD ST_ 16.0 (43045) #1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Transformer BOARD ST_ 16.0 (43045) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Slatt 500kV & Boardman Plant	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF PGE Grassland-Slatt 500kV & Boardman Plant	OPEN Transformer BOARD F_ 24.0 (43047) TO GRASSLND_500.0 (43049) CKT 1
Bus: Alvey 500 kV + RAS	OPEN Bus ALVEY_500.0 (40051)
Bus: Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
Bus: Bell BPA 500 kV	OPEN Bus COULE R1_500.0 (40288)
Bus: Bell BPA 500 kV	OPEN Bus BELL SC_500.0 (40096)
Bus: Bell BPA 500 kV	OPEN Bus BELL BPA_500.0 (40091)
Bus: Buckley 500 kV	OPEN Bus BUCKLEY_500.0 (40155)
Bus: Dixonville 500 kV	SET SWITCHED SHUNT AT BUS GRANT PS_230.0 (45123) TO 147.4 MVR
Bus: Dixonville 500 kV	OPEN Bus DIXONVLE_500.0 (45095)
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #3
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #2
Bus: Hot Springs 500 kV	OPEN Bus HOT SPR_500.0 (40553)
Bus: Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
Bus: Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
Bus: Keeler 500 kV + RAS	OPEN Bus KEELER_500.0 (40601)
Bus: Rock Creek 500 kV	OPEN Bus HRVST W1_ 0.7 (47981)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W2_ 0.6 (47940)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W1_ 0.7 (47906)
Bus: Rock Creek 500 kV	OPEN Bus HRVST C1_ 34.5 (47980)
Bus: Rock Creek 500 kV	OPEN Bus MILLR C1_ 34.5 (47967)
Bus: Rock Creek 500 kV	OPEN Bus MILLRA S_230.0 (47857)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 1_ 34.5 (47825)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W2_ 0.7 (47907)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE W1_ 0.6 (47866)
Bus: Rock Creek 500 kV	OPEN Bus TULMN 1_ 34.5 (47826)
Bus: Rock Creek 500 kV	OPEN Bus IMRIE_230.0 (47822)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 1_ 34.5 (47902)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE C1_ 34.5 (47865)
Bus: Rock Creek 500 kV	OPEN Bus TULMN C1_ 34.5 (47938)
Bus: Rock Creek 500 kV	OPEN Bus HARVST W_230.0 (47858)
Bus: Rock Creek 500 kV	OPEN Bus DOOLEY T_230.0 (47465)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC C1_ 34.5 (47388)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE 1_ 34.5 (47829)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_230.0 (41402)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_500.0 (41401)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W3_ 0.7 (47498)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W2_ 0.7 (47495)
Bus: Rock Creek 500 kV	OPEN Bus ENRGZR T_230.0 (47823)
Bus: Rock Creek 500 kV	OPEN Bus MILLR W1_ 0.6 (47968)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W1_ 0.7 (47939)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W1_ 0.7 (47937)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C1_ 34.5 (47904)
Bus: Rock Creek 500 kV	OPEN Bus HRVST 1_ 34.5 (47979)

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Contingency Studied	Actions Taken in the Contingency
Bus: Rock Creek 500 kV	OPEN Bus MILLR 1_ 34.5 (47966)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C2_ 34.5 (47905)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 2_ 34.5 (47903)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C1_ 34.5 (47936)
Bus: Rock Creek 500 kV	OPEN Bus WILLIS T_230.0 (47824)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C3_ 34.5 (47497)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C2_ 34.5 (47494)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 2_ 34.5 (47493)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 3_ 34.5 (47496)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC W1_ 0.7 (47389)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_ 34.5 (47387)
Bus: Rock Creek 500 kV	OPEN Bus WHITE CK_230.0 (47827)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_230.0 (47386)
Bus: Sickler 500 kV	OPEN Bus SICKLER_500.0 (40973)
Bus: Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
Bus: Summer Lake 500 kV	OPEN Bus BURNS_500.0 (45029)
Bus: Summer Lake 500 kV	OPEN Bus SUMMER L_500.0 (41043)
Bus: Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-1: Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
N-1: Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
N-1: Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
N-1: Allston-Napavine 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-1: Allston-Paul #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-1: Alvery-Dixonville 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO DIXONVLE_500.0 (45095) CKT 1
N-1: Alvey-Marion 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
N-1: Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-1: Ashe-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
N-1: Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-1: Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-1: Bell-Coulee 500 kV	OPEN Bus COULE R1_500.0 (40288)
N-1: Bell-Taft 500 kV	OPEN Bus BELL SC_500.0 (40096)
N-1: Big Eddy-Celilo 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO CELILO1_500.0 (41311) CKT 1
N-1: Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-1: Big Eddy-Knight 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO KNIGHT_500.0 (41450) CKT 1
N-1: Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-1: Boise Bench-Brownlee #3 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-1: Brady-Antelope 230 kV	OPEN Line BRADY_230.0 (60073) TO ANTLOPE_230.0 (65075) CKT 1
N-1: Broadview-Garrison #1 500 kV	OPEN Bus TOWN1_500.0 (62013)
N-1: Broadview-Garrison #1 500 kV	OPEN Bus GAR1EAST_500.0 (40451)
N-1: Brownlee-Ontario 230 kV	OPEN MultiSectionLine BROWNLEE_230.0 (60095) TO ONTARIO_230.0 (60265) CKT 1
N-1: Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-1: Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-1: Buckley-Slatt 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-1: Captain Jack-Olinda 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO OLINDA_500.0 (30020) CKT 1
N-1: CaptJack-Kfalls 500 kV	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
N-1: Cascade Crossing 500 kV	OPEN Bus BETHEL5_500.0 (43041)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHCRS1_500.0 (43491)
N-1: Cascade Crossing 500 kV	OPEN Bus CDRSBET1_500.0 (43951)
N-1: Cascade Crossing 500 kV	OPEN Bus CDR SPRG_500.0 (43950)
N-1: Chief Jo-Coulee 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-1: Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-1: Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-1: Coulee-Hanford 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-1: Coulee-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Covington4-Raver 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-1: Covington5-Raver 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
N-1: Coyote-Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
N-1: CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-1: Dixonville-Meridian 500 kV	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
N-1: Drycreek-Lolo 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO LOLO_230.0 (48197) CKT 1
N-1: Drycreek-N Lewiston 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO N LEWIST_230.0 (48255) CKT 1
N-1: Drycreek-Wala Ava 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO WALA AVA_230.0 (48451) CKT 1

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Contingency Studied	Actions Taken in the Contingency
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Dworshak-Taft 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-1: Echo Lake-Maple Valley 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO MAPLE VL_500.0 (40693) CKT 1
N-1: Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-1: Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Echo Lake-Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
N-1: Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-1: Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-1: Goldhill-Placer 115 kV	OPEN Bus FLINT1_115.0 (32236)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_ 13.2 (32460)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_115.0 (32234)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTL1_115.0 (32233)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSESHE_115.0 (32230)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSHE1_115.0 (32229)
N-1: Grassland-Coyote 500 kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-1: Grassland-Slatt 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
N-1: Grizzly-John Day #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-1: Grizzly-Malin 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO GRIZZ R3_500.0 (40488) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZ R3_500.0 (40488) TO PONDROSA_500.0 (40837) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN MultiSectionLine PONDROSA_500.0 (40837) TO SUMMER L_500.0 (41043) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Round Bu 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO ROUND BU_500.0 (43485) CKT 1
N-1: Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-1: Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-1: Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 67.1 MVR
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Transformer HATWAI_500.0 (40521) TO HATWAI_230.0 (40519) CKT 1
N-1: Hatwai-Lolo 230 kV	OPEN Line HATWAI_230.0 (40519) TO LOLO_230.0 (48197) CKT 1
N-1: Hatwai-Low Gran 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Hatwai-N Lewiston 230 kV	OPEN Line HATWAI_230.0 (40519) TO N LEWIST_230.0 (48255) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN MultiSectionLine HURICANE_230.0 (45103) TO WALAWALA_230.0 (45327) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO HURICANE_230.0 (45103) CKT 1
N-1: Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt MALIN_500.0 (40687) #s
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c1

Appendix A - 16hs2a_2250idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN MultiSectionLine BURNS_500.0 (45029) TO SUMMER L_500.0 (41043) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN Line HEMINWAY_500.0 (60155) TO BURNS_500.0 (45029) CKT 1
N-1: Hill Top 345/230 Xfmr	OPEN Transformer HIL TOP_230.0 (40537) TO HIL TOP_345.0 (64058) CKT 1
N-1: Horse Hv-McNary 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-1: Hot Springs-Taft 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	CLOSE Shunt HUMBOLT1_ 24.9 (64216) #b
N-1: Humboldt-Coyote Ck 345 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 10.8 MVR
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt EIGHTMFK_120.0 (64457) #b
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line MAGGIECR_120.0 (64070) TO CARLIN_120.0 (64169) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line COYOTECR_345.0 (64032) TO HUMBOLDT_345.0 (64059) CKT 1
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #3_ 99.0 (65017)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #2_ 99.0 (65014)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO_345.0 (66225)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO &1_345.0 (67582)
N-1: Ing500-CusterW 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-1: John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-1: John Day-Rock Ck 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-1: John Day-Slatt 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-1: Kfalls-Meridian 500 kV	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
N-1: Knight-Wautoma 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
N-1: LaGrande-North Powder 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO N POWDER_230.0 (60312) CKT 1
N-1: Lanes-Marion 500 kV	OPEN Line LANE_500.0 (40629) TO MARION_500.0 (40699) CKT 1
N-1: Lit Goose-Central Ferry 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
N-1: Lit Goose-Low Mon 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
N-1: Low Gran-Central Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Low Mon-Sac Tap 500 kV	OPEN Line LOW MON_500.0 (40683) TO SACJWA T_500.0 (40917) CKT 1
N-1: Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
N-1: Malin-Hilltop 230 kV	OPEN Line CANBYTAP_230.0 (40171) TO HIL TOP_230.0 (40537) CKT 1
N-1: Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-1: Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-1: Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-1: Maple Vly-Rocky RH 345 kV	OPEN MultiSectionLine MAPLE VL_345.0 (40691) TO ROCKY RH_345.0 (40891) CKT 1
N-1: Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Shunt SANTIAM_230.0 (40939) #s
N-1: Marion-Santiam 500 kV	OPEN Line MARION_500.0 (40699) TO SANTIAM_500.0 (40941) CKT 1
N-1: McLouglin-Ostrander 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-1: McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary S2-McNary S3 230 kV	OPEN Line MCNRY S2_230.0 (41352) TO MCNRY S3_230.0 (41353) CKT 1
N-1: McNary-Board T1 230 kV	OPEN Line BOARD T1_230.0 (40121) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-1: McNary-Longhorn 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
N-1: McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-1: McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-1: McNary-Roundup 230 kV	OPEN Line MCNRY S1_230.0 (41351) TO ROUNDUP_230.0 (40905) CKT 1
N-1: McNary-Sac Tap-Low Mon 500 kV	CLOSE Gen ICE H1-2_ 13.8 (40559) #1
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJWA T_500.0 (40917)
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 10.8 MVR
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS HIL TOP_230.0 (40537) TO 52.2 MVR
N-1: Midpoint-Humboldt 345 kV	OPEN Bus IDAHO-NV_345.0 (64061)
N-1: Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Shunt OLY E_230.0 (40794) #s

Appendix A - 16hs2a_2250idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Ontario-Caldwell 230 kV	OPEN MultiSectionLine CALDWELL_230.0 (60110) TO LANGLEY_230.0 (60266) CKT 1
N-1: Ostrander-Knight 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-1: Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-1: Ostrander-Troutdale 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO TROUTDAL_500.0 (41095) CKT 1
N-1: Oxbow-Brownlee #2 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 2
N-1: Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-1: Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-1: Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO SATSOP_500.0 (40949) CKT 1
N-1: Pearl-Keeler 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-1: Pearl-Keeler 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pinto-Four Corner 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Ponderosa A 500/230 kV Xfmr	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Ponderosa B 500/230 kV Xfmr	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Raver-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-1: Raver-Tacoma 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus UTAH-NEV_345.0 (67657)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus HA PS_345.0 (18002)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus H ALLEN_345.0 (18001)
N-1: Robinson-Harry Allen 500 kV	OPEN Line ROBINSON_500.0 (64895) TO H ALLEN_500.0 (18450) CKT 1
N-1: Rock Ck-Wautoma 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Round Mtn-Table Mtn 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-1: Roundup-Lagrande 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO ROUNDUP_230.0 (40905) CKT 1
N-1: Schultz-Sickler 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-1: Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-1: Schultz-Wautoma 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Sigurd-Glen Canyon 230 kV	OPEN Bus SIGURDPS_230.0 (66355)
N-1: Slatt 500/230 kV Xfmr	OPEN Transformer SLATT_500.0 (40989) TO SLATT_230.0 (40986) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-1: Snok Tap-Snoking 500 kV	OPEN Line SNOK TAP_500.0 (41001) TO SNOKING_500.0 (41007) CKT 1
N-1: Table Mtn-Tesla 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-1: Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-1: Vantage 500/230 kV Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
N-1: Vantage 500/230 kV Xfmr #2	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 2
N-1: Walla Walla-Talbot 230 kV	OPEN Line TALBOT_230.0 (44912) TO WALAWALA_230.0 (45327) CKT 1
N-1: Walla Walla-Wallula 230 kV	OPEN Line WALAWALA_230.0 (45327) TO WALLULA_230.0 (45331) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Line BETHEL_230.0 (43039) TO ROUNDB N_230.0 (43483) CKT 1

Appendix A - 16hs2a_2250idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	CLOSE Shunt BETHEL5_500.0 (43041) #1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN MultiSectionLine BETHEL_230.0 (43039) TO SANTIAM_230.0 (40939) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	CLOSE Shunt BETHEL5_500.0 (43041) #1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap SANTIAM_500.0 (40941) TO SANTMKO2_500.0 (43492) CKT 2
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap MIKKALO_500.0 (43970) TO MKLOSNT2_500.0 (43971) CKT 2
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN MultiSectionLine BIGEDDY2_230.0 (41342) TO CHEMAWA_230.0 (40213) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Bus PARKDALE_230.0 (40813)
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIHOR41_230.0 (61995) CKT 4 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 2
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO21_230.0 (61997) CKT 2 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO11_230.0 (61998) CKT 1 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO HORSEFLT_230.0 (60102) CKT 4
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	CLOSE Shunt KINPORT_345.0 (60190) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine BRIDGER_345.0 (60085) TO 3MIKNOLL_345.0 (60084) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt GARLAND1_ 34.5 (67147) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS ROSEBUD_230.0 (63012) TO -10 MVR
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt FRANNIE2_ 34.5 (67145) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt OREBASIN_230.0 (66145) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt PTRSNFLT_230.0 (62030) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 2_ 22.0 (62049) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line GAR2EAST_500.0 (40453) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Series Cap GAR2EAST_500.0 (40453) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line GAR1EAST_500.0 (40451) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Series Cap GAR1EAST_500.0 (40451) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Transformer HELLSCYN_230.0 (60150) TO HELSCYN1_ 14.4 (60151) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN Line MONROE_230.0 (40747) TO NOVELTY_230.0 (42304) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus SNOHOMS3_345.0 (40993)
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus CHIEF J3_345.0 (40223)

Appendix A - 16hs2a_2250idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO7_ 13.8 (41220) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO6_ 13.8 (41219) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO5_ 13.8 (41218) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO4_ 13.8 (41217) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO3_ 13.8 (41216) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #I
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: DC-BIPOLE	OPEN Bus CELILO1_500.0 (41311)
N-2: DC-BIPOLE	OPEN Bus CELILO2_500.0 (41312)
N-2: DC-BIPOLE	OPEN Bus CELILO3_230.0 (41313)
N-2: DC-BIPOLE	OPEN Bus CELILO4_230.0 (41314)
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS WALNUT_230.0 (24158) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt WALNUT_230.0 (24158) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VSTA_230.0 (24901) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt VSTA_230.0 (24901) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VINCENT_230.0 (24155) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VINCENT_230.0 (24155) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VILLA PK_230.0 (24154) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VILLA PK_230.0 (24154) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VALLEYSC_115.0 (24160) TO 187.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #ei
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #2
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #b
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS S.CLARA_230.0 (24128) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt S.CLARA_230.0 (24128) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS SANBRDNO_230.0 (24132) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt SANBRDNO_230.0 (24132) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS RIOHONDO_230.0 (24126) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt RIOHONDO_230.0 (24126) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PARDEE_230.0 (24114) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt PARDEE_230.0 (24114) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PADUA_230.0 (24112) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt PADUA_230.0 (24112) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS OLINDA_230.0 (24100) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_230.0 (24100) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MOORPARK_230.0 (24099) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MOORPARK_230.0 (24099) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRAGE_230.0 (24806) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRAGE_230.0 (24806) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOME_230.0 (25656) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOME_230.0 (25656) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOMW_230.0 (24093) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOMW_230.0 (24093) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LAGUBELL_230.0 (24076) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt LAGUBELL_230.0 (24076) #ei

Appendix A - 16hs2a_2250idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LCIENEGA_230.0 (24082) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LCIENEGA_230.0 (24082) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS GOULD_230.0 (24059) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt GOULD_230.0 (24059) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS EL NIDO_230.0 (24040) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt EL NIDO_230.0 (24040) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS DEVERS_230.0 (24804) TO 316.8 MVR
N-2: DC-BIPOLE	CLOSE Shunt DEVERS_230.0 (24804) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS CHINO_230.0 (24025) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt CHINO_230.0 (24025) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS BARRE_230.0 (24016) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt BARRE_230.0 (24016) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS ANTELOPE_230.0 (24401) TO 158.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #ei
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #b
N-2: DC-BIPOLE	OPEN Shunt BIGEDDY2_230.0 (41342) #s
N-2: DC-BIPOLE	OPEN Shunt SYLMARLA_230.0 (26094) #b
N-2: DC-BIPOLE	OPEN Shunt SYLMAR S_230.0 (24147) #b
N-2: DC-BIPOLE	OPEN Bus SYLMAR2_230.0 (26099)
N-2: DC-BIPOLE	OPEN Bus SYLMAR1_230.0 (26097)
N-2: DC-BIPOLE	CHANGE INJECTION GROUP RAS PDCI Gen Drop Units BY 'PDCI_gen_drop_value_less300' MW in generator merit order by opening
N-2: DC-BIPOLE	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: DC-BIPOLE	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: DC-BIPOLE	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: DC-BIPOLE	OPEN Shunt MALIN_500.0 (40687) #s
N-2: Double Palo Verde	CHANGE LOAD AT BUS AGUAFAPS_ 69.0 (14400) BY -120 MW (cnst pf)
N-2: Double Palo Verde	OPEN Gen PALOVRD1_ 24.0 (14931) #1
N-2: Double Palo Verde	OPEN Gen PALOVRD2_ 24.0 (14932) #1
N-2: Double Palo Verde	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: Double Palo Verde	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: Double Palo Verde	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: Double Palo Verde	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: Double Palo Verde	OPEN Shunt MALIN_500.0 (40687) #s
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-2: Double Palo Verde	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Line COVINGTN_230.0 (40303) TO MAPLEV12_230.0 (40692) CKT 2
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus ROCKY RH_345.0 (40891)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_345.0 (40691)
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN Bus PONDROSB_500.0 (40834)
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus GRIZZ R3_500.0 (40488)

Appendix A - 16hs2a_2250idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus PONDROSA_500.0 (40837)
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus WINDSHAR_230.0 (41155)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus CASCADTP_230.0 (40185)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus OUTLOOK_230.0 (45229)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus ALFALFA_230.0 (40039)
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #11
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #10
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #2

Appendix A - 16hs2a_2250idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG2_ 13.2 (38755) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #6
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #4
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine MCNARY_345.0 (40721) TO ROSS_345.0 (40901) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus ROSS_345.0 (40901)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN Line KING_230.0 (60177) TO MIDPOINT_230.0 (60232) CKT 1
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line PEARL #_230.0 (43773) TO SHERWOOD_230.0 (43527) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN MultiSectionLine BIGEDDY3_230.0 (41343) TO MCLOUGLN_230.0 (43313) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT5_500.0 (40306)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus OLYMPIA_300.0 (40795)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus COULEE_300.0 (40285)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Bus CENTR SS_230.0 (47748)
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1

Appendix A - 16hs2a_2250idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN Bus CHRISTOP_230.0 (42505)
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Transformer ROUND MT_500.0 (30005) TO RD MT 1M_500.0 (30065) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 2
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_DLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_SLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 3_ 18.0 (34604)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 2_ 18.0 (34602)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 1_ 18.0 (34600)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 1_ 11.5 (31810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBOU2-3_ 11.5 (31808)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 4-5_ 13.8 (31782)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT4_ 13.8 (38715)

Appendix A - 16hs2a_2250idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT3_ 13.8 (38710)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT2_ 13.8 (38705)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT1_ 13.8 (38700)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 5_ 12.5 (38845)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 4_ 12.5 (38840)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 3_ 12.5 (38835)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 2_ 12.5 (38830)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 1_ 12.5 (38825)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus ADDY N_230.0 (40021)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Line BELL BPA_115.0 (40087) TO BIGELOW_115.0 (40113) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine LANCASTR_230.0 (40624) TO NOXONBPA_230.0 (40787) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1

Appendix B

16la1sa_3400idnw_N Base Case (Idaho-Northwest, East-to-West)

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

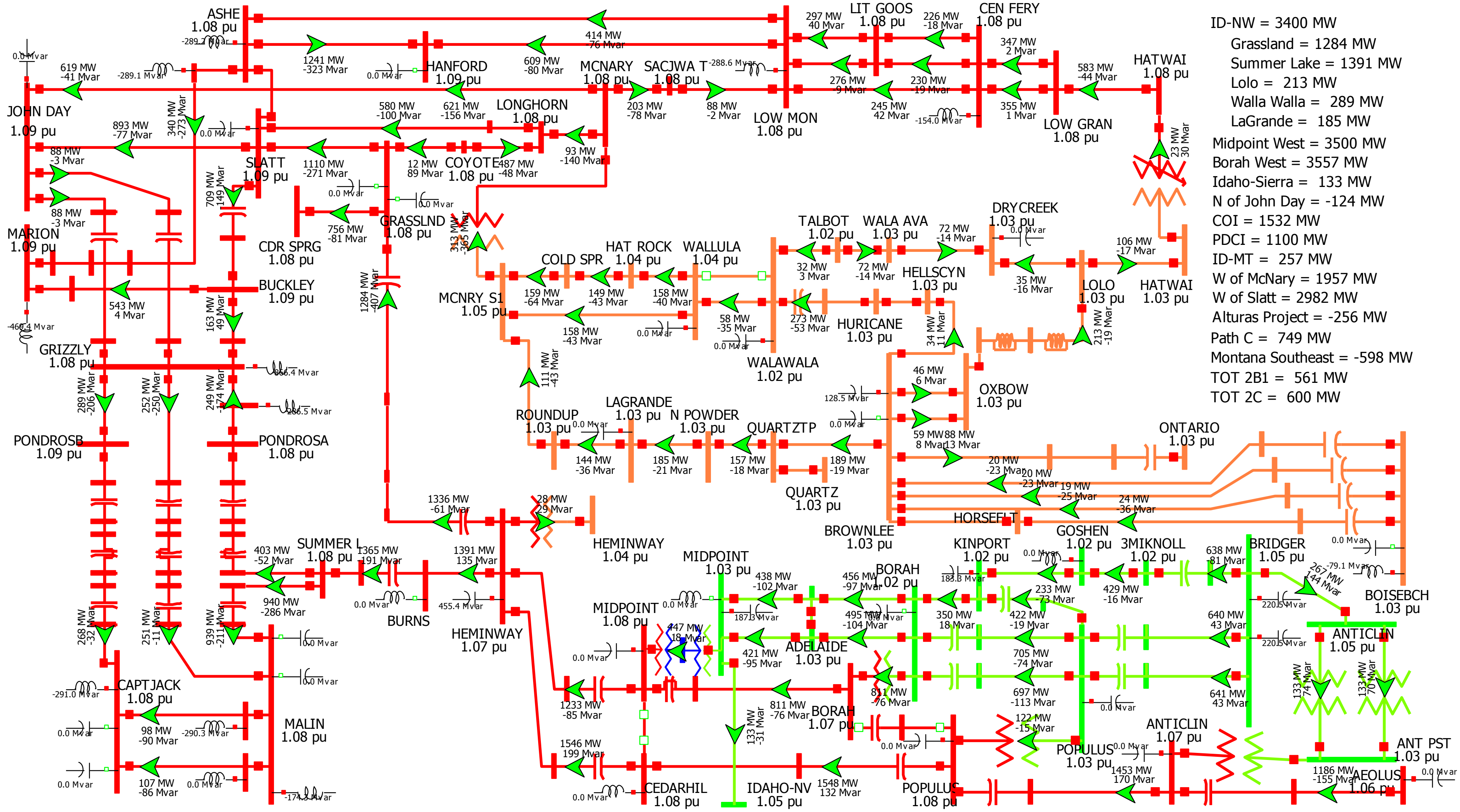


Figure B1: 16la1sa_3400idnw_N Base Case **Pre-Contingency**

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

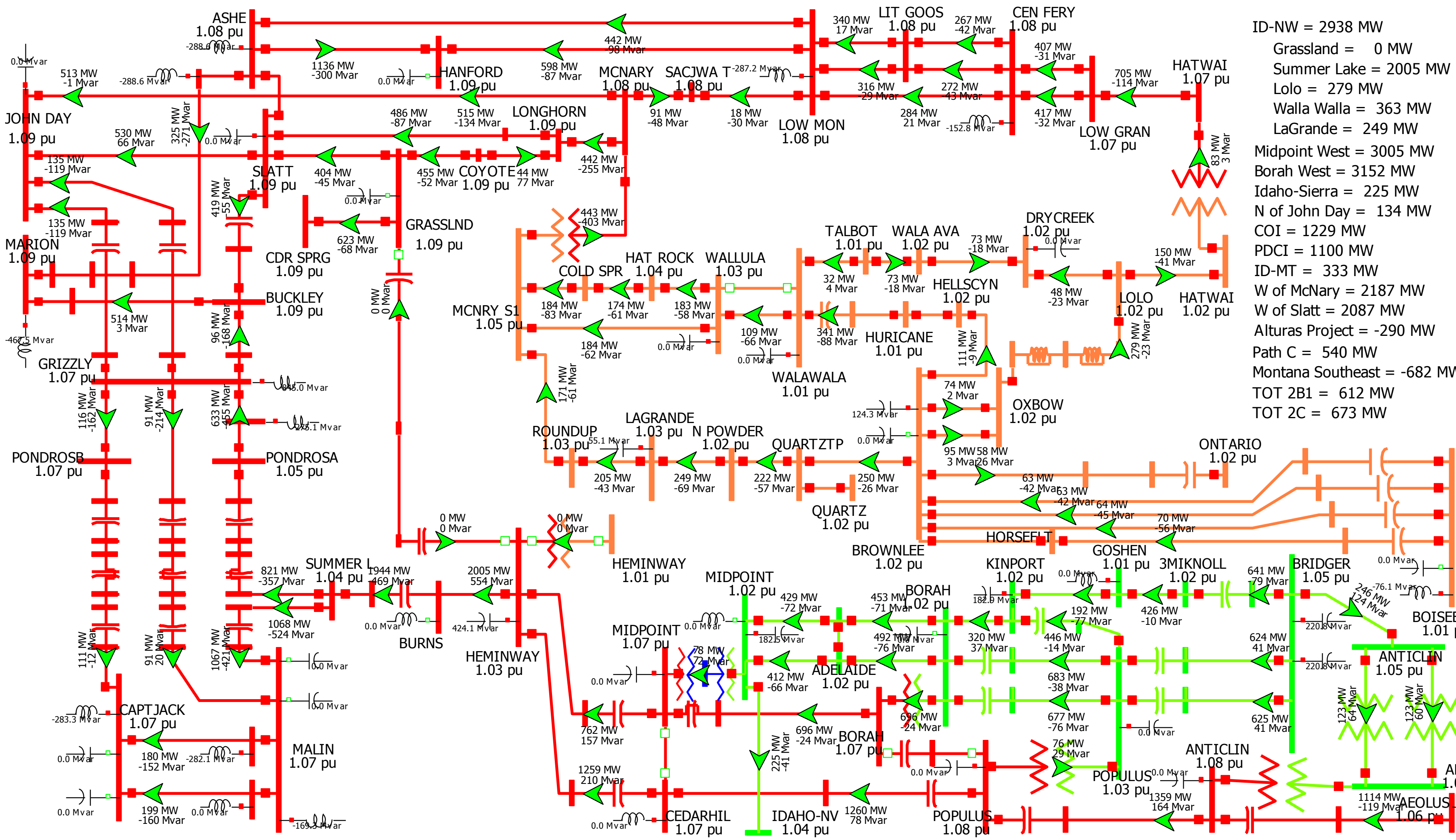


Figure B2: 16la1sa_3400idnw_N Base Case after the contingency **BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr**

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

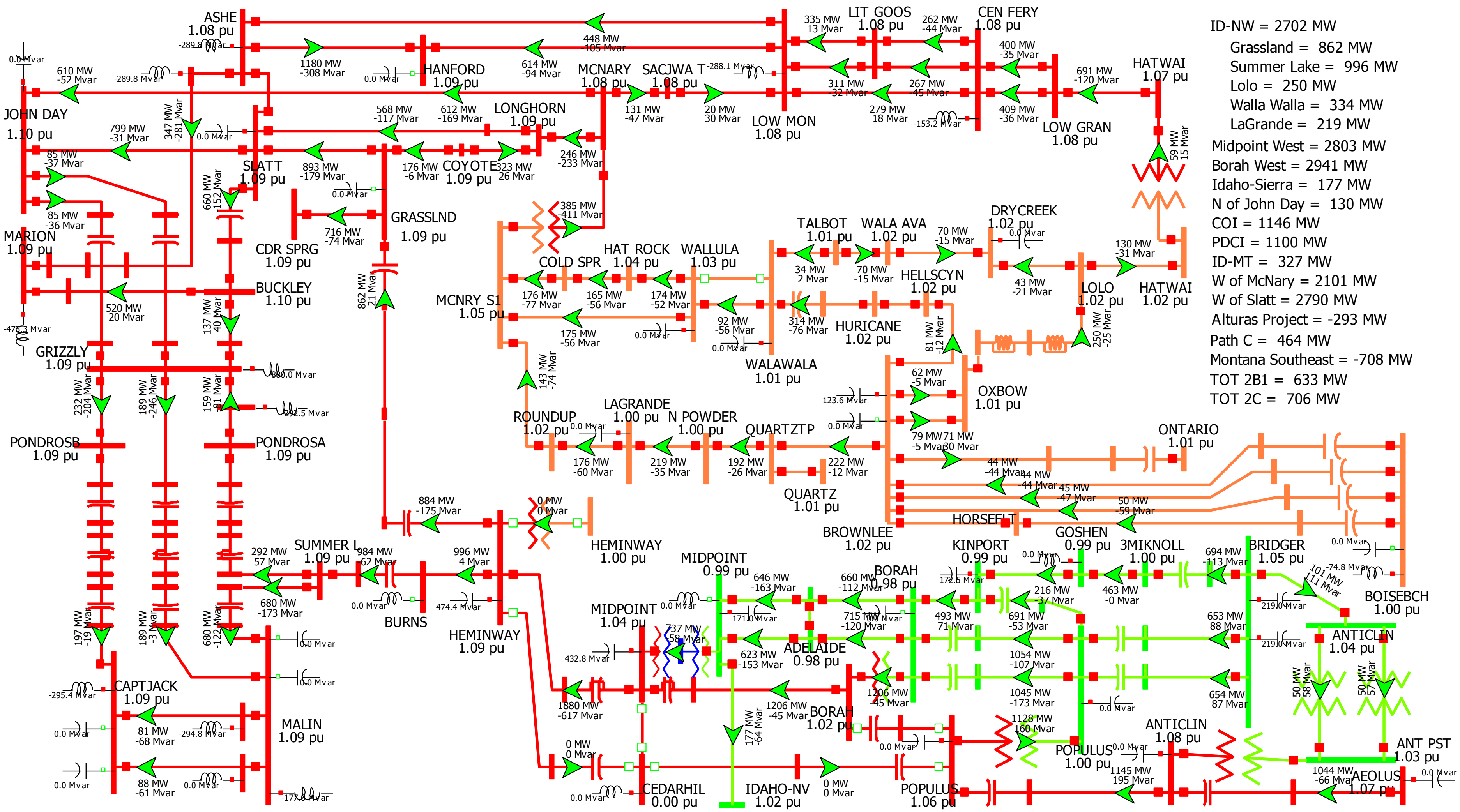
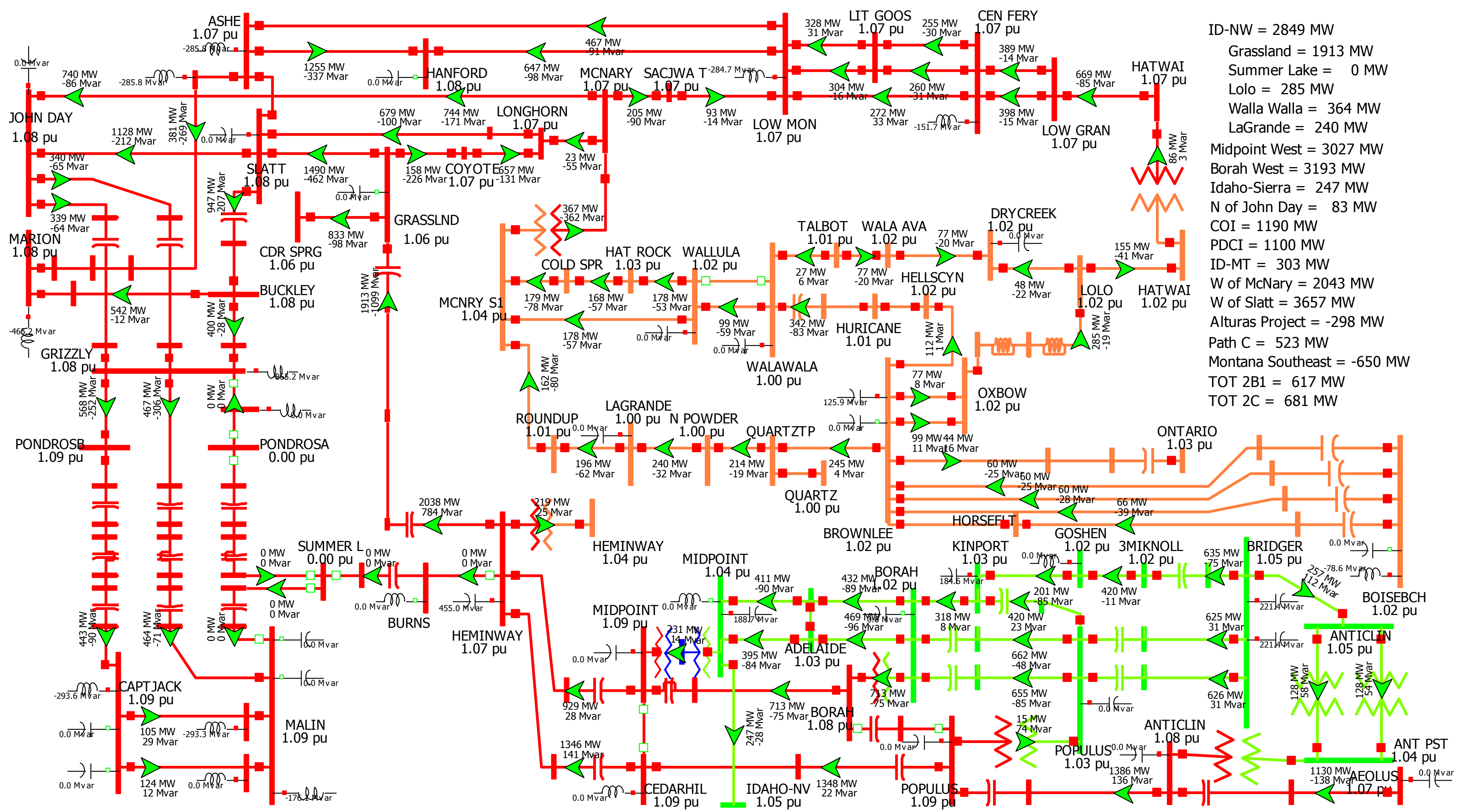


Figure B3: 16la1sa_3400idnw_N Base Case after the contingency **BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS**

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results



ID-NW = 2849 MW
Grassland = 1913 MW
Summer Lake = 0 MW
Lolo = 285 MW
Walla Walla = 364 MW
LaGrande = 240 MW
Midpoint West = 3027 MW
Borah West = 3193 MW
Idaho-Sierra = 247 MW
N of John Day = 83 MW
COI = 1190 MW
PDCI = 1100 MW
ID-MT = 303 MW
W of McNary = 2043 MW
W of Slatt = 3657 MW
Alturas Project = -298 MW
Path C = 523 MW
Montana Southeast = -650 MW
TOT 2B1 = 617 MW
TOT 2C = 681 MW

Figure B4: 16la1sa_3400idnw_N Base Case after the contingency **Bus: Summer Lake 500 kV**

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

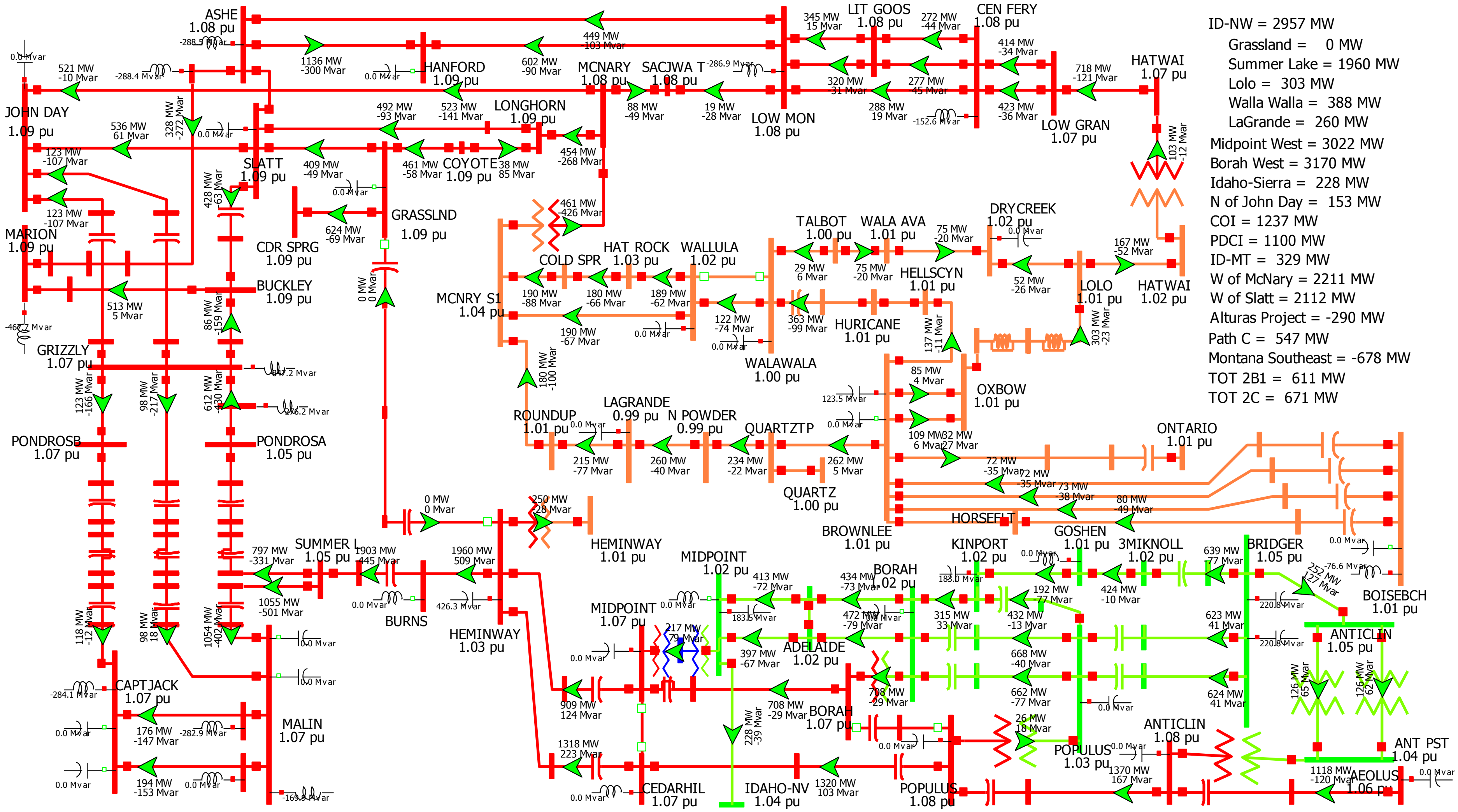


Figure B5: 16la1sa_3400idnw_N Base Case after the contingency **N-1: Hemingway-Grassland 500 kV**

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

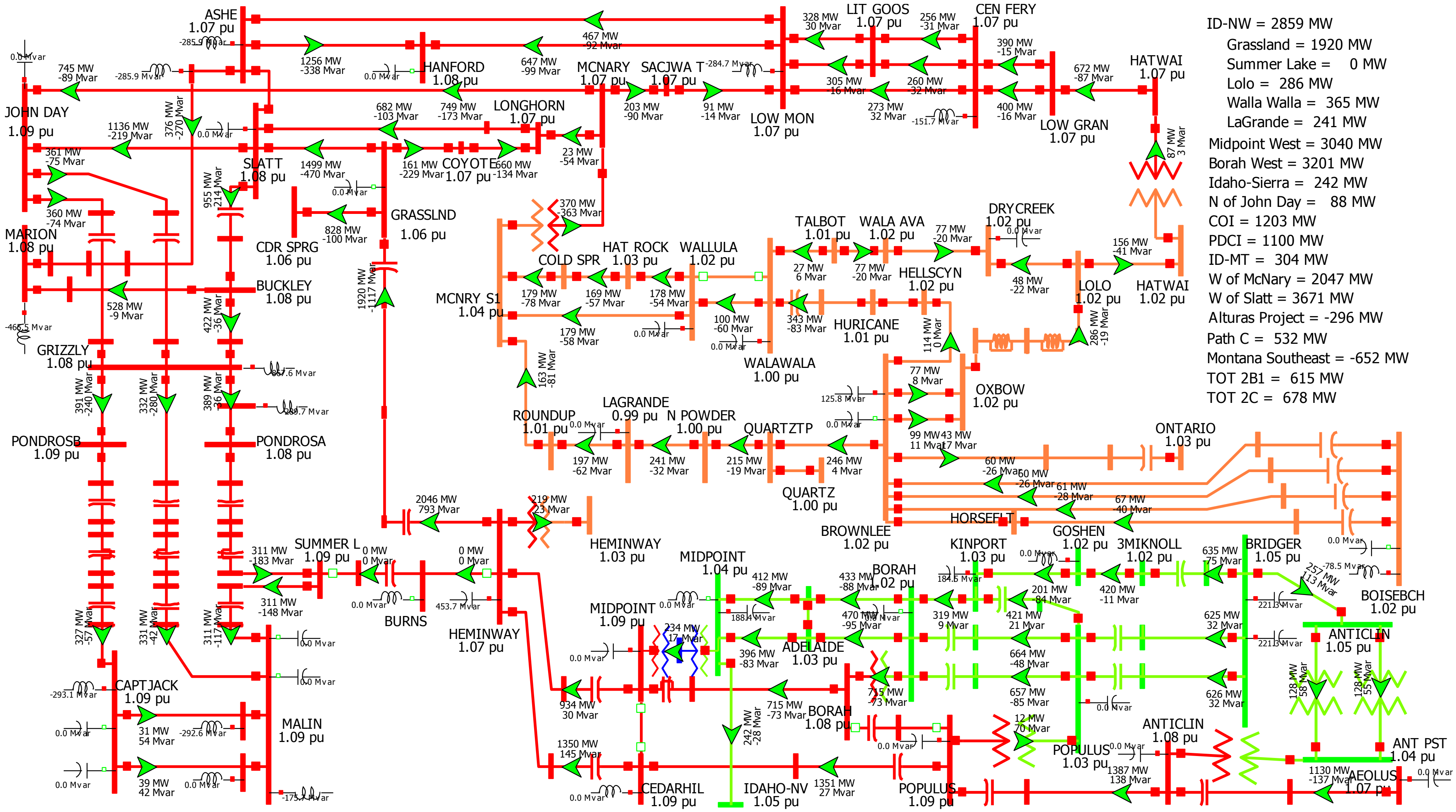


Figure B6: 16la1sa_3400idnw_N Base Case after the contingency **N-1: Hemingway-Summer Lake 500 kV**

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

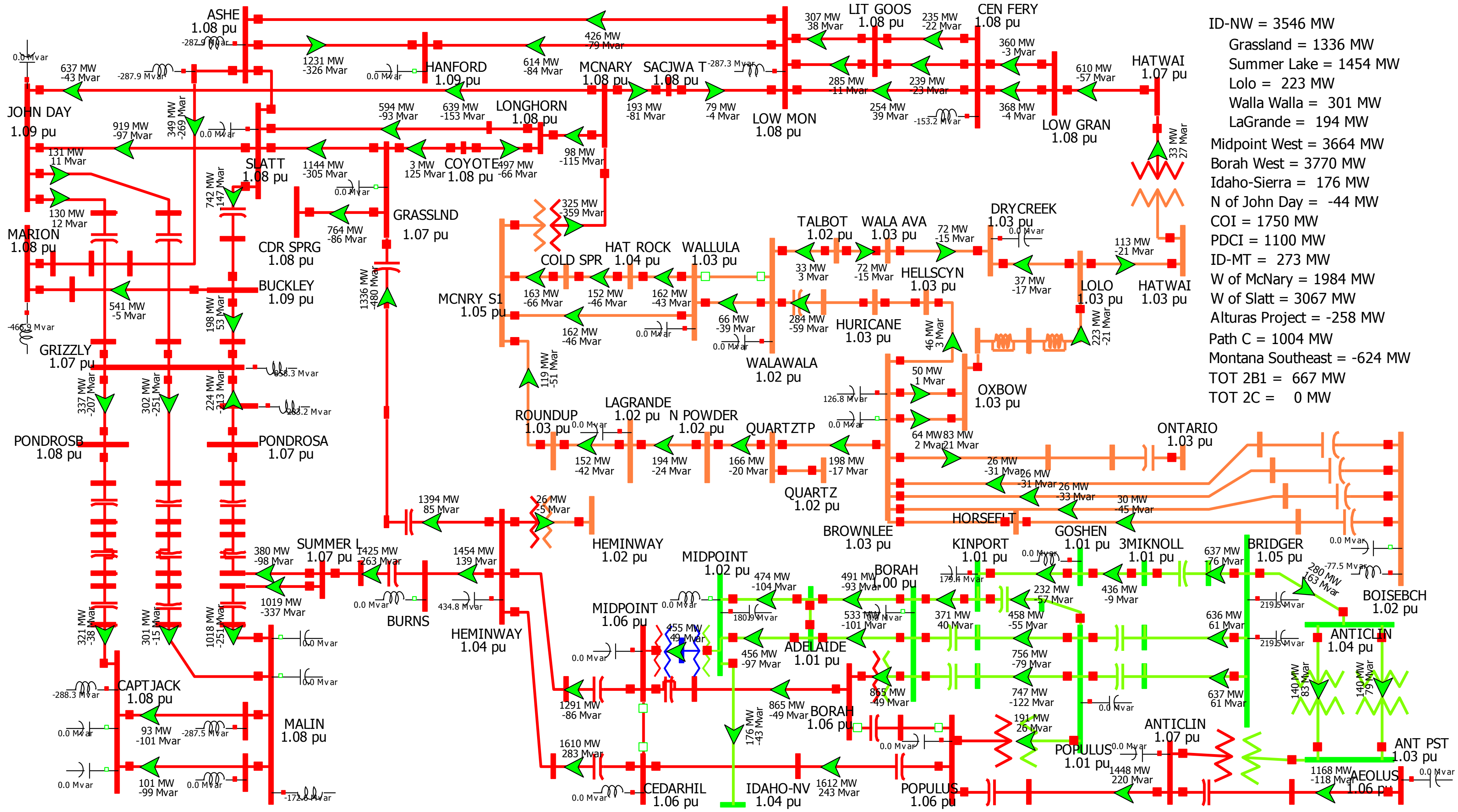


Figure B7: 16la1sa_3400idnw_N Base Case after the contingency **N-1: Red Butte-Harry Allen 345 kV**

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

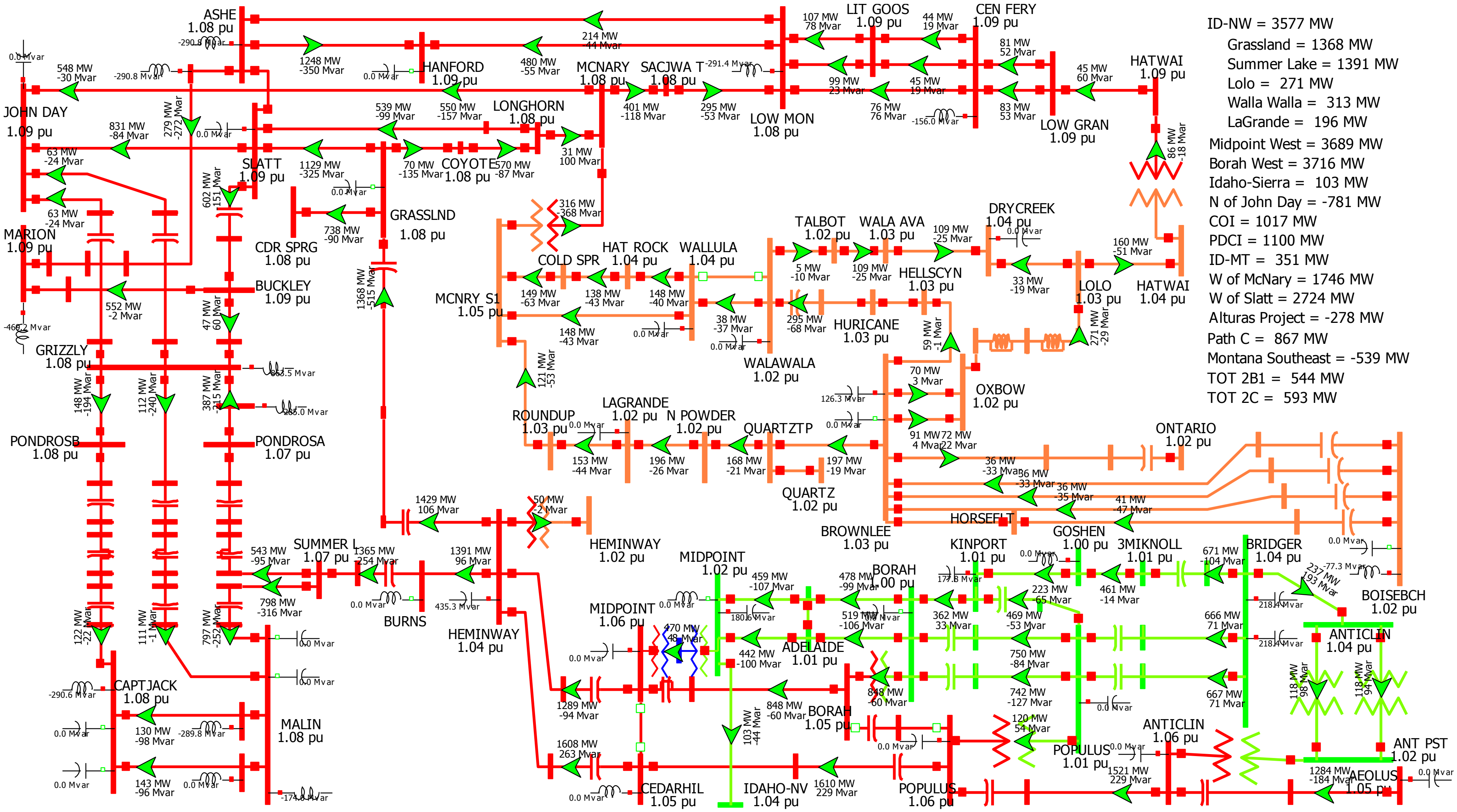


Figure B8: 16la1sa_3400idnw_N Base Case after the contingency **N-2: Broadview-Garrison #1 & #2 500 kV + RAS**

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

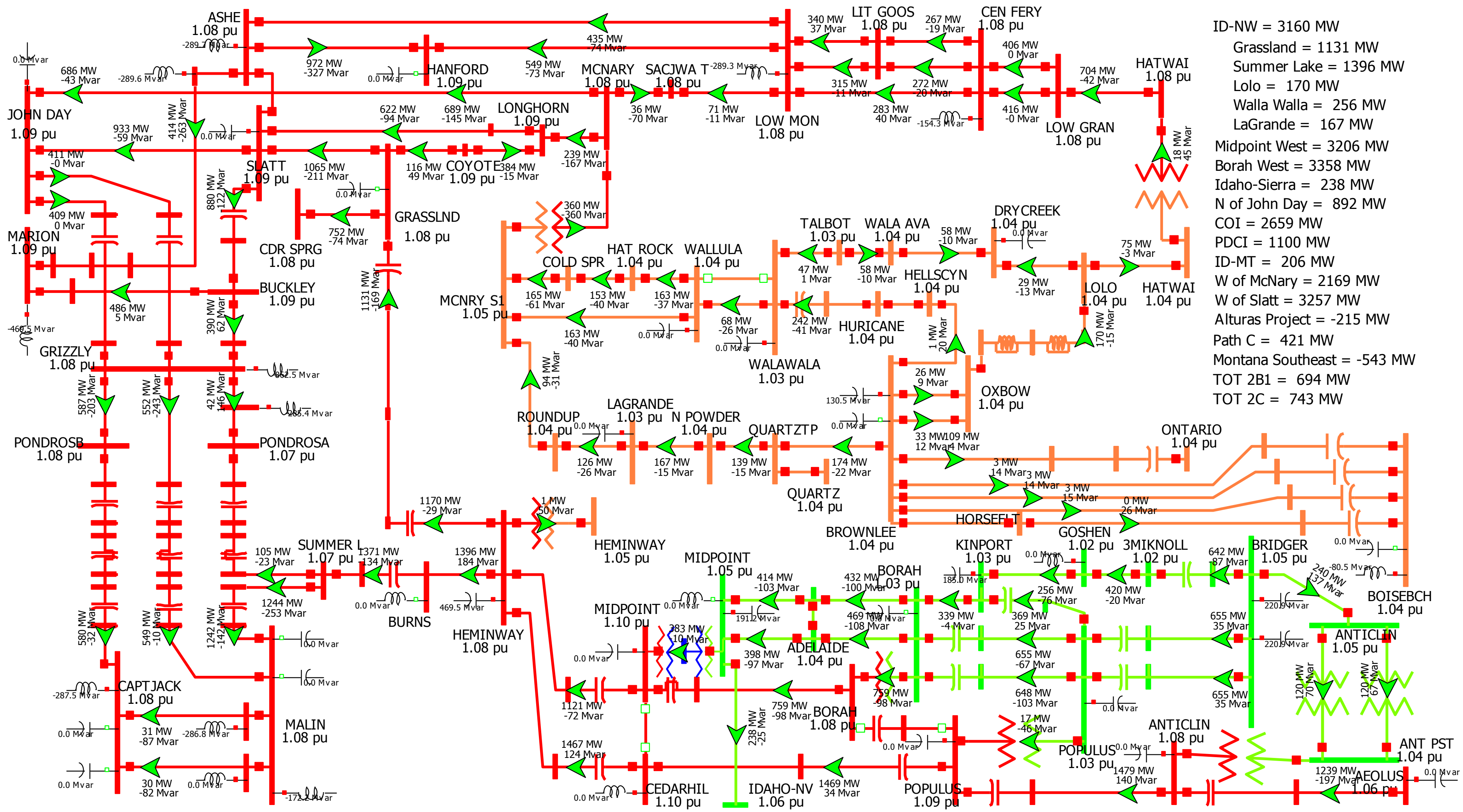


Figure B9: 16la1sa_3400idnw_N Base Case after the contingency **N-2: Double Palo Verde**

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

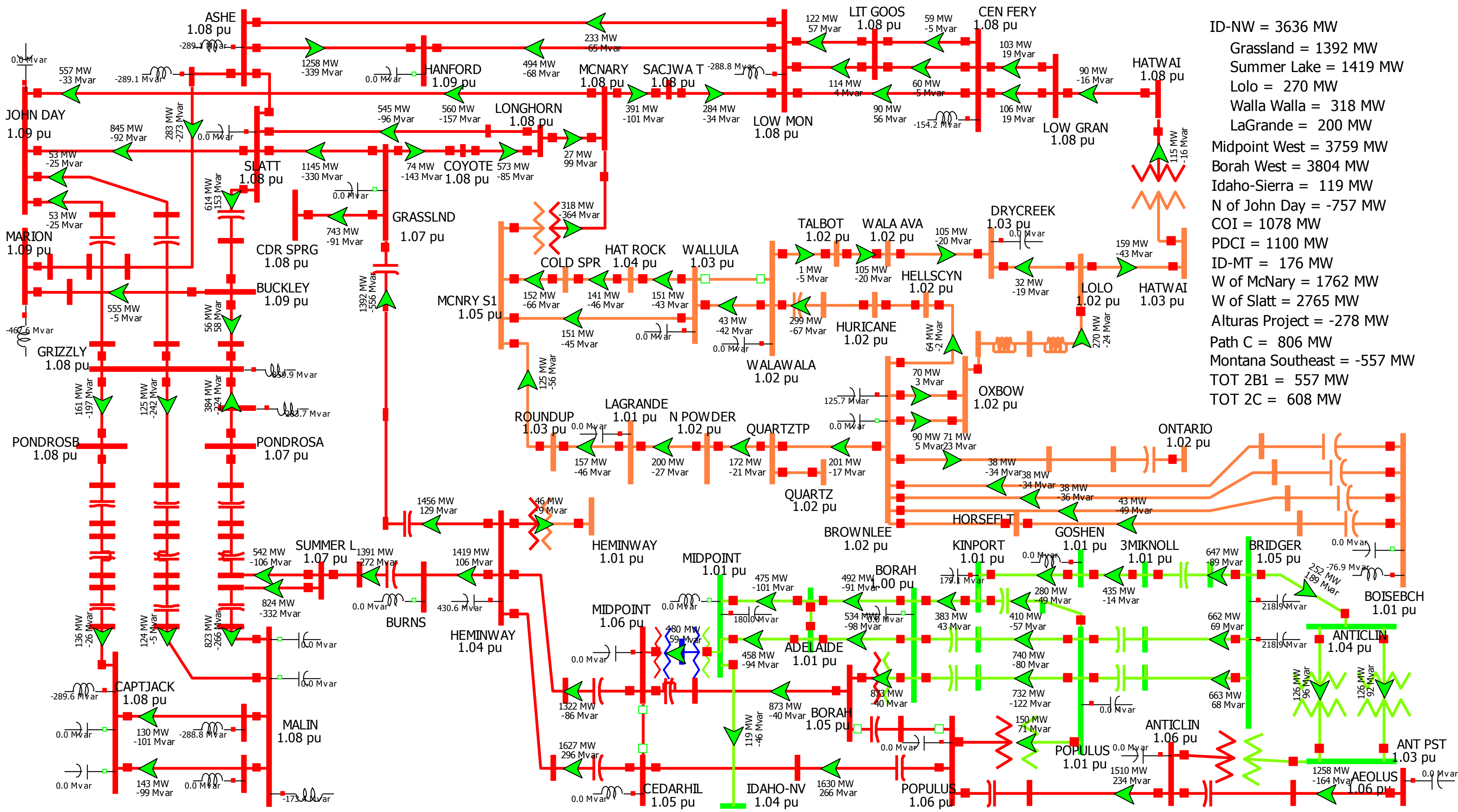


Figure B10: 16la1sa_3400idnw_N Base Case after the contingency **N-2: Garrison-Taft #1 & #2**

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	No Violations							
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	No Violations							
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4028 Taft-Dworshak & Taft Reactor 500kV	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	No Violations							
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	No Violations							
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	300.7	300.0	100.2%	370.0	81.3%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	300.7	300.0	100.2%	370.0	81.3%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	No Violations							
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	No Violations							
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	304.3	300.0	101.4%	370.0	82.2%
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	304.3	300.0	101.4%	370.0	82.2%
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations							
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	No Violations							
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	No Violations							
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	No Violations							
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV	No Violations							
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations							
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	No Violations							
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	No Violations							
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations							
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations							
BF 4502 Paul-Allston & Allston-Keeler 500 kV	No Violations							
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV	No Violations							
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations							
BF 4542 Paul-Allston 500 kV & Center G2	No Violations							
BF 4542 Paul-Napavine 500 kV & Center G1	No Violations							
BF 4550 Olympia-Paul & Paul-Allston 500 kV	No Violations							

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	No Violations							
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	FRANKLIN (40443) -> FRANKL E (40440) CKT 1 at FRANKLIN	Branch MVA	193.1	264.8	254.0	104.2%	307.0	86.2%
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	No Violations							
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations							
BF 4700 Hatwai 500kV & 230 kV + RAS	No Violations							
BF 4708 Hatwai 500 kV Bus	No Violations							
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	No Violations							
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	No Violations							
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations							
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.4	51.0	50.0	101.9%	55.0	92.7%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	336.2	300.0	112.1%	370.0	90.9%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	336.2	300.0	112.1%	370.0	90.9%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTNPS	Branch MVA	263.7	305.1	300.0	101.7%	370.0	82.5%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	322.3	315.0	102.3%	394.0	81.8%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	321.7	315.0	102.1%	394.0	81.6%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1440.6	2258.5	2000.1	112.9%	3000.0	75.3%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1462.1	2234.5	2000.1	111.7%	3000.0	74.5%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.4	51.5	50.0	103.0%	55.0	93.7%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	334.4	300.0	111.5%	370.0	90.4%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	334.4	300.0	111.5%	370.0	90.4%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTNPS	Branch MVA	263.7	304.5	300.0	101.5%	370.0	82.3%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	320.9	315.0	101.9%	394.0	81.5%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	320.4	315.0	101.7%	394.0	81.3%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1440.6	2253.8	2000.1	112.7%	3000.0	75.1%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1462.1	2224.8	2000.1	111.2%	3000.0	74.2%
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	300.2	300.0	100.1%	370.0	81.1%
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	300.2	300.0	100.1%	370.0	81.1%
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	303.1	300.0	101.0%	370.0	81.9%
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	303.1	300.0	101.0%	370.0	81.9%
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations							
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	No Violations							
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	No Violations							
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations							
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations							
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations							
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	No Violations							
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	FRANKLIN (40443) -> FRANKL E (40440) CKT 1 at FRANKLIN	Branch MVA	193.1	262.2	254.0	103.2%	307.0	85.4%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	STATL C2 (47959)	% Δ Volts	1.016	0.962				5.31%

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	STATL W2 (47571)	% Δ Volts	1.002	0.949				5.29%
BF 5214 Low Mon-McNary & Calpine PH 500 kV	No Violations							
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	332.2	300.0	110.7%	370.0	89.8%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	332.2	300.0	110.7%	370.0	89.8%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	90.5	121.5	112.0	108.5%	146.7	82.9%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	319.4	315.0	101.4%	394.0	81.1%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	318.8	315.0	101.2%	394.0	80.9%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1532.2	2372.7	1732.1	137.0%	2338.3	101.5%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	333.9	300.0	111.3%	370.0	90.2%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	333.9	300.0	111.3%	370.0	90.2%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	90.5	122.7	112.0	109.6%	146.7	83.6%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	320.7	315.0	101.8%	394.0	81.4%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	263.7	300.7	300.0	100.2%	370.0	81.3%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	320.1	315.0	101.6%	394.0	81.2%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1532.2	2309.6	1732.1	133.3%	2338.3	98.8%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	334.9	300.0	111.6%	370.0	90.5%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	334.9	300.0	111.6%	370.0	90.5%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTNPS	Branch MVA	263.7	303.7	300.0	101.2%	370.0	82.1%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	321.3	315.0	102.0%	394.0	81.6%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	320.7	315.0	101.8%	394.0	81.4%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1440.6	2335.2	2000.1	116.8%	3000.0	77.8%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1462.1	2308.3	2000.1	115.4%	3000.0	76.9%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	324.3	300.0	108.1%	370.0	87.7%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	324.3	300.0	108.1%	370.0	87.7%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTNPS	Branch MVA	263.7	301.4	300.0	100.5%	370.0	81.5%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	CEDARHIL (60159) -> CEDHEM21 (61992) CKT 2 at CEDARHIL	Branch Amp	1661.2	2454.0	2309.4	106.3%	3464.1	70.8%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	POPULUS (67794) -> POPCED21 (61963) CKT 2 at POPULUS	Branch Amp	1663.5	2426.2	2309.4	105.1%	3464.1	70.0%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	331.4	300.0	110.5%	370.0	89.6%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	331.4	300.0	110.5%	370.0	89.6%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	317.7	315.0	100.9%	394.0	80.6%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	317.2	315.0	100.7%	394.0	80.5%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1346.9	2434.9	1732.1	140.6%	2338.3	104.1%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	BORPOP11 (61970) -> BORAH (60060) CKT 1 at BORAH	Branch Amp	1172.4	1891.4	1701.6	111.2%	2108.6	89.7%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	BORPOP21 (61969) -> BORAH (60060) CKT 2 at BORAH	Branch Amp	1156.6	1873.6	1650.1	113.5%	2227.4	84.1%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	POPULUS (67790) -> BORPOP11 (61970) CKT 1 at POPULUS	Branch Amp	1162.5	1886.4	1492.7	126.4%	2264.2	83.3%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	PTRSNFUR (62386)	% Δ Volts	0.993	0.937				5.64%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	AMPS (65025)	% Δ Volts	0.991	0.938				5.35%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts	0.991	0.939				5.25%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	348.8	300.0	116.3%	370.0	94.3%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	348.8	300.0	116.3%	370.0	94.3%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	331.2	315.0	105.2%	394.0	84.1%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	330.4	315.0	104.9%	394.0	83.9%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	90.5	122.0	112.0	109.0%	146.7	83.2%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTNPS	Branch MVA	263.7	301.1	300.0	100.4%	370.0	81.4%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BORPOP11 (61970) -> BORAH (60060) CKT 1 at BORAH	Branch Amp	1172.4	1806.0	1701.6	106.1%	2108.6	85.7%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BORPOP21 (61969) -> BORAH (60060) CKT 2 at BORAH	Branch Amp	1156.6	1791.3	1650.1	108.6%	2227.4	80.4%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	POPULUS (67790) -> BORPOP11 (61970) CKT 1 at BORPOP11	Branch Amp	1162.5	1804.1	1492.7	120.9%	2264.2	79.7%

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	AMPS (65025)	% Δ Volts	0.991	0.939				5.25%
BF Lolo 230kV	No Violations							
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	332.6	300.0	110.9%	370.0	89.9%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	332.6	300.0	110.9%	370.0	89.9%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	90.5	119.3	112.0	106.5%	146.7	81.3%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	319.6	315.0	101.5%	394.0	81.1%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	319.0	315.0	101.3%	394.0	81.0%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1532.2	2314.7	1732.1	133.6%	2338.3	99.0%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PTRSNFUR (62386)	% Δ Volts	0.993	0.927				6.65%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PTRSNFLT (62030)	% Δ Volts	0.991	0.930				6.16%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	KINGSR S (47177)	% Δ Volts	1.024	0.966				5.66%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	MCDERMIT (47189)	% Δ Volts	1.026	0.968				5.65%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	FIELDS T (47160)	% Δ Volts	1.034	0.977				5.51%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HINES (61825)	% Δ Volts	1.038	0.981				5.49%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	CATLOW (47134)	% Δ Volts	1.035	0.979				5.41%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	WJOHN DY (61835)	% Δ Volts	1.038	0.983				5.30%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HINES (61826)	% Δ Volts	1.042	0.988				5.18%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HARNEY (40507)	% Δ Volts	1.043	0.989				5.18%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	AMPS (65025)	% Δ Volts	0.991	0.940				5.15%
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	No Violations							
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	No Violations							
Bus: Alvey 500 kV	No Violations							
Bus: Bell BPA 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	303.1	300.0	101.0%	370.0	81.9%
Bus: Bell BPA 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	303.1	300.0	101.0%	370.0	81.9%
Bus: Buckley 500 kV	No Violations							
Bus: Dixonville 500 kV	No Violations							
Bus: Hot Springs 500 kV	No Violations							
Bus: Keeler 500 kV	No Violations							
Bus: Rock Creek 500 kV	No Violations							
Bus: Sickler 500 kV	No Violations							
Bus: Summer Lake 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.4	51.5	50.0	102.9%	55.0	93.6%
Bus: Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	336.2	300.0	112.1%	370.0	90.9%
Bus: Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	336.2	300.0	112.1%	370.0	90.9%
Bus: Summer Lake 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTNPS	Branch MVA	263.7	305.6	300.0	101.9%	370.0	82.6%
Bus: Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	322.3	315.0	102.3%	394.0	81.8%
Bus: Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	321.7	315.0	102.1%	394.0	81.6%
Bus: Summer Lake 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1440.6	2257.4	2000.1	112.9%	3000.0	75.2%
Bus: Summer Lake 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1462.1	2233.6	2000.1	111.7%	3000.0	74.5%
N-1: Allston-Keeler 500 kV	No Violations							
N-1: Allston-Napavine 500 kV	No Violations							
N-1: Allston-Paul #2 500 kV	No Violations							
N-1: Alvery-Dixonville 500 kV	No Violations							
N-1: Alvey-Marion 500 kV	No Violations							
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Bell-Coulee 500 kV	No Violations							
N-1: Bell-Taft 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	302.9	300.0	101.0%	370.0	81.9%
N-1: Bell-Taft 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	302.9	300.0	101.0%	370.0	81.9%
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	300.3	300.0	100.1%	370.0	81.2%
N-1: Brady-Antelope 230 kV + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	300.3	300.0	100.1%	370.0	81.2%
N-1: Broadview-Garrison #1 500 kV	No Violations							
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Cal Sub 120 kV Phase Shifter	No Violations							
N-1: Captain Jack-Olinda 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	301.3	300.0	100.4%	370.0	81.4%
N-1: Captain Jack-Olinda 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	301.3	300.0	100.4%	370.0	81.4%
N-1: CaptJack-Kfalls 500 kV	No Violations							
N-1: Cascade Crossing 500 kV	No Violations							
N-1: Chief Jo-Coulee 500 kV	No Violations							
N-1: Chief Jo-Monroe 500 kV	No Violations							
N-1: Chief Jo-Sickler 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Covington4-Raver 500 kV	No Violations							
N-1: Covington5-Raver 500 kV	No Violations							
N-1: Coyote-Longhorn 500 kV	No Violations							
N-1: CusterW-Monroe 500 kV	No Violations							
N-1: Dixonville-Meridian 500 kV	No Violations							
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV	No Violations							
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Echo Lake-Maple Valley 500 kV	No Violations							
N-1: Echo Lake-Raver 500 kV	No Violations							
N-1: Echo Lake-Schultz 500 kV	No Violations							
N-1: Echo Lake-Snok Tap 500 kV	No Violations							
N-1: Garrison-Taft #2 500 kV	No Violations							
N-1: Goldhill-Placer 115 kV	No Violations							
N-1: Grassland-Coyote 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	No Violations							
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Harry Allen 345 kV Phase Shifter	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	350.7	315.0	111.3%	394.0	89.0%
N-1: Harry Allen 345 kV Phase Shifter	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	349.5	315.0	111.0%	394.0	88.7%
N-1: Hatwai 500/230 kV Xfmr	No Violations							
N-1: Hatwai-Lolo 230 kV	No Violations							
N-1: Hatwai-Low Gran 500 kV	No Violations							
N-1: Hatwai-N Lewiston 230 kV	No Violations							

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Hells Canyon-Brownlee 230 kV	No Violations							
N-1: Hells Canyon-Walla Walla 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	300.2	300.0	100.1%	370.0	81.1%
N-1: Hells Canyon-Walla Walla 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	300.2	300.0	100.1%	370.0	81.1%
N-1: Hemingway-Grassland 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.4	54.4	50.0	108.9%	55.0	99.0%
N-1: Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	331.1	300.0	110.4%	370.0	89.5%
N-1: Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	331.1	300.0	110.4%	370.0	89.5%
N-1: Hemingway-Grassland 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	90.5	121.5	112.0	108.5%	146.7	82.8%
N-1: Hemingway-Grassland 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	318.5	315.0	101.1%	394.0	80.8%
N-1: Hemingway-Grassland 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	318.0	315.0	100.9%	394.0	80.7%
N-1: Hemingway-Grassland 500 kV	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1532.2	2303.2	1732.1	133.0%	2338.3	98.5%
N-1: Hemingway-Summer Lake 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.4	51.3	50.0	102.6%	55.0	93.3%
N-1: Hemingway-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	334.5	300.0	111.5%	370.0	90.4%
N-1: Hemingway-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	334.5	300.0	111.5%	370.0	90.4%
N-1: Hemingway-Summer Lake 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTNPS	Branch MVA	263.7	304.0	300.0	101.3%	370.0	82.2%
N-1: Hemingway-Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	321.0	315.0	101.9%	394.0	81.5%
N-1: Hemingway-Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	320.4	315.0	101.7%	394.0	81.3%
N-1: Hemingway-Summer Lake 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1440.6	2269.6	2000.1	113.5%	3000.0	75.7%
N-1: Hemingway-Summer Lake 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1462.1	2245.9	2000.1	112.3%	3000.0	74.9%
N-1: Hill Top 345/230 Xfmr	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	109.1	169.8	150.0	113.2%	180.0	94.3%
N-1: Hill Top 345/230 Xfmr	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	316.0	421.8	415.7	101.5%	483.5	87.2%
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: Hot Springs-Taft 500 kV	No Violations							
N-1: Humboldt-Coyote Ck 345 kV	No Violations							
N-1: Huntington-Pinto-Four Corners 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	360.0	300.0	120.0%	370.0	97.3%
N-1: Huntington-Pinto-Four Corners 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	360.0	300.0	120.0%	370.0	97.3%
N-1: Huntington-Pinto-Four Corners 345 kV	H ALLEN (18001) -> H ALLEN (18019) CKT 2 at H ALLEN	Branch MVA	298.4	367.4	357.0	102.9%	415.9	88.3%
N-1: Huntington-Pinto-Four Corners 345 kV	H ALLEN (18001) -> H ALLEN (18019) CKT 1 at H ALLEN	Branch MVA	298.4	367.4	357.0	102.9%	415.9	88.3%
N-1: Ing500-CusterW 500 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Kfalls-Meridian 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.4	50.4	50.0	100.8%	55.0	91.7%
N-1: Lanes-Marion 500 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-Sac Tap 500 kV	No Violations							
N-1: Malin 500/230 Xfmr	No Violations							
N-1: Malin-Hilltop 230 kV	No Violations							
N-1: Malin-Round Mtn #1 500 kV	No Violations							
N-1: Malin-Round Mtn #2 500 kV	No Violations							
N-1: Malin-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	303.9	300.0	101.3%	370.0	82.1%
N-1: Malin-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	303.9	300.0	101.3%	370.0	82.1%
N-1: Maple Vly-Rocky RH 345 kV	No Violations							
N-1: Marion-Pearl 500 kV	No Violations							
N-1: Marion-Santiam 500 kV	No Violations							
N-1: McLouglin-Ostrander 230 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: McNary-Longhorn 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	No Violations							
N-1: McNary-Sac Tap-Low Mon 500 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	319.3	300.0	106.4%	370.0	86.3%
N-1: Midpoint-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	319.3	300.0	106.4%	370.0	86.3%
N-1: Midpoint-Humboldt 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	300.9	300.0	100.3%	370.0	81.3%
N-1: Midpoint-Humboldt 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	300.9	300.0	100.3%	370.0	81.3%
N-1: Napavine-Paul 500 kV	No Violations							
N-1: Olympia-Paul 500 kV	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	No Violations							
N-1: Paul-Satsop 500 kV	No Violations							
N-1: Pearl-Keeler 500 kV	No Violations							
N-1: Pinto-Four Corner 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	357.2	300.0	119.1%	370.0	96.6%
N-1: Pinto-Four Corner 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	357.2	300.0	119.1%	370.0	96.6%
N-1: Pinto-Four Corner 345 kV	H ALLEN (18001) -> H ALLEN (18019) CKT 2 at H ALLEN	Branch MVA	298.4	364.4	357.0	102.1%	415.9	87.6%
N-1: Pinto-Four Corner 345 kV	H ALLEN (18001) -> H ALLEN (18019) CKT 1 at H ALLEN	Branch MVA	298.4	364.4	357.0	102.1%	415.9	87.6%
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Populus-Cedar Hill-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	330.3	300.0	110.1%	370.0	89.3%
N-1: Populus-Cedar Hill-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	330.3	300.0	110.1%	370.0	89.3%
N-1: Populus-Cedar Hill-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	316.9	315.0	100.6%	394.0	80.4%
N-1: Populus-Cedar Hill-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	316.3	315.0	100.4%	394.0	80.3%
N-1: Populus-Cedar Hill-Hemingway 500 kV	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1346.9	2296.5	1732.1	132.6%	2338.3	98.2%
N-1: Populus-Cedar Hill-Hemingway 500 kV	BORPOP11 (61970) -> BORAH (60060) CKT 1 at BORAH	Branch Amp	1172.4	1893.1	1701.6	111.3%	2108.6	89.8%
N-1: Populus-Cedar Hill-Hemingway 500 kV	BORPOP21 (61969) -> BORAH (60060) CKT 2 at BORAH	Branch Amp	1156.6	1875.2	1650.1	113.6%	2227.4	84.2%
N-1: Populus-Cedar Hill-Hemingway 500 kV	POPULUS (67790) -> BORPOP11 (61970) CKT 1 at POPULUS	Branch Amp	1162.5	1888.0	1492.7	126.5%	2264.2	83.4%
N-1: Raver-Paul 500 kV	No Violations							
N-1: Raver-Tacoma 500 kV	No Violations							
N-1: Red Butte-Harry Allen 345 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	350.6	315.0	111.3%	394.0	89.0%
N-1: Red Butte-Harry Allen 345 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	349.3	315.0	110.9%	394.0	88.7%
N-1: Robinson-Harry Allen 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	109.1	165.9	150.0	110.6%	180.0	92.2%
N-1: Robinson-Harry Allen 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	334.3	300.0	111.4%	370.0	90.4%
N-1: Robinson-Harry Allen 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	334.3	300.0	111.4%	370.0	90.4%
N-1: Robinson-Harry Allen 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	263.7	328.4	300.0	109.5%	370.0	88.8%
N-1: Robinson-Harry Allen 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	257.6	320.5	300.0	106.8%	370.0	86.6%
N-1: Robinson-Harry Allen 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	315.1	315.0	100.0%	394.0	80.0%
N-1: Robinson-Harry Allen 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	316.0	419.0	415.7	100.8%	483.5	86.7%
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Round Mtn-Table Mtn 500 kV	No Violations							
N-1: Roundup-Lagrande 230 kV	No Violations							
N-1: Schultz-Sickler 500 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Sigurd-Glen Canyon 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	318.9	300.0	106.3%	370.0	86.2%
N-1: Sigurd-Glen Canyon 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	318.9	300.0	106.3%	370.0	86.2%
N-1: Slatt 500/230 kV Xfmr	No Violations							

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Slatt-Longhorn 500 kV	No Violations							
N-1: Snok Tap-Snoking 500 kV	No Violations							
N-1: Table Mtn-Tesla 500 kV	No Violations							
N-1: Table Mtn-Vaca Dixon 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	300.2	300.0	100.1%	370.0	81.1%
N-1: Table Mtn-Vaca Dixon 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	300.2	300.0	100.1%	370.0	81.1%
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations							
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	No Violations							
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	No Violations							
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Bridger-Populus #1 & #2 345 kV	BRIDGER (60085) -> BRI3MI11 (61999) CKT 1 at BRIDGER	Branch Amp	1065.7	1764.7	1600.0	110.3%	1840.0	95.9%
N-2: Bridger-Populus #1 & #2 345 kV	BRI3MI11 (61999) -> 3MIKNOLL (60084) CKT 1 at 3MIKNOLL	Branch Amp	1065.7	1738.8	1650.1	105.4%	2227.4	78.1%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	BRIDGER (60085) -> POPBRI11 (61968) CKT 1 at BRIDGER	Branch Amp	1022.3	1815.8	1492.7	121.6%	1849.2	98.2%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	POPBRI11 (61968) -> POPULUS (67790) CKT 1 at POPULUS	Branch Amp	1011.6	1800.1	1650.1	109.1%	2227.6	80.8%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	90.5	126.1	112.0	112.6%	146.7	86.0%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	ABSAROKE (62201)	% Δ Volts	0.956	0.878				8.16%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLBUSAT (62224)	% Δ Volts	0.976	0.901				7.68%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLUMBUS (62015)	% Δ Volts	0.979	0.904				7.66%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	BGTMBERA (62250)	% Δ Volts	1.010	0.936				7.33%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLRPLJE (62220)	% Δ Volts	1.001	0.930				7.09%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	DUCKCR-R (62325)	% Δ Volts	1.016	0.945				6.99%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	WILSALL (62019)	% Δ Volts	1.037	0.966				6.85%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLRPLJE (62205)	% Δ Volts	1.001	0.937				6.39%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	WILSALL (62016)	% Δ Volts	1.034	0.968				6.38%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	CLYDE P (62108)	% Δ Volts	1.027	0.966				5.94%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	AMPS (65025)	% Δ Volts	0.991	0.939				5.25%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	THRRIVER (62331)	% Δ Volts	1.033	0.979				5.23%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	BENCHLND (62230)	% Δ Volts	1.030	0.978				5.05%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	STANFRDM (62231)	% Δ Volts	1.033	0.981				5.03%
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	No Violations							
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	No Violations							
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations							
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations							
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations							
N-2: CusterW-Monroe #1 & #2 500 kV	No Violations							
N-2: DC-BIPOLE	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	326.8	300.0	108.9%	370.0	88.3%
N-2: DC-BIPOLE	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	326.8	300.0	108.9%	370.0	88.3%
N-2: Double Palo Verde	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	368.9	300.0	123.0%	370.0	99.7%
N-2: Double Palo Verde	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	368.9	300.0	123.0%	370.0	99.7%
N-2: Double Palo Verde	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO	Branch MVA	290.6	366.3	315.0	116.3%	394.0	93.0%
N-2: Double Palo Verde	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO	Branch MVA	290.6	364.8	315.0	115.8%	394.0	92.6%
N-2: Double Palo Verde	H ALLEN (18001) -> H ALLEN (18019) CKT 2 at H ALLEN	Branch MVA	298.4	377.4	357.0	105.7%	415.9	90.7%
N-2: Double Palo Verde	H ALLEN (18001) -> H ALLEN (18019) CKT 1 at H ALLEN	Branch MVA	298.4	377.4	357.0	105.7%	415.9	90.7%
N-2: Double Palo Verde	CHOLLA (14000) -> CHOSAG11 (14014) CKT 1 at CHOSAG11	Branch Amp	965.8	1059.9	1026.0	103.3%	1538.1	68.9%
N-2: Double Palo Verde	MONTROSE (79049)	% Δ Volts	1.020	0.968				5.10%
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations							
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations							
N-2: Garrison-Taft #1 & #2 500 kV + RAS	PLACIDLK (62344)	% Δ Volts	1.026	0.962				6.24%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	DIXON MV (40348)	% Δ Volts	1.026	0.969				5.56%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	SUPERRMT (62296)	% Δ Volts	1.022	0.967				5.38%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	RATTLE S (40867)	% Δ Volts	1.025	0.970				5.37%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	DIAMNDMT (62295)	% Δ Volts	1.022	0.968				5.28%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	TARKIO-R (62294)	% Δ Volts	1.025	0.971				5.27%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	HAMLTNMT (62074)	% Δ Volts	1.015	0.962				5.22%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	ST REGIS (62297)	% Δ Volts	1.020	0.967				5.20%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	ALBERTON (62293)	% Δ Volts	1.029	0.976				5.15%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	HUSON-R (62300)	% Δ Volts	1.032	0.979				5.14%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	HAUGEN (62298)	% Δ Volts	1.018	0.966				5.11%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	SALTESE (62299)	% Δ Volts	1.017	0.966				5.01%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	WALDORF (62091)	% Δ Volts	1.038	0.986				5.01%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	FRENCH-R (62292)	% Δ Volts	1.038	0.986				5.01%
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	301.2	300.0	100.4%	370.0	81.4%
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	301.2	300.0	100.4%	370.0	81.4%
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	No Violations							
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	301.6	300.0	100.5%	370.0	81.5%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	301.6	300.0	100.5%	370.0	81.5%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	No Violations							
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	310.8	300.0	103.6%	370.0	84.0%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	310.8	300.0	103.6%	370.0	84.0%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	BENTNAVA (48039) -> TAUNTON (48425) CKT 1 at BENTNAVA	Branch Amp	225.8	266.7	252.0	105.8%	271.1	98.4%
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	300.2	300.0	100.1%	370.0	81.1%
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	300.2	300.0	100.1%	370.0	81.1%
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV	No Violations							
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	No Violations							
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	No Violations							
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	No Violations							

Appendix B - 16la1sa_3400idnw_N Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Malin-Round Mtn #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	316.2	300.0	105.4%	370.0	85.5%
N-2: Malin-Round Mtn #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	316.2	300.0	105.4%	370.0	85.5%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	320.0	300.0	106.7%	370.0	86.5%
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	320.0	300.0	106.7%	370.0	86.5%
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations							
N-2: Napavine-Allston & Paul-Allston #2 500 kV	No Violations							
N-2: Paul-Napavine & Paul-Allston #2 500 kV	No Violations							
N-2: Paul-Raver & Raver-Covingt4 500 kV	No Violations							
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	No Violations							
N-2: Raver-Covington #1 & #2 500 kV	No Violations							
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations							
N-2: Raver-Paul & Napavine-Paul 500 kV	No Violations							
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations							
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations							
N-2: Raver-Schultz #1 & #2 500 kV	No Violations							
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations							
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations							
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	315.5	300.0	105.2%	370.0	85.3%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	315.5	300.0	105.2%	370.0	85.3%
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	BENTNAVA (48039) -> TAUNTON (48425) CKT 1 at BENTNAVA	Branch Amp	225.8	254.9	252.0	101.1%	271.1	94.0%
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	No Violations							
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	314.8	300.0	104.9%	370.0	85.1%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	314.8	300.0	104.9%	370.0	85.1%
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	303.0	300.0	101.0%	370.0	81.9%
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	303.0	300.0	101.0%	370.0	81.9%
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	302.9	300.0	101.0%	370.0	81.9%
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	302.9	300.0	101.0%	370.0	81.9%
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	BENTNAVA (48039) -> TAUNTON (48425) CKT 1 at BENTNAVA	Branch Amp	225.8	254.1	252.0	100.8%	271.1	93.7%
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	DWOR (41201)	% Δ Volts	1.0	1.0				5.09%
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	302.9	300.0	101.0%	370.0	81.9%
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	302.9	300.0	101.0%	370.0	81.9%
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	302.8	300.0	100.9%	370.0	81.8%
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	302.8	300.0	100.9%	370.0	81.8%
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	295.5	301.2	300.0	100.4%	370.0	81.4%
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	295.5	301.2	300.0	100.4%	370.0	81.4%
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations							

Appendix B - 16la1sa_3400idnw_N Base Case VQ Results V is the voltage at Qm & Qm is the Reactive Margin Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Harry Allen		Hemingway		Midpoint		Mill Creek		Pinto		Populus		Taft		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 11L12 MERIDIAN-KLAM FALLS 500 KV+KFGEN2+ST	0.70	-1142	0.71	-1821	0.75	-1628	0.73	-621	0.70	-719	0.80	-1445	0.90	-1250	0.70	-484
BF 11L22 CAPT JACK-KLAM FALLS 500 KV+KFGEN2+ST	0.70	-1141	0.71	-1833	0.75	-1636	0.73	-627	0.70	-717	0.80	-1452	0.90	-1265	0.70	-486
BF 11R1 MERIDIAN-KLAM FALLS 500 KV & MERIDIAN 500/230 KV XFMR	0.70	-1146	0.70	-1882	0.74	-1681	0.72	-630	0.70	-719	0.80	-1499	0.89	-1276	0.70	-488
BF 11R6 MERIDIAN-DIXONVILLE 500 KV & MERIDIAN 500/230 KV XFMR	0.70	-1143	0.70	-1901	0.74	-1696	0.72	-640	0.70	-717	0.80	-1511	0.89	-1305	0.70	-492
BF 4003 HANFORD-VANTAGE & HANFORD CAPS	0.70	-1142	0.70	-1912	0.74	-1705	0.72	-632	0.70	-716	0.80	-1519	0.89	-1280	0.70	-490
BF 4019 CAPTJACK-MALIN #2 & MALIN 500/230 XFMR	0.70	-1141	0.70	-1913	0.74	-1704	0.72	-645	0.70	-716	0.80	-1518	0.89	-1319	0.70	-493
BF 4028 TAFT-DWORSHAK & TAFT REACTOR 500KV	0.70	-1139	0.70	-1861	0.74	-1658	0.76	-570	0.70	-714	0.80	-1478	0.89	-857	0.70	-511
BF 4046 JOHN DAY-GRIZZLY #2 & GRIZZLY-MALIN #2 500 KV	0.70	-1137	0.70	-1878	0.74	-1704	0.72	-646	0.70	-712	0.80	-1520	0.89	-1318	0.70	-493
BF 4064 CAPTJACK-MALIN & MALIN-ROUND MTN #1 500 KV	0.70	-1138	0.70	-1933	0.73	-1724	0.72	-651	0.70	-713	0.80	-1537	0.89	-1333	0.70	-495
BF 4072 GRIZZLY-MALIN #2 & MALIN-ROUND MTN #2 500 KV	0.70	-1132	0.70	-1891	0.73	-1719	0.72	-651	0.70	-709	0.80	-1536	0.89	-1329	0.70	-495
BF 4095 LOW MON-HANFORD & HANFORD-WAUTOMA 500 KV	0.70	-1141	0.70	-1904	0.74	-1699	0.72	-637	0.70	-715	0.80	-1514	0.89	-1284	0.70	-494
BF 4104 ASHE-HANFORD & HANFORD-WAUTOMA 500 KV	0.70	-1141	0.70	-1901	0.74	-1700	0.73	-623	0.70	-716	0.80	-1517	0.89	-1252	0.70	-489
BF 4111 HOT SPRINGS-TAFT & TAFT-DWORSHAK 500 KV	0.70	-1139	0.70	-1865	0.74	-1661	0.75	-586	0.70	-714	0.80	-1481	0.88	-843	0.70	-512
BF 4114 GARRISON-TAFT #1 +TAFT REACTOR 500KV	0.70	-1135	0.71	-1812	0.75	-1617	0.78	-428	0.70	-712	0.80	-1438	0.90	-990	0.75	-455
BF 4119 GARRISON-TAFT #1 & TAFT-BELL 500KV + RAS	0.70	-1125	0.72	-1647	0.76	-1487	0.83	-385	0.70	-706	0.81	-1321	0.90	-555	0.74	-500
BF 4131 SLATT-JOHN DAY & JOHN DAY-GRIZZLY #2 500 KV	0.70	-1138	0.70	-1895	0.74	-1700	0.72	-637	0.70	-713	0.80	-1520	0.89	-1295	0.70	-492
BF 4143 (OR 4134) JOHN DAY-GRIZZLY #1 & JOHN DAY CAPS 500 KV	0.70	-1141	0.70	-1902	0.74	-1698	0.72	-643	0.70	-715	0.80	-1514	0.89	-1314	0.70	-493
BF 4148 HOT SPRINGS-TAFT & GARRISON-TAFT #2 500 KV	0.70	-1136	0.71	-1838	0.75	-1637	0.77	-507	0.70	-712	0.80	-1454	0.88	-1216	0.73	-492
BF 4170 JOHN DAY-MARION & JOHN DAY CAPS 500 KV	0.70	-1141	0.70	-1903	0.74	-1699	0.72	-641	0.70	-715	0.80	-1515	0.89	-1305	0.70	-493
BF 4186 (OR 4582) MALIN-ROUND MTN 500 KV & MALIN 500/230 XFMR	0.70	-1136	0.70	-1911	0.74	-1709	0.72	-647	0.70	-712	0.80	-1527	0.89	-1323	0.70	-495
BF 4194 ROCK CK-JOHN DAY & BIG EDDY-JOHN DAY 500 KV	0.70	-1142	0.70	-1910	0.74	-1704	0.72	-642	0.70	-716	0.80	-1518	0.89	-1311	0.70	-492
BF 4197 JOHN DAY-BIG EDDY #1 & JOHN DAY CAPS 500 KV	0.70	-1142	0.70	-1916	0.74	-1707	0.72	-642	0.70	-716	0.80	-1520	0.89	-1312	0.70	-492
BF 4202 JOHN DAY-BIG EDDY#2 & BIG EDDY-OSTRANDER 500 KV	0.70	-1142	0.70	-1906	0.74	-1701	0.72	-637	0.70	-716	0.80	-1516	0.89	-1295	0.70	-491
BF 4231 MCNARY-LONGHORN 500 KV & MCNARY 500/230 KV XFMR	0.70	-1141	0.70	-1884	0.74	-1699	0.72	-644	0.70	-715	0.80	-1517	0.89	-1317	0.70	-492
BF 4234 MCNARY-LONGHORN & MCNARY-HERMCALP 500 KV	0.70	-1143	0.72	-1773	0.75	-1591	0.74	-610	0.70	-721	0.81	-1409	0.90	-1225	0.70	-479
BF 4247 LIT GOOS-LOW MON #2 & LOW MON-MCNARY 500 KV	0.70	-1142	0.70	-1907	0.74	-1702	0.72	-632	0.70	-716	0.80	-1517	0.89	-1259	0.70	-492
BF 4259 LIT GOOS-LOW MON #2 & LOW MON-HANFORD 500 KV	0.70	-1141	0.70	-1903	0.74	-1707	0.72	-650	0.70	-715	0.80	-1519	0.89	-1324	0.70	-494
BF 4268 MONROE-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.70	-1142	0.70	-1915	0.74	-1706	0.72	-644	0.70	-716	0.80	-1519	0.89	-1312	0.70	-494
BF 4276 ING500-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.70	-1142	0.70	-1917	0.74	-1707	0.72	-645	0.70	-716	0.80	-1520	0.89	-1319	0.70	-494
BF 4280 KEELER-PEARL & PEARL-MARION 500 KV	0.70	-1144	0.70	-1911	0.74	-1704	0.72	-635	0.70	-717	0.80	-1517	0.89	-1292	0.70	-490
BF 4280 KEELER-PEARL & PEARL-OSTRANDER 500 KV	0.70	-1142	0.70	-1918	0.74	-1708	0.72	-645	0.70	-716	0.80	-1521	0.89	-1318	0.70	-493
BF 4287 PEARL-OSTRANDER 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.70	-1142	0.70	-1918	0.74	-1708	0.72	-645	0.70	-716	0.80	-1520	0.89	-1320	0.70	-493
BF 4293 SCHULTZ-RAVER & RAVER COVINGTON5 500 KV	0.70	-1142	0.70	-1913	0.74	-1705	0.72	-642	0.70	-716	0.80	-1518	0.89	-1307	0.70	-493
BF 4336 CHIEF JO-SICKLER 500 KV & SICKLER 500/230 XFMR	0.70	-1142	0.70	-1916	0.74	-1706	0.72	-645	0.70	-716	0.80	-1519	0.89	-1315	0.70	-494
BF 4336 SICKLER-SCHULTZ 500 KV & SICKLER 500/230 XFMR	0.70	-1142	0.70	-1916	0.74	-1706	0.72	-646	0.70	-716	0.80	-1519	0.89	-1319	0.70	-494
BF 4377 ASHE-MARION & MARION-ALVEY 500 KV	0.70	-1139	0.70	-1897	0.74	-1696	0.72	-646	0.70	-714	0.80	-1513	0.89	-1316	0.70	-495
BF 4386 BUCKLEY-MARION & MARION-SANTIAM 500 KV	0.70	-1141	0.70	-1900	0.74	-1699	0.72	-637	0.70	-715	0.80	-1515	0.89	-1296	0.70	-491
BF 4432 OSTRANDER-TROUTDALE & SPLIT OSTRANDER 500 KV	0.70	-1141	0.70	-1886	0.74	-1689	0.72	-634	0.70	-715	0.80	-1508	0.89	-1284	0.70	-492
BF 4439 BIG EDDY-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.70	-1142	0.70	-1906	0.74	-1701	0.72	-640	0.70	-716	0.80	-1516	0.89	-1303	0.70	-492
BF 4442 BIG EDDY-OSTRANDER 500 KV & OSTRANDER-MCLOUGHLIN 230 KV	0.70	-1142	0.70	-1908	0.74	-1702	0.72	-641	0.70	-716	0.80	-1516	0.89	-1307	0.70	-492
BF 4448 KNIGHT-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.70	-1141	0.70	-1903	0.74	-1699	0.72	-641	0.70	-716	0.80	-1514	0.89	-1305	0.70	-493
BF 4450 KNIGHT-OSTRANDER & OSTRANDER-PEARL 500 KV	0.70	-1141	0.70	-1907	0.74	-1701	0.72	-642	0.70	-716	0.80	-1516	0.89	-1308	0.70	-493
BF 4502 PAUL-ALLSTON & ALLSTON-KEELER 500 KV	0.70	-1141	0.70	-1913	0.74	-1705	0.72	-648	0.70	-716	0.80	-1518	0.89	-1325	0.70	-495
BF 4510 PEARL-MARION 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.70	-1144	0.70	-1911	0.74	-1703	0.72	-635	0.70	-717	0.80	-1517	0.89	-1291	0.70	-490
BF 4526 CUSTERW-MONROE & MONROE-ECHO LAKE 500 KV	0.70	-1142	0.70	-1913	0.74	-1704	0.72	-641	0.70	-716	0.80	-1518	0.89	-1304	0.70	-493
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV	0.70	-1143	0.70	-1916	0.74	-1706	0.72	-634	0.70	-716	0.80	-1519	0.89	-1287	0.70	-491

Appendix B - 16la1sa_3400idnw_N Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Harry Allen		Hemingway		Midpoint		Mill Creek		Pinto		Populus		Taft		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 4540 PAUL-NAPAVINE & PAUL-SATSOP 500 KV	0.70	-1142	0.70	-1916	0.74	-1706	0.72	-643	0.70	-716	0.80	-1519	0.89	-1312	0.70	-493
BF 4542 PAUL-ALLSTON 500 KV & CENTER G2	0.70	-1142	0.72	-1754	0.76	-1565	0.74	-593	0.70	-720	0.81	-1383	0.90	-1182	0.71	-469
BF 4542 PAUL-NAPAVINE 500 KV & CENTER G1	0.70	-1142	0.72	-1767	0.75	-1575	0.74	-594	0.70	-720	0.81	-1392	0.90	-1186	0.71	-469
BF 4550 OLYMPIA-PAUL & PAUL-ALLSTON 500 KV	0.70	-1142	0.70	-1914	0.74	-1704	0.72	-645	0.70	-716	0.80	-1517	0.89	-1319	0.70	-493
BF 4554 OLYMPIA-PAUL 500 KV & TONO 500/115 XFMR	0.70	-1142	0.70	-1918	0.74	-1707	0.72	-641	0.70	-716	0.80	-1519	0.89	-1310	0.70	-492
BF 4572 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.70	-1141	0.70	-1904	0.74	-1701	0.72	-634	0.70	-715	0.80	-1517	0.89	-1267	0.70	-492
BF 4630 CEN FERRY-LIT GOOS #1 & LIT GOOS-LOW MON #1 500 KV	0.70	-1142	0.70	-1913	0.74	-1704	0.72	-641	0.70	-716	0.80	-1518	0.89	-1299	0.70	-494
BF 4652 TAFT-DWORSHAK & TAFT-HATWAI 500 KV + RAS	0.70	-1141	0.71	-1824	0.75	-1620	0.78	-526	0.70	-718	0.80	-1436	0.91	-744	0.70	-496
BF 4672 MONROE-CHIEF JO 500 KV & MONROE CAPS	0.70	-1142	0.70	-1911	0.74	-1703	0.72	-640	0.70	-716	0.80	-1517	0.89	-1298	0.70	-493
BF 4676 LIT GOOS-LOW MON & LOW MON-ASHE 500 KV	0.70	-1141	0.70	-1920	0.74	-1708	0.72	-654	0.70	-716	0.80	-1520	0.89	-1335	0.70	-496
BF 4690 PAUL-ALLSTON 500 KV & ALLSTON 500/230 XFMR	0.70	-1142	0.70	-1914	0.74	-1705	0.72	-647	0.70	-716	0.80	-1519	0.89	-1323	0.70	-494
BF 4708 HATWAI 500 KV BUS	0.70	-1136	0.70	-1844	0.74	-1646	0.77	-509	0.70	-712	0.80	-1463	0.88	-750	0.71	-501
BF 4728 COULEE-CHIEF JO 500 KV & CHEIF JO 500/230 XFMR	0.70	-1141	0.70	-1911	0.74	-1703	0.72	-642	0.70	-716	0.80	-1516	0.89	-1301	0.70	-494
BF 4775 CEN FERRY-LOW GRAN #1 & #2 500 KV	0.70	-1135	0.70	-1850	0.74	-1656	0.73	-621	0.70	-711	0.80	-1474	0.89	-1023	0.70	-511
BF 4776 HATWAI-LOW GRAN & LOW GRAN-CEN FERRY 500 KV	0.70	-1136	0.70	-1858	0.74	-1662	0.75	-586	0.70	-712	0.80	-1480	0.89	-946	0.70	-507
BF 4870 JOHN DAY-BIG EDDY 500 KV & BIG EDDY 500/230 KV	0.70	-1142	0.70	-1915	0.74	-1707	0.72	-642	0.70	-716	0.80	-1520	0.89	-1311	0.70	-492
BF 4888 ASHE-SLATT & CGS 500 KV	0.70	-1143	0.73	-1678	0.76	-1499	0.76	-560	0.70	-724	0.81	-1320	0.91	-1110	0.72	-450
BF 4891 LOW MON-ASHE & ASHE-SLATT 500 KV	0.70	-1141	0.70	-1896	0.74	-1697	0.72	-633	0.70	-715	0.80	-1514	0.89	-1269	0.70	-493
BF 4901 LOW MON-ASHE & ASHE-HANFORD 500 KV	0.70	-1142	0.70	-1890	0.74	-1696	0.73	-617	0.70	-716	0.80	-1516	0.90	-1226	0.70	-485
BF 4940 LOW MON-ASHE & ASHE-MARION 500 KV	0.70	-1139	0.70	-1893	0.74	-1693	0.72	-642	0.70	-714	0.80	-1510	0.89	-1294	0.70	-496
BF 4957 SUMMER L-MALIN & SUMMER L-HEMINGWAY 500 KV	0.70	-1066	0.70	-1476	0.73	-1562	0.77	-506	0.70	-658	0.81	-1571	0.92	-987	0.73	-423
BF 4959 GRIZZLY-SUMMER L & SUMMER L-MALIN 500 KV	0.70	-1070	0.71	-1549	0.72	-1635	0.77	-518	0.70	-661	0.81	-1642	0.92	-1012	0.73	-432
BF 4996 CAPTJACK-MALIN #1 & #2 500 KV	0.70	-1143	0.70	-1928	0.74	-1715	0.72	-647	0.70	-717	0.80	-1527	0.89	-1326	0.70	-493
BF 5003 SLATT-BUCKLEY & SLATT-BOARDMAN 500 KV	0.70	-1134	0.70	-1886	0.73	-1706	0.72	-636	0.70	-710	0.80	-1533	0.89	-1292	0.70	-491
BF 5006 SLATT-LONGHORN & SLATT-GRASSLAND 500 KV	0.70	-1129	0.70	-1882	0.73	-1716	0.73	-618	0.70	-706	0.80	-1550	0.90	-1239	0.70	-485
BF 5015 ASHE-SLATT & SLATT-BUCKLEY 500 KV	0.70	-1137	0.70	-1900	0.74	-1705	0.72	-636	0.70	-712	0.80	-1524	0.89	-1283	0.70	-493
BF 5018 ASHE-SLATT & SLATT-JOHN DAY 500 KV	0.70	-1138	0.70	-1897	0.73	-1708	0.73	-627	0.70	-713	0.80	-1528	0.89	-1263	0.70	-489
BF 5021 SLATT-JOHN DAY & SLATT-LONGHORN 500 KV	0.70	-1138	0.70	-1906	0.74	-1708	0.72	-640	0.70	-713	0.80	-1525	0.89	-1301	0.70	-493
BF 5028 BUCKLEY-GRIZZLY & GRIZZLY-SUMMER LAKE 500 KV	0.70	-1141	0.70	-1882	0.74	-1694	0.72	-637	0.70	-715	0.80	-1518	0.89	-1300	0.70	-490
BF 5040 GRIZZLY-JOHN DAY & GRIZZLY-ROUND BU 500 KV	0.70	-1141	0.70	-1898	0.74	-1696	0.72	-643	0.70	-715	0.80	-1513	0.89	-1312	0.70	-493
BF 5114 ECHO LAKE-RAVER & ECHO LAKE- SNOK TAP 500 KV	0.70	-1142	0.70	-1918	0.74	-1707	0.72	-642	0.70	-716	0.80	-1520	0.89	-1311	0.70	-493
BF 5117 ECHO LAKE-MAPLE VALLEY & ECHO LAKE-RAVER 500 KV	0.70	-1142	0.70	-1912	0.74	-1704	0.72	-641	0.70	-716	0.80	-1517	0.89	-1304	0.70	-493
BF 5148 COULEE-SCHULTZ & ECHO LAKE-SCHULTZ 500 KV	0.70	-1141	0.70	-1901	0.74	-1696	0.72	-632	0.70	-715	0.80	-1512	0.89	-1268	0.70	-494
BF 5170 WAUTOMA-SCHULTZ & SCHULTZ-RAVER 500 KV	0.70	-1142	0.70	-1910	0.74	-1704	0.73	-625	0.70	-716	0.80	-1518	0.89	-1262	0.70	-489
BF 5179 VANTAGE-SCHULTZ & SCHULTZ-RAVER #4	0.70	-1142	0.70	-1912	0.74	-1705	0.72	-634	0.70	-716	0.80	-1518	0.89	-1285	0.70	-491
BF 5187 MCNARY-LONGHORN & LONGHORN-SLATT 500 KV	0.70	-1141	0.70	-1896	0.74	-1705	0.72	-641	0.70	-715	0.80	-1522	0.89	-1307	0.70	-493
BF 5193 GRASSLAND-COYOTE & COYOTE-LONGHORN 500 KV	0.70	-1142	0.71	-1760	0.75	-1592	0.73	-618	0.70	-719	0.81	-1415	0.90	-1246	0.70	-482
BF 5211 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.70	-1141	0.70	-1895	0.74	-1700	0.72	-634	0.70	-715	0.80	-1517	0.89	-1266	0.70	-491
BF 5214 LOW MON-MCNARY & CALPINE PH 500 KV	0.70	-1143	0.72	-1762	0.76	-1581	0.74	-606	0.70	-720	0.81	-1401	0.90	-1202	0.70	-479
BF 5250 HANFORD-WAUTOMA#1 & WAUTOMA-KNIGHT 500 KV	0.70	-1141	0.70	-1906	0.74	-1701	0.72	-644	0.70	-715	0.80	-1516	0.89	-1308	0.70	-495
BF 5259 HANFORD-WAUTOMA#2 & WAUTOMA-ROCK CK 500 KV	0.70	-1142	0.70	-1908	0.74	-1702	0.72	-638	0.70	-716	0.80	-1517	0.89	-1294	0.70	-492
BF 5266 SLATT-BUCKLY 500 KV	0.70	-1138	0.70	-1914	0.73	-1710	0.72	-646	0.70	-713	0.80	-1525	0.89	-1317	0.70	-495
BF 5339 VANTAGE-SCHULTZ 500 KV & VANTAGE 500/230 XFMR #1	0.70	-1142	0.70	-1915	0.74	-1706	0.72	-636	0.70	-716	0.80	-1519	0.89	-1294	0.70	-491
BF 5345 VANTAGE-HANFORD 500 KV & VANTAGE 500/230 XFMR #1	0.70	-1142	0.70	-1912	0.74	-1705	0.72	-632	0.70	-716	0.80	-1519	0.89	-1280	0.70	-490
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR	0.70	-1073	0.70	-1074	0.74	-1286	0.80	-450	0.70	-664	0.83	-1343	0.94	-870	0.75	-381
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR + RAS	0.70	-1069	0.70	-964	0.73	-1269	0.80	-443	0.70	-661	0.83	-1321	0.94	-856	0.75	-378

Appendix B - 16la1sa_3400idnw_N Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Harry Allen		Hemingway		Midpoint		Mill Creek		Pinto		Populus		Taft		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF IPC HEMINGWAY-SUMMER L 500 KV & HEMINGWAY 500/230 XFMR	0.70	-1069	0.70	-1296	0.73	-1490	0.77	-501	0.70	-660	0.82	-1511	0.92	-979	0.74	-419
BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.70	-1088	0.70	-1148	0.73	-1294	0.77	-510	0.70	-675	0.78	-1220	0.92	-1008	0.73	-427
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR	0.70	-1076	0.70	-1423	0.74	-1224	0.79	-466	0.70	-665	0.82	-1133	0.94	-914	0.75	-386
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR + RAS	0.70	-1039	0.70	-1335	0.73	-992	0.82	-380	0.70	-635	0.83	-1082	0.95	-736	0.77	-330
BF LOLO 230KV	0.70	-1136	0.70	-1873	0.74	-1691	0.73	-623	0.70	-712	0.80	-1514	0.90	-1258	0.70	-484
BF PGE GRASSLAND-CEDAR SPRING & HEMINGWAY-GRASSLAND 500 KV	0.70	-1072	0.70	-1213	0.74	-1334	0.80	-428	0.70	-663	0.82	-1388	0.94	-827	0.76	-373
BF PGE GRASSLAND-COYOTE 500 KV & CARTY GAS PROJECT	0.70	-1142	0.70	-1876	0.74	-1692	0.72	-644	0.70	-716	0.80	-1511	0.89	-1318	0.70	-493
BF PGE SLATT-GRASSLAND 500 KV & BOARDMAN COAL GEN	0.70	-1139	0.71	-1734	0.75	-1570	0.74	-609	0.70	-717	0.81	-1403	0.90	-1230	0.70	-479
BUS: ALVEY 500 KV	0.70	-1141	0.70	-1902	0.74	-1699	0.72	-643	0.70	-715	0.80	-1514	0.89	-1311	0.70	-493
BUS: BELL BPA 500 KV	0.70	-1128	0.71	-1720	0.75	-1552	0.80	-448	0.70	-707	0.80	-1384	0.88	-595	0.73	-498
BUS: BUCKLEY 500 KV	0.70	-1137	0.70	-1887	0.74	-1693	0.72	-636	0.70	-713	0.80	-1513	0.89	-1288	0.70	-492
BUS: DIXONVILLE 500 KV	0.70	-1142	0.70	-1906	0.74	-1700	0.72	-642	0.70	-716	0.80	-1514	0.89	-1312	0.70	-492
BUS: HOT SPRINGS 500 KV	0.70	-1142	0.70	-1921	0.74	-1710	0.71	-661	0.70	-716	0.80	-1523	0.88	-1335	0.70	-495
BUS: KEELER 500 KV	0.70	-1142	0.70	-1913	0.74	-1705	0.72	-648	0.70	-716	0.80	-1518	0.89	-1325	0.70	-494
BUS: ROCK CREEK 500 KV	0.70	-1141	0.70	-1889	0.74	-1686	0.72	-635	0.70	-716	0.80	-1501	0.89	-1288	0.70	-491
BUS: SICKLER 500 KV	0.70	-1142	0.70	-1913	0.74	-1705	0.72	-642	0.70	-716	0.80	-1518	0.89	-1307	0.70	-494
BUS: SUMMER LAKE 500 KV	0.70	-1066	0.70	-1478	0.73	-1564	0.77	-507	0.70	-658	0.81	-1573	0.92	-990	0.73	-425
N-1: ALLSTON-KEELER 500 KV	0.70	-1141	0.70	-1913	0.74	-1705	0.72	-649	0.70	-716	0.80	-1518	0.89	-1328	0.70	-495
N-1: ALLSTON-NAPAVINE 500 KV	0.70	-1142	0.70	-1914	0.74	-1705	0.72	-647	0.70	-716	0.80	-1518	0.89	-1324	0.70	-494
N-1: ALLSTON-PAUL #2 500 KV	0.70	-1142	0.70	-1914	0.74	-1705	0.72	-647	0.70	-716	0.80	-1519	0.89	-1323	0.70	-494
N-1: ALVERY-DIXONVILLE 500 KV	0.70	-1142	0.70	-1910	0.74	-1702	0.72	-644	0.70	-716	0.80	-1517	0.89	-1316	0.70	-493
N-1: ALVEY-MARION 500 KV	0.70	-1140	0.70	-1914	0.74	-1706	0.72	-646	0.70	-715	0.80	-1520	0.89	-1321	0.70	-494
N-1: ASHE-HANFORD 500 KV	0.70	-1141	0.70	-1903	0.74	-1701	0.73	-624	0.70	-716	0.80	-1518	0.89	-1256	0.70	-489
N-1: ASHE-LOW MON 500 KV	0.70	-1141	0.70	-1909	0.74	-1702	0.72	-641	0.70	-715	0.80	-1516	0.89	-1297	0.70	-495
N-1: ASHE-MARION 500 KV	0.70	-1140	0.70	-1901	0.74	-1698	0.72	-646	0.70	-715	0.80	-1513	0.89	-1317	0.70	-495
N-1: ASHE-SLATT 500 KV	0.70	-1142	0.70	-1904	0.74	-1702	0.72	-637	0.70	-716	0.80	-1518	0.89	-1291	0.70	-492
N-1: BELL-COULEE 500 KV	0.70	-1137	0.70	-1858	0.74	-1660	0.73	-611	0.70	-712	0.80	-1478	0.88	-1038	0.70	-511
N-1: BELL-TAFT 500 KV	0.70	-1129	0.71	-1721	0.75	-1553	0.80	-442	0.70	-707	0.80	-1386	0.88	-587	0.74	-494
N-1: BIG EDDY-CELILO 500 KV	0.70	-1142	0.70	-1918	0.74	-1708	0.72	-646	0.70	-716	0.80	-1520	0.89	-1321	0.70	-493
N-1: BIG EDDY-JOHN DAY 500 KV	0.70	-1142	0.70	-1916	0.74	-1707	0.72	-642	0.70	-716	0.80	-1520	0.89	-1312	0.70	-492
N-1: BIG EDDY-KNIGHT 500 KV	0.70	-1142	0.70	-1914	0.74	-1705	0.72	-643	0.70	-716	0.80	-1519	0.89	-1315	0.70	-492
N-1: BIG EDDY-OSTRANDER 500 KV	0.70	-1142	0.70	-1909	0.74	-1703	0.72	-641	0.70	-716	0.80	-1517	0.89	-1306	0.70	-492
N-1: BOISE BENCH-BROWNLEE #3 230 KV	0.70	-1141	0.70	-1886	0.74	-1678	0.72	-644	0.70	-716	0.80	-1506	0.89	-1318	0.70	-493
N-1: BRADY-ANTELOPE 230 KV + RAS	0.70	-1134	0.70	-1835	0.73	-1647	0.72	-617	0.70	-709	0.80	-1487	0.90	-1324	0.70	-479
N-1: BROADVIEW-GARRISON #1 500 KV	0.70	-1137	0.73	-1773	0.76	-1597	0.81	-383	0.70	-713	0.81	-1408	0.95	-764	0.81	-380
N-1: BROWNLEE-ONTARIO 230 KV	0.70	-1142	0.70	-1873	0.74	-1673	0.72	-644	0.70	-716	0.80	-1501	0.89	-1318	0.70	-493
N-1: BUCKLEY-GRIZZLY 500 KV	0.70	-1140	0.70	-1911	0.74	-1703	0.72	-646	0.70	-715	0.80	-1518	0.89	-1319	0.70	-494
N-1: BUCKLEY-MARION 500 KV	0.70	-1141	0.70	-1902	0.74	-1700	0.72	-637	0.70	-715	0.80	-1516	0.89	-1296	0.70	-491
N-1: BUCKLEY-SLATT 500 KV	0.70	-1138	0.70	-1914	0.73	-1710	0.72	-646	0.70	-713	0.80	-1525	0.89	-1317	0.70	-495
N-1: CAL SUB 120 KV PHASE SHIFTER	0.70	-1138	0.70	-1889	0.74	-1688	0.72	-640	0.70	-714	0.80	-1507	0.89	-1308	0.70	-491
N-1: CAPTAIN JACK-OLINDA 500 KV	0.70	-1132	0.70	-1923	0.73	-1724	0.72	-652	0.70	-708	0.80	-1542	0.89	-1332	0.70	-497
N-1: CAPTJACK-KFALLS 500 KV	0.70	-1141	0.70	-1908	0.74	-1702	0.72	-645	0.70	-715	0.80	-1517	0.89	-1319	0.70	-493
N-1: CASCADE CROSSING 500 KV	0.70	-1138	0.70	-1904	0.74	-1706	0.72	-634	0.70	-713	0.80	-1525	0.89	-1286	0.70	-491
N-1: CHIEF JO-COULEE 500 KV	0.70	-1142	0.70	-1911	0.74	-1702	0.72	-641	0.70	-716	0.80	-1516	0.89	-1298	0.70	-494
N-1: CHIEF JO-MONROE 500 KV	0.70	-1142	0.70	-1911	0.74	-1703	0.72	-640	0.70	-716	0.80	-1517	0.89	-1298	0.70	-493
N-1: CHIEF JO-SICKLER 500 KV	0.70	-1142	0.70	-1915	0.74	-1705	0.72	-644	0.70	-716	0.80	-1519	0.89	-1313	0.70	-494

Appendix B - 16la1sa_3400idnw_N Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Harry Allen		Hemingway		Midpoint		Mill Creek		Pinto		Populus		Taft		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: COULEE-HANFORD 500 KV	0.70	-1142	0.70	-1912	0.74	-1704	0.72	-631	0.70	-716	0.80	-1518	0.89	-1276	0.70	-491
N-1: COULEE-SCHULTZ 500 KV	0.70	-1141	0.70	-1908	0.74	-1701	0.72	-639	0.70	-716	0.80	-1515	0.89	-1292	0.70	-494
N-1: COVINGTON4-RAVER 500 KV	0.70	-1142	0.70	-1918	0.74	-1707	0.72	-645	0.70	-716	0.80	-1520	0.89	-1320	0.70	-493
N-1: COVINGTON5-RAVER 500 KV	0.70	-1142	0.70	-1918	0.74	-1707	0.72	-645	0.70	-716	0.80	-1520	0.89	-1319	0.70	-493
N-1: COYOTE-LONGHORN 500 KV	0.70	-1141	0.70	-1910	0.74	-1710	0.72	-642	0.70	-715	0.80	-1525	0.89	-1312	0.70	-492
N-1: CUSTERW-MONROE 500 KV	0.70	-1142	0.70	-1916	0.74	-1706	0.72	-644	0.70	-716	0.80	-1519	0.89	-1312	0.70	-493
N-1: DIXONVILLE-MERIDIAN 500 KV	0.70	-1142	0.70	-1902	0.74	-1697	0.72	-640	0.70	-716	0.80	-1512	0.89	-1307	0.70	-492
N-1: DRYCREEK-LOLO 230 KV	0.70	-1142	0.70	-1918	0.74	-1707	0.72	-645	0.70	-716	0.80	-1520	0.89	-1319	0.70	-493
N-1: DRYCREEK-N LEWISTON 230 KV	0.70	-1142	0.70	-1918	0.74	-1707	0.72	-645	0.70	-716	0.80	-1520	0.89	-1319	0.70	-493
N-1: DRYCREEK-WALA AVA 230 KV	0.70	-1142	0.70	-1916	0.74	-1707	0.72	-642	0.70	-716	0.80	-1521	0.89	-1310	0.70	-492
N-1: DWORSHAK-HATWAI 500 KV	0.70	-1138	0.70	-1861	0.74	-1653	0.77	-512	0.70	-714	0.80	-1470	0.88	-761	0.71	-500
N-1: DWORSHAK-TAFT 500 KV	0.70	-1139	0.70	-1861	0.74	-1658	0.76	-570	0.70	-714	0.80	-1478	0.89	-857	0.70	-511
N-1: ECHO LAKE-MAPLE VALLEY 500 KV	0.70	-1142	0.70	-1913	0.74	-1704	0.72	-641	0.70	-716	0.80	-1518	0.89	-1304	0.70	-493
N-1: ECHO LAKE-RAVER 500 KV	0.70	-1142	0.70	-1917	0.74	-1707	0.72	-644	0.70	-716	0.80	-1520	0.89	-1315	0.70	-493
N-1: ECHO LAKE-SCHULTZ 500 KV	0.70	-1142	0.70	-1911	0.74	-1703	0.72	-639	0.70	-716	0.80	-1517	0.89	-1298	0.70	-493
N-1: ECHO LAKE-SNOK TAP 500 KV	0.70	-1142	0.70	-1918	0.74	-1708	0.72	-643	0.70	-716	0.80	-1521	0.89	-1315	0.70	-493
N-1: GARRISON-TAFT #2 500 KV	0.70	-1135	0.71	-1812	0.75	-1617	0.78	-428	0.70	-712	0.80	-1438	0.90	-990	0.75	-455
N-1: GOLDHILL-PLACER 115 KV	0.70	-1142	0.70	-1919	0.74	-1709	0.72	-646	0.70	-716	0.80	-1522	0.89	-1321	0.70	-493
N-1: GRASSLAND-COYOTE 500 KV	0.70	-1142	0.70	-1876	0.74	-1692	0.72	-644	0.70	-716	0.80	-1511	0.89	-1318	0.70	-493
N-1: GRASSLAND-SLATT 500 KV	0.70	-1137	0.70	-1891	0.73	-1706	0.72	-634	0.70	-712	0.80	-1531	0.89	-1290	0.70	-489
N-1: GRIZZLY-JOHN DAY #2 500 KV	0.70	-1141	0.70	-1902	0.74	-1698	0.72	-643	0.70	-715	0.80	-1514	0.89	-1314	0.70	-493
N-1: GRIZZLY-MALIN 500 KV	0.70	-1138	0.70	-1897	0.74	-1697	0.72	-643	0.70	-713	0.80	-1515	0.89	-1311	0.70	-494
N-1: GRIZZLY-PONDEROSA A-SUMMER L 500 KV	0.70	-1142	0.70	-1887	0.74	-1696	0.72	-637	0.70	-716	0.80	-1519	0.89	-1300	0.70	-490
N-1: GRIZZLY-PONDEROSA B-CAPT JACK 500 KV	0.70	-1138	0.70	-1896	0.74	-1696	0.72	-644	0.70	-713	0.80	-1515	0.89	-1312	0.70	-494
N-1: GRIZZLY-ROUND BU 500 KV	0.70	-1142	0.70	-1915	0.74	-1706	0.72	-645	0.70	-716	0.80	-1519	0.89	-1319	0.70	-493
N-1: HANFORD-LOW MON 500 KV	0.70	-1141	0.70	-1907	0.74	-1701	0.72	-638	0.70	-715	0.80	-1515	0.89	-1289	0.70	-494
N-1: HANFORD-VANTAGE 500 KV	0.70	-1142	0.70	-1912	0.74	-1705	0.72	-632	0.70	-716	0.80	-1519	0.89	-1280	0.70	-490
N-1: HANFORD-WAUTOMA 500 KV	0.70	-1142	0.70	-1916	0.74	-1706	0.72	-645	0.70	-716	0.80	-1519	0.89	-1315	0.70	-494
N-1: HARRY ALLEN 345 KV PHASE SHIFTER	0.70	-982	0.74	-1517	0.77	-1362	0.74	-584	0.70	-596	0.82	-1232	0.91	-1163	0.71	-467
N-1: HATWAI 500/230 KV XFMR	0.70	-805	0.70	-1892	0.74	-1713	0.72	-641	0.70	-708	0.80	-1523	0.89	-1300	0.70	-492
N-1: HATWAI-LOLO 230 KV	0.70	-1142	0.70	-1918	0.74	-1707	0.72	-644	0.70	-716	0.80	-1520	0.89	-1315	0.70	-493
N-1: HATWAI-LOW GRAN 500 KV	0.70	-1142	0.70	-1916	0.74	-1663	0.74	-586	0.70	-716	0.80	-1481	0.89	-947	0.70	-493
N-1: HATWAI-N LEWISTON 230 KV	0.70	-1136	0.70	-1860	0.74	-1708	0.72	-645	0.70	-712	0.80	-1520	0.89	-1318	0.70	-508
N-1: HELLS CANYON-BROWNLEE 230 KV	0.70	-1142	0.70	-1918	0.74	-1661	0.72	-639	0.70	-716	0.80	-1494	0.89	-1304	0.70	-493
N-1: HELLS CANYON-WALLA WALLA 230 KV	0.70	-1141	0.71	-1839	0.74	-1667	0.73	-619	0.70	-716	0.80	-1500	0.90	-1251	0.70	-490
N-1: HEMINGWAY-GRASSLAND 500 KV	0.70	-1134	0.70	-1831	0.74	-1356	0.80	-458	0.70	-710	0.82	-1410	0.93	-894	0.70	-484
N-1: HEMINGWAY-SUMMER LAKE 500 KV	0.70	-1075	0.70	-1235	0.73	-1555	0.77	-503	0.70	-666	0.81	-1563	0.92	-981	0.75	-388
N-1: HILL TOP 345/230 XFMR	0.70	-1070	0.70	-1470	0.74	-1639	0.73	-626	0.70	-660	0.80	-1467	0.90	-1265	0.74	-420
N-1: HORSE HV-MCNARY 230 KV	0.70	-1136	0.70	-1826	0.74	-1707	0.72	-645	0.70	-713	0.80	-1520	0.89	-1319	0.70	-486
N-1: HOT SPRINGS-TAFT 500 KV	0.70	-1141	0.70	-1917	0.74	-1703	0.73	-610	0.70	-716	0.80	-1516	0.89	-1228	0.70	-493
N-1: HUMBOLDT-COYOTE CK 345 KV	0.70	-1142	0.70	-1912	0.75	-1493	0.72	-635	0.70	-716	0.81	-1413	0.89	-1292	0.70	-491
N-1: HUNTINGTON-PINTO-FOUR CORNERS 345 KV	0.70	-1139	0.70	-1849	0.77	-1404	0.74	-596	0.70	-714	0.82	-1277	0.90	-1205	0.70	-493
N-1: ING500-CUSTERW 500 KV	0.70	-1025	0.73	-1560	0.74	-1707	0.72	-645	0.70	-716	0.80	-1520	0.89	-1319	0.70	-476
N-1: JOHN DAY-MARION 500 KV	0.70	-1142	0.70	-1917	0.74	-1699	0.72	-641	0.70	-716	0.80	-1515	0.89	-1305	0.70	-493
N-1: JOHN DAY-ROCK CK 500 KV	0.70	-1141	0.70	-1903	0.74	-1705	0.72	-647	0.70	-715	0.80	-1519	0.89	-1323	0.70	-493
N-1: JOHN DAY-SLATT 500 KV	0.70	-1142	0.70	-1913	0.74	-1712	0.72	-641	0.70	-716	0.80	-1528	0.89	-1306	0.70	-493

Appendix B - 16la1sa_3400idnw_N Base Case VQ Results V is the voltage at Qm & Qm is the Reactive Margin Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Harry Allen		Hemingway		Midpoint		Mill Creek		Pinto		Populus		Taft		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: KFALLS-MERIDIAN 500 KV	0.70	-1139	0.70	-1914	0.74	-1680	0.72	-630	0.70	-714	0.80	-1498	0.89	-1275	0.70	-493
N-1: KNIGHT-WAUTOMA 500 KV	0.70	-1146	0.70	-1881	0.74	-1702	0.72	-645	0.70	-719	0.80	-1516	0.89	-1314	0.70	-488
N-1: LAGRANDE-NORTH POWDER 230 KV	0.70	-1141	0.70	-1908	0.74	-1692	0.72	-630	0.70	-715	0.80	-1513	0.89	-1277	0.70	-495
N-1: LANES-MARION 500 KV	0.70	-1137	0.70	-1879	0.74	-1703	0.72	-644	0.70	-712	0.80	-1518	0.89	-1315	0.70	-489
N-1: LIT GOOSE-CENTRAL FERRY 500 KV	0.70	-1141	0.70	-1910	0.74	-1706	0.72	-643	0.70	-716	0.80	-1519	0.89	-1311	0.70	-493
N-1: LIT GOOSE-LOW MON 500 KV	0.70	-1142	0.70	-1916	0.74	-1705	0.72	-643	0.70	-716	0.80	-1519	0.89	-1308	0.70	-493
N-1: LOW GRAN-CENTRAL FERRY 500 KV	0.70	-1142	0.70	-1915	0.74	-1704	0.72	-641	0.70	-716	0.80	-1518	0.89	-1296	0.70	-494
N-1: LOW MON-SAC TAP 500 KV	0.70	-1142	0.70	-1914	0.74	-1707	0.72	-638	0.70	-716	0.80	-1520	0.89	-1282	0.70	-494
N-1: MALIN 500/230 XFMR	0.70	-1142	0.70	-1916	0.74	-1705	0.72	-645	0.70	-716	0.80	-1519	0.89	-1320	0.70	-492
N-1: MALIN-HILLTOP 230 KV	0.70	-1141	0.70	-1915	0.74	-1665	0.72	-634	0.70	-716	0.80	-1487	0.89	-1287	0.70	-493
N-1: MALIN-ROUND MTN #1 500 KV	0.70	-1138	0.70	-1861	0.74	-1711	0.72	-648	0.70	-714	0.80	-1528	0.89	-1324	0.70	-489
N-1: MALIN-ROUND MTN #2 500 KV	0.70	-1137	0.70	-1914	0.74	-1711	0.72	-648	0.70	-712	0.80	-1529	0.89	-1324	0.70	-495
N-1: MALIN-SUMMER LAKE 500 KV	0.70	-1136	0.70	-1914	0.73	-1721	0.72	-643	0.70	-712	0.80	-1554	0.89	-1311	0.70	-495
N-1: MAPLE VLY-ROCKY RH 345 KV	0.70	-1127	0.70	-1885	0.74	-1707	0.72	-644	0.70	-705	0.80	-1520	0.89	-1315	0.70	-494
N-1: MARION-PEARL 500 KV	0.70	-1142	0.70	-1917	0.74	-1704	0.72	-635	0.70	-716	0.80	-1517	0.89	-1291	0.70	-493
N-1: MARION-SANTIAM 500 KV	0.70	-1144	0.70	-1912	0.74	-1706	0.72	-646	0.70	-717	0.80	-1519	0.89	-1321	0.70	-490
N-1: MCLOUGLIN-OSTRANDER 230 KV	0.70	-1142	0.70	-1916	0.74	-1707	0.72	-646	0.70	-716	0.80	-1520	0.89	-1322	0.70	-493
N-1: MCNARY 500/230 KV XFMR	0.70	-1142	0.70	-1918	0.74	-1701	0.72	-644	0.70	-716	0.80	-1518	0.89	-1314	0.70	-493
N-1: MCNARY-BOARD T1 230 KV	0.70	-1141	0.70	-1906	0.73	-1718	0.72	-648	0.70	-715	0.80	-1532	0.89	-1328	0.70	-493
N-1: MCNARY-JOHN DAY 500 KV	0.70	-1142	0.70	-1930	0.74	-1703	0.72	-642	0.70	-715	0.80	-1518	0.89	-1306	0.70	-495
N-1: MCNARY-LONGHORN 500 KV	0.70	-1139	0.70	-1906	0.74	-1704	0.72	-645	0.70	-714	0.80	-1519	0.89	-1318	0.70	-494
N-1: MCNARY-ROSS 345 KV	0.70	-1142	0.70	-1901	0.74	-1704	0.72	-641	0.70	-716	0.80	-1518	0.89	-1306	0.70	-494
N-1: MCNARY-ROUNDUP 230 KV	0.70	-1141	0.70	-1909	0.74	-1693	0.72	-637	0.70	-715	0.80	-1515	0.89	-1298	0.70	-493
N-1: MCNARY-SAC TAP-LOW MON 500 KV	0.70	-1139	0.70	-1887	0.74	-1705	0.72	-635	0.70	-714	0.80	-1519	0.89	-1275	0.70	-490
N-1: MIDPOINT-HEMINGWAY 500 KV	0.70	-1142	0.70	-1911	0.72	-1277	0.76	-550	0.70	-716	0.79	-1290	0.91	-1095	0.70	-491
N-1: MIDPOINT-HUMBOLDT 345 KV	0.70	-1098	0.70	-1449	0.74	-1557	0.72	-637	0.70	-683	0.81	-1467	0.89	-1301	0.72	-447
N-1: NAPAVINE-PAUL 500 KV	0.70	-1134	0.71	-1772	0.74	-1708	0.72	-645	0.70	-709	0.80	-1520	0.89	-1319	0.70	-491
N-1: OLYMPIA-PAUL 500 KV	0.70	-1142	0.70	-1918	0.74	-1707	0.72	-643	0.70	-716	0.80	-1519	0.89	-1316	0.70	-493
N-1: ONTARIO-CALDWELL 230 KV	0.70	-1142	0.70	-1919	0.74	-1697	0.72	-645	0.70	-716	0.80	-1515	0.89	-1320	0.70	-493
N-1: OSTRANDER-KNIGHT 500 KV	0.70	-1142	0.70	-1904	0.74	-1701	0.72	-642	0.70	-716	0.80	-1516	0.89	-1309	0.70	-493
N-1: OSTRANDER-PEARL 500 KV	0.70	-1141	0.70	-1906	0.74	-1708	0.72	-646	0.70	-716	0.80	-1521	0.89	-1321	0.70	-493
N-1: OSTRANDER-TROUTDALE 500 KV	0.70	-1142	0.70	-1920	0.74	-1706	0.72	-644	0.70	-716	0.80	-1519	0.89	-1317	0.70	-493
N-1: OXBOW-BROWNLEE #2 230 KV	0.70	-1142	0.70	-1915	0.74	-1705	0.72	-645	0.70	-716	0.80	-1519	0.89	-1320	0.70	-493
N-1: OXBOW-LOLO 230 KV	0.70	-1142	0.70	-1915	0.74	-1688	0.73	-624	0.70	-716	0.80	-1513	0.90	-1261	0.70	-493
N-1: PAUL-SATSOP 500 KV	0.70	-1136	0.70	-1870	0.74	-1706	0.72	-644	0.70	-712	0.80	-1519	0.89	-1316	0.70	-484
N-1: PEARL-KEELER 500 KV	0.70	-1142	0.70	-1916	0.74	-1709	0.72	-644	0.70	-716	0.80	-1522	0.89	-1318	0.70	-493
N-1: PEARL-KEELER 500 KV + RAS	0.70	-1142	0.70	-1920	0.74	-1709	0.72	-644	0.70	-716	0.80	-1522	0.89	-1318	0.70	-493
N-1: PINTO-FOUR CORNER 345 KV	0.70	-1032	0.73	-1588	0.76	-1426	0.73	-601	0.70	-580	0.82	-1297	0.90	-1214	0.70	-480
N-1: PONDEROSA A 500/230 KV XFMR	0.70	-1142	0.70	-1918	0.74	-1708	0.72	-645	0.70	-716	0.80	-1521	0.89	-1320	0.70	-493
N-1: PONDEROSA B 500/230 KV XFMR	0.70	-1142	0.70	-1916	0.74	-1706	0.72	-645	0.70	-716	0.80	-1519	0.89	-1321	0.70	-493
N-1: POPULUS-CEDAR HILL-HEMINGWAY 500 KV	0.70	-1078	0.70	-1564	0.74	-1236	0.79	-483	0.70	-667	0.81	-1139	0.93	-956	0.74	-396
N-1: RAVER-PAUL 500 KV	0.70	-1143	0.70	-1918	0.74	-1707	0.72	-635	0.70	-717	0.80	-1520	0.89	-1291	0.70	-491
N-1: RAVER-TACOMA 500 KV	0.70	-1142	0.70	-1917	0.74	-1707	0.72	-644	0.70	-716	0.80	-1520	0.89	-1317	0.70	-493
N-1: RED BUTTE-HARRY ALLEN 345 KV	0.00	0	0.74	-1519	0.77	-1363	0.74	-584	0.70	-596	0.82	-1233	0.91	-1164	0.71	-467
N-1: ROBINSON-HARRY ALLEN 500 KV	0.70	-1091	0.70	-1824	0.74	-1651	0.72	-628	0.70	-674	0.80	-1494	0.89	-1272	0.70	-489
N-1: ROCK CK-WAUTOMA 500 KV	0.70	-1142	0.70	-1911	0.74	-1704	0.72	-640	0.70	-716	0.80	-1518	0.89	-1301	0.70	-492

Appendix B - 16la1sa_3400idnw_N Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Harry Allen		Hemingway		Midpoint		Mill Creek		Pinto		Populus		Taft		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: ROUND MTN-TABLE MTN 500 KV	0.70	-1138	0.70	-1922	0.74	-1714	0.72	-648	0.70	-713	0.80	-1529	0.89	-1325	0.70	-495
N-1: ROUNDUP-LAGRANDE 230 KV	0.70	-1138	0.70	-1884	0.74	-1693	0.72	-634	0.70	-713	0.80	-1514	0.89	-1289	0.70	-490
N-1: SCHULTZ-SICKLER 500 KV	0.70	-1142	0.70	-1917	0.74	-1707	0.72	-643	0.70	-716	0.80	-1520	0.89	-1313	0.70	-493
N-1: SCHULTZ-VANTAGE 500 KV	0.70	-1142	0.70	-1915	0.74	-1706	0.72	-637	0.70	-716	0.80	-1519	0.89	-1296	0.70	-491
N-1: SCHULTZ-WAUTOMA 500 KV	0.70	-1142	0.70	-1913	0.74	-1706	0.72	-628	0.70	-716	0.80	-1520	0.89	-1272	0.70	-490
N-1: SIGURD-GLEN CANYON 230 KV	0.70	-1111	0.70	-1844	0.74	-1646	0.72	-635	0.70	-687	0.80	-1472	0.89	-1293	0.70	-490
N-1: SLATT 500/230 KV XFMR	0.70	-1142	0.70	-1914	0.74	-1705	0.72	-645	0.70	-716	0.80	-1519	0.89	-1318	0.70	-493
N-1: SLATT-LONGHORN 500 KV	0.70	-1141	0.70	-1913	0.74	-1706	0.72	-644	0.70	-715	0.80	-1520	0.89	-1315	0.70	-493
N-1: SNOK TAP-SNOKING 500 KV	0.70	-1142	0.70	-1915	0.74	-1705	0.72	-644	0.70	-716	0.80	-1518	0.89	-1315	0.70	-493
N-1: TABLE MTN-TESLA 500 KV	0.70	-1137	0.70	-1931	0.73	-1721	0.72	-650	0.70	-712	0.80	-1534	0.89	-1330	0.70	-495
N-1: TABLE MTN-VACA DIXON 500 KV	0.70	-1133	0.70	-1940	0.73	-1731	0.72	-652	0.70	-710	0.80	-1544	0.89	-1335	0.70	-496
N-1: VANTAGE 500/230 KV XFMR #1	0.70	-1142	0.70	-1918	0.74	-1708	0.72	-645	0.70	-716	0.80	-1520	0.89	-1320	0.70	-493
N-1: VANTAGE 500/230 KV XFMR #2	0.70	-1142	0.70	-1918	0.74	-1708	0.72	-645	0.70	-716	0.80	-1520	0.89	-1320	0.70	-493
N-1: WALLA WALLA-TALBOT 230 KV	0.70	-1142	0.70	-1917	0.74	-1706	0.72	-643	0.70	-716	0.80	-1519	0.89	-1302	0.70	-494
N-1: WALLA WALLA-WALLULA 230 KV	0.70	-1141	0.70	-1910	0.74	-1703	0.72	-642	0.70	-715	0.80	-1518	0.89	-1308	0.70	-493
N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.70	-1140	0.70	-1884	0.74	-1690	0.72	-640	0.70	-714	0.80	-1509	0.89	-1289	0.70	-494
N-2: ASHE-MARION & BUCKLEY-MARION 500 KV	0.70	-1139	0.70	-1886	0.74	-1691	0.72	-639	0.70	-714	0.80	-1510	0.89	-1293	0.70	-493
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.70	-1135	0.70	-1898	0.73	-1701	0.72	-647	0.70	-711	0.80	-1520	0.89	-1314	0.70	-497
N-2: ASHE-MARION & SLATT-COYOTE TAP-LONGHORN 500 KV	0.70	-1139	0.70	-1896	0.74	-1696	0.72	-645	0.70	-714	0.80	-1513	0.89	-1311	0.70	-495
N-2: ASHE-MARION & SLATT-JOHN DAY 500 KV	0.70	-1137	0.70	-1897	0.74	-1703	0.72	-642	0.70	-712	0.80	-1522	0.89	-1302	0.70	-494
N-2: ASHE-SLATT & MCNARY-JOHN DAY 500 KV	0.70	-1139	0.70	-1891	0.74	-1697	0.72	-633	0.70	-714	0.80	-1515	0.89	-1276	0.70	-492
N-2: ASHE-SLATT & SLATT-COYOTE TAP-LONGHORN 500 KV	0.70	-1141	0.70	-1897	0.74	-1699	0.72	-637	0.70	-715	0.80	-1516	0.89	-1287	0.70	-493
N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.70	-1132	0.74	-1468	0.77	-1324	0.85	-357	0.70	-717	0.82	-1177	0.91	-368	0.79	-388
N-2: BETHEL-CEDAR SPRING 500 KV & BETHEL-ROUND BUTTE 230 KV	0.70	-1138	0.70	-1905	0.74	-1707	0.72	-632	0.70	-713	0.80	-1525	0.89	-1282	0.70	-491
N-2: BETHEL-CEDAR SPRING 500 KV & BETHEL-SANTIAM 230 KV	0.70	-1138	0.70	-1907	0.74	-1707	0.72	-635	0.70	-713	0.80	-1526	0.89	-1287	0.70	-491
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-CHEMAWA 230 KV	0.70	-1142	0.70	-1906	0.74	-1701	0.72	-640	0.70	-716	0.80	-1516	0.89	-1304	0.70	-492
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-TROUTDALE 230 KV	0.70	-1142	0.70	-1907	0.74	-1702	0.72	-639	0.70	-716	0.80	-1516	0.89	-1303	0.70	-492
N-2: BOISE BENCH-BROWNLEE #1 & #2 230 KV	0.70	-1140	0.71	-1796	0.74	-1600	0.72	-641	0.70	-715	0.81	-1467	0.89	-1312	0.70	-492
N-2: BOISE BENCH-BROWNLEE #3 & BOISE BENCH-HORSEFLAT#4 230 KV	0.70	-1140	0.71	-1793	0.74	-1598	0.72	-641	0.70	-715	0.81	-1466	0.89	-1312	0.70	-492
N-2: BRIDGER-POPULUS #1 & #2 345 KV	0.70	-1142	0.79	-1509	0.81	-1283	0.77	-552	0.70	-720	0.84	-906	0.92	-1099	0.72	-435
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV	0.70	-1141	0.79	-1452	0.81	-1236	0.76	-583	0.70	-719	0.84	-861	0.91	-1154	0.71	-440
N-2: BROADVIEW-GARRISONT #1 & #2 500 KV + RAS	0.70	-1142	0.85	-1198	0.83	-1205	0.83	-378	0.70	-727	0.86	-1030	0.91	-1394	0.92	-140
N-2: BROWNLEE-HELLS CANYON & OXBOW-LOLO 230 KV	0.70	-1134	0.71	-1765	0.74	-1632	0.73	-612	0.70	-711	0.80	-1483	0.90	-1242	0.70	-478
N-2: BROWNLEE-OXBOW & BROWNLEE-HELLS CANYON 230 KV	0.70	-1141	0.71	-1835	0.74	-1658	0.72	-639	0.70	-716	0.80	-1493	0.89	-1303	0.70	-489
N-2: BUCKLEY-MARION & JOHN DAY-MARION 500 KV	0.70	-1140	0.70	-1886	0.74	-1691	0.72	-629	0.70	-715	0.80	-1510	0.89	-1273	0.70	-490
N-2: CHIEF JO-MONROE & CHIEF JO-SICKLER 500 KV	0.70	-1141	0.70	-1905	0.74	-1699	0.72	-638	0.70	-716	0.80	-1514	0.89	-1288	0.70	-494
N-2: CHIEF JO-MONROE 500 KV & CHIEF JO-SNOHOMS4 345 KV	0.70	-1141	0.70	-1907	0.74	-1700	0.72	-638	0.70	-716	0.80	-1515	0.89	-1289	0.70	-493
N-2: CHIEF JO-MONROE 500 KV & MONROE-SAMMAMSH 230 KV	0.70	-1142	0.70	-1910	0.74	-1702	0.72	-640	0.70	-716	0.80	-1516	0.89	-1297	0.70	-493
N-2: CHIEF JO-SICKLER 500 KV & CHIEF J3-SNOHOMS3 345 KV	0.70	-1142	0.70	-1912	0.74	-1704	0.72	-642	0.70	-716	0.80	-1517	0.89	-1304	0.70	-494
N-2: COULEE-CHIEF JO 500 KV & CHIEF J4-SNOHOMS4 345 KV	0.70	-1141	0.70	-1909	0.74	-1701	0.72	-639	0.70	-716	0.80	-1515	0.89	-1291	0.70	-494
N-2: COULEE-HANFORD & HANFORD-VANTAGE 500 KV	0.70	-1143	0.70	-1905	0.74	-1701	0.73	-607	0.70	-717	0.80	-1517	0.90	-1202	0.70	-485
N-2: COULEE-SCHULTZ #1 & #2 500 KV	0.70	-1140	0.70	-1891	0.74	-1688	0.72	-634	0.70	-715	0.80	-1505	0.89	-1259	0.70	-497
N-2: CUSTERW-ING500 & CUSTERW-MONROE 500 KV	0.70	-1142	0.70	-1915	0.74	-1705	0.72	-643	0.70	-716	0.80	-1519	0.89	-1310	0.70	-494
N-2: CUSTERW-MONROE #1 & #2 500 KV + RAS	0.70	-1142	0.70	-1911	0.73	-1764	0.71	-669	0.70	-716	0.79	-1577	0.88	-1375	0.70	-494
N-2: DC-BIPOLE	0.70	-1090	0.70	-2163	0.71	-1924	0.70	-722	0.70	-674	0.78	-1722	0.87	-1498	0.70	-521
N-2: DOUBLE PALO VERDE	0.70	-1007	0.70	-2134	0.72	-1901	0.70	-715	0.70	-575	0.79	-1665	0.87	-1473	0.70	-524

Appendix B - 16la1sa_3400idnw_N Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Harry Allen		Hemingway		Midpoint		Mill Creek		Pinto		Populus		Taft		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: ECHOLAKE-MAPLE VLY 500 KV & COVINGTON-MAPLE VLY 230 KV	0.70	-1142	0.70	-1913	0.74	-1704	0.72	-641	0.70	-716	0.80	-1518	0.89	-1303	0.70	-493
N-2: ECHOLAKE-MAPLE VLY 500 KV & ROCKY RH-MAPLE VLY 345 KV	0.70	-1142	0.70	-1911	0.74	-1703	0.72	-640	0.70	-716	0.80	-1517	0.89	-1297	0.70	-493
N-2: GARRISON-TAFT #1 & #2 500 KV + RAS	0.70	-1131	0.75	-1458	0.79	-1311	0.83	-296	0.70	-716	0.82	-1160	0.85	-1475	0.81	-354
N-2: GRASSLAND-CEDAR SPRING & SLATT - BUCKLEY 500 KV	0.70	-1132	0.70	-1910	0.73	-1717	0.72	-637	0.70	-709	0.80	-1536	0.89	-1287	0.70	-493
N-2: GRASSLAND-COYOTE & SLATT - LONGHORN 500 KV	0.70	-1141	0.70	-1833	0.74	-1669	0.72	-646	0.70	-715	0.80	-1496	0.89	-1317	0.70	-495
N-2: GRIZZLY-MALIN & GRIZZLY-CAPTAIN JACK 500 KV	0.70	-1131	0.70	-1879	0.74	-1635	0.73	-621	0.70	-708	0.80	-1460	0.90	-1240	0.70	-496
N-2: GRIZZLY-MALIN & GRIZZLY-SUMMER LAKE 500 KV	0.70	-1139	0.70	-1863	0.75	-1627	0.73	-609	0.70	-714	0.81	-1455	0.90	-1222	0.70	-490
N-2: GRIZZLY-MALIN & MALIN-SUMMER LAKE 500 KV	0.70	-1115	0.70	-1877	0.74	-1677	0.73	-622	0.70	-695	0.80	-1516	0.89	-1245	0.70	-497
N-2: HANFORD-ASHE & HANFORD-LOW MON 500 KV	0.70	-1138	0.70	-1865	0.74	-1680	0.74	-589	0.70	-713	0.80	-1503	0.90	-1143	0.71	-481
N-2: HANFORD-WAUTOMA #1 & #2 500 KV	0.70	-1140	0.70	-1907	0.74	-1701	0.72	-643	0.70	-715	0.80	-1516	0.89	-1301	0.70	-496
N-2: HELLS CANYON-BROWNLEE & OXBOW-LOLO 230 KV	0.70	-1134	0.70	-1785	0.74	-1652	0.73	-617	0.70	-710	0.80	-1503	0.90	-1249	0.70	-481
N-2: JOHN DAY-BIG EDDY #1 & #2 500 KV	0.70	-1144	0.70	-1902	0.74	-1699	0.73	-615	0.70	-718	0.80	-1515	0.90	-1228	0.70	-485
N-2: JOHN DAY-BIG EDDY & JOHN DAY-MARION 500 KV	0.70	-1141	0.70	-1899	0.74	-1697	0.72	-637	0.70	-715	0.80	-1514	0.89	-1294	0.70	-492
N-2: JOHN DAY-GRIZZLY #1 & #2 500 KV	0.70	-1138	0.70	-1877	0.74	-1683	0.72	-643	0.70	-713	0.80	-1505	0.89	-1311	0.70	-494
N-2: JOHN DAY-GRIZZLY #2 & BUCKLEY-GRIZZLY 500 KV	0.70	-1138	0.70	-1893	0.74	-1693	0.72	-645	0.70	-713	0.80	-1511	0.89	-1316	0.70	-494
N-2: JOHN DAY-MARION & BUCKLEY-MARION 500 KV	0.70	-1140	0.70	-1886	0.74	-1691	0.72	-629	0.70	-715	0.80	-1510	0.89	-1273	0.70	-490
N-2: JOHN DAY-MARION & MARION-PEARL 500 KV	0.70	-1143	0.70	-1895	0.74	-1694	0.72	-630	0.70	-717	0.80	-1511	0.89	-1275	0.70	-490
N-2: JOHN DAY-ROCK CREEK 500 KV & MCNARY-ROSS 345 KV	0.70	-1141	0.70	-1904	0.74	-1701	0.72	-642	0.70	-715	0.80	-1516	0.89	-1309	0.70	-492
N-2: KEELER-PEARL 500 & SHERWOOD-CARLTON 230 KV	0.70	-1142	0.70	-1921	0.74	-1711	0.72	-645	0.70	-716	0.80	-1524	0.89	-1318	0.70	-493
N-2: KNIGHT-OSTRANDER & OSTRANDER-BIG EDDY 500 KV	0.70	-1141	0.70	-1893	0.74	-1693	0.72	-635	0.70	-715	0.80	-1510	0.89	-1287	0.70	-491
N-2: KNIGHT-OSTRANDER 500 KV & MCNARY-ROSS 345 KV	0.70	-1140	0.70	-1897	0.74	-1697	0.72	-637	0.70	-715	0.80	-1513	0.89	-1293	0.70	-492
N-2: KNIGHT-OSTRANDER 500 KV & MIDWAY-BONNEVILLE 230 KV	0.70	-1141	0.70	-1907	0.74	-1702	0.72	-643	0.70	-715	0.80	-1517	0.89	-1310	0.70	-494
N-2: LOWER GRANITE-CENTRAL FERRY #1 & #2 500 KV	0.70	-1135	0.70	-1850	0.74	-1656	0.73	-621	0.70	-711	0.80	-1474	0.89	-1023	0.70	-511
N-2: MALIN-ROUND MTN #1 & #2 500 KV	0.70	-1104	0.70	-1960	0.72	-1786	0.71	-669	0.70	-688	0.79	-1617	0.88	-1370	0.70	-506
N-2: MCNARY-JOHN DAY & ROCK CREEK-JOHN DAY 500 KV	0.70	-1139	0.70	-1899	0.74	-1700	0.72	-645	0.70	-714	0.80	-1516	0.89	-1312	0.70	-494
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-HORSE HEAVEN 230 KV	0.70	-1139	0.70	-1903	0.74	-1702	0.72	-641	0.70	-713	0.80	-1518	0.89	-1302	0.70	-494
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-ROSS 345 KV	0.70	-1138	0.70	-1896	0.74	-1699	0.72	-636	0.70	-713	0.80	-1515	0.89	-1289	0.70	-493
N-2: MCNARY-ROSS 345 KV & MCNARY-HORSE HEAVEN 230 KV	0.70	-1140	0.70	-1907	0.74	-1703	0.72	-640	0.70	-715	0.80	-1517	0.89	-1303	0.70	-492
N-2: MIDPOINT-SUMMER LAKE 500 KV & MIDPOINT-KING 230 KV	0.70	-1097	0.70	-1441	0.72	-1261	0.76	-534	0.70	-682	0.79	-1272	0.92	-1057	0.73	-438
N-2: MONROE-CUSTERW & CHIEF JO-MONROE 500 KV	0.70	-1141	0.70	-1908	0.74	-1701	0.72	-638	0.70	-716	0.80	-1515	0.89	-1290	0.70	-493
N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV	0.70	-1139	0.70	-1892	0.74	-1685	0.71	-665	0.70	-714	0.80	-1503	0.89	-1362	0.70	-499
N-2: PAUL-NAPAVINE & PAUL-ALLSTON #2 500 KV	0.70	-1141	0.70	-1909	0.74	-1701	0.72	-652	0.70	-715	0.80	-1515	0.89	-1335	0.70	-496
N-2: PAUL-RAVER & RAVER-COVINGT4 500 KV	0.70	-1143	0.70	-1917	0.74	-1707	0.72	-636	0.70	-716	0.80	-1520	0.89	-1291	0.70	-491
N-2: PEARL-KEELER 500 KV & PEARL-SHERWOOD 230 KV	0.70	-1142	0.70	-1920	0.74	-1710	0.72	-644	0.70	-716	0.80	-1522	0.89	-1317	0.70	-493
N-2: PEARL-OSTRANDER 500 KV & BIG EDDY-MCLOUGLN 230 KV	0.70	-1142	0.70	-1917	0.74	-1707	0.72	-644	0.70	-716	0.80	-1520	0.89	-1317	0.70	-493
N-2: PEARL-OSTRANDER 500 KV & OSTRANDER-MCLOUGLN 230 KV	0.70	-1142	0.70	-1920	0.74	-1708	0.72	-646	0.70	-716	0.80	-1520	0.89	-1323	0.70	-493
N-2: RAVER-COVINGTON #1 & #2 500 KV	0.70	-1142	0.70	-1917	0.74	-1706	0.72	-645	0.70	-716	0.80	-1519	0.89	-1318	0.70	-493
N-2: RAVER-ECHO LAKE & RAVER-SCHULTZ 500 KV	0.70	-1142	0.70	-1914	0.74	-1705	0.72	-641	0.70	-716	0.80	-1519	0.89	-1306	0.70	-493
N-2: RAVER-PAUL & NAPAVINE-PAUL 500 KV	0.70	-1143	0.70	-1917	0.74	-1707	0.72	-635	0.70	-716	0.80	-1520	0.89	-1290	0.70	-491
N-2: RAVER-PAUL 500 KV & COULEE-OLYMPIA 300 KV	0.70	-1142	0.70	-1915	0.74	-1705	0.72	-633	0.70	-716	0.80	-1519	0.89	-1281	0.70	-491
N-2: RAVER-PAUL 500 KV & TACOMA A-CHEHALIS 230 KV	0.70	-1143	0.70	-1922	0.74	-1710	0.72	-634	0.70	-716	0.80	-1523	0.89	-1287	0.70	-491
N-2: RAVER-SCHULTZ #1 & #2 500 KV	0.70	-1141	0.70	-1900	0.74	-1696	0.72	-633	0.70	-715	0.80	-1512	0.89	-1272	0.70	-493
N-2: RAVER-TACOMA & RAVER-COVINGT4 500 KV	0.70	-1142	0.70	-1915	0.74	-1705	0.72	-644	0.70	-716	0.80	-1518	0.89	-1315	0.70	-493
N-2: RAVER-TACOMA 500 KV & TACOMA-CHRISTOP-COVINGTON 230 KV	0.70	-1142	0.70	-1916	0.74	-1706	0.72	-644	0.70	-716	0.80	-1518	0.89	-1316	0.70	-493
N-2: ROUND MTN-TABLE MTN #1 & #2 500 KV	0.70	-1105	0.70	-2006	0.72	-1807	0.71	-675	0.70	-689	0.79	-1623	0.88	-1393	0.70	-507
N-2: SCHULTZ-WAUTOMA & VANTAGE-SCHULTZ 500 KV	0.70	-1143	0.70	-1911	0.74	-1705	0.73	-605	0.70	-717	0.80	-1519	0.90	-1203	0.70	-483

Appendix B - 16la1sa_3400idnw_N Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Harry Allen		Hemingway		Midpoint		Mill Creek		Pinto		Populus		Taft		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: SICKLER-SCHULTZ & SCHULTZ-VANTAGE 500 KV	0.70	-1142	0.70	-1914	0.74	-1706	0.72	-635	0.70	-716	0.80	-1519	0.89	-1289	0.70	-491
N-2: TABLE MTN-TESLA & TABLE MTN-VACA DIXON 500 KV	0.70	-1106	0.70	-2018	0.74	-1694	0.72	-642	0.70	-690	0.80	-1511	0.89	-1312	0.70	-506
N-2: TAFT-BELL 500KV & BELL-BOUNDARY #3 230KV	0.70	-1128	0.71	-1720	0.75	-1553	0.80	-440	0.70	-707	0.80	-1385	0.89	-584	0.74	-493
N-2: TAFT-BELL 500KV & BELL-LANCASTER 230KV + RAS	0.70	-1127	0.72	-1646	0.75	-1526	0.77	-539	0.70	-708	0.80	-1361	0.87	-718	0.75	-475
N-2: TAFT-BELL 500KV & BELL-TRENTWOOD #2 115KV	0.70	-1129	0.71	-1721	0.75	-1553	0.80	-442	0.70	-707	0.80	-1386	0.88	-587	0.74	-494
N-2: TAFT-BELL 500KV & LANCASTER-NOXON 230KV + RAS	0.70	-1128	0.72	-1686	0.75	-1572	0.76	-556	0.70	-707	0.80	-1405	0.87	-749	0.75	-481
N-2: TAFT-DWORSHAK & GARRISON-TAFT #1 500KV	0.70	-1132	0.72	-1743	0.75	-1552	0.79	-468	0.70	-709	0.81	-1380	0.88	-711	0.77	-449
N-2: WAUTOMA-ROCK CK 500 KV & MIDWAY-BIG EDDY 230 KV	0.70	-1142	0.70	-1911	0.74	-1704	0.72	-639	0.70	-716	0.80	-1519	0.89	-1297	0.70	-492
N-2: WAUTOMA-ROCK CK 500 KV & SPRINGCREEK-BIG EDDY 230 KV	0.70	-1142	0.70	-1911	0.74	-1704	0.72	-639	0.70	-716	0.80	-1519	0.89	-1297	0.70	-492
N-3: SCHULTZ-RAVER #1 & #2 & #3 500 KV	0.70	-1141	0.70	-1899	0.74	-1696	0.72	-636	0.70	-715	0.80	-1511	0.89	-1279	0.70	-493

Appendix B - 16la1sa_3400idnw_N Base Case Transient Stability Plots

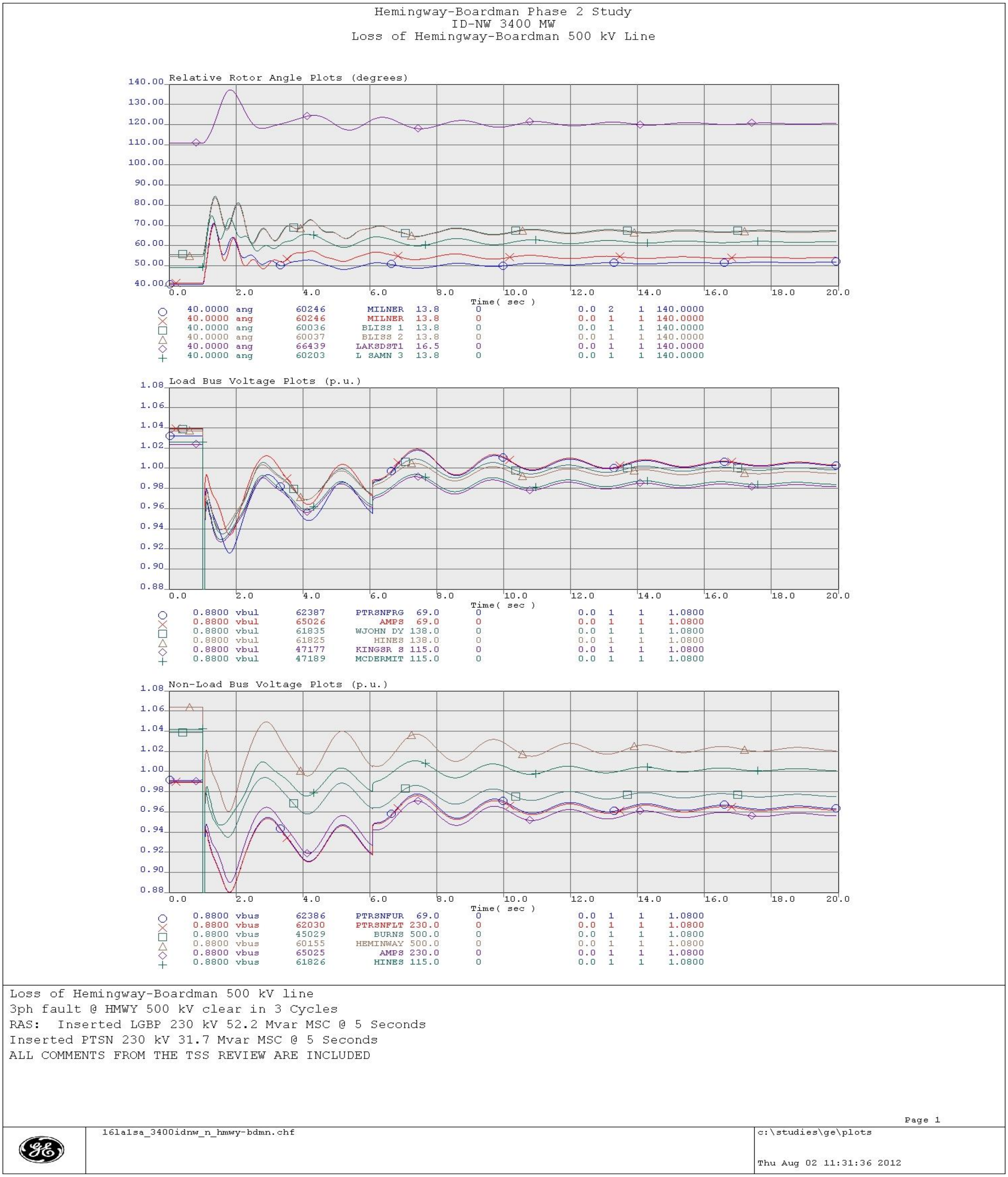


Figure B11: N-1 loss of Hemingway-Boardman 500 kV

Appendix B - 16la1sa_3400idnw_N Base Case Transient Stability Plots

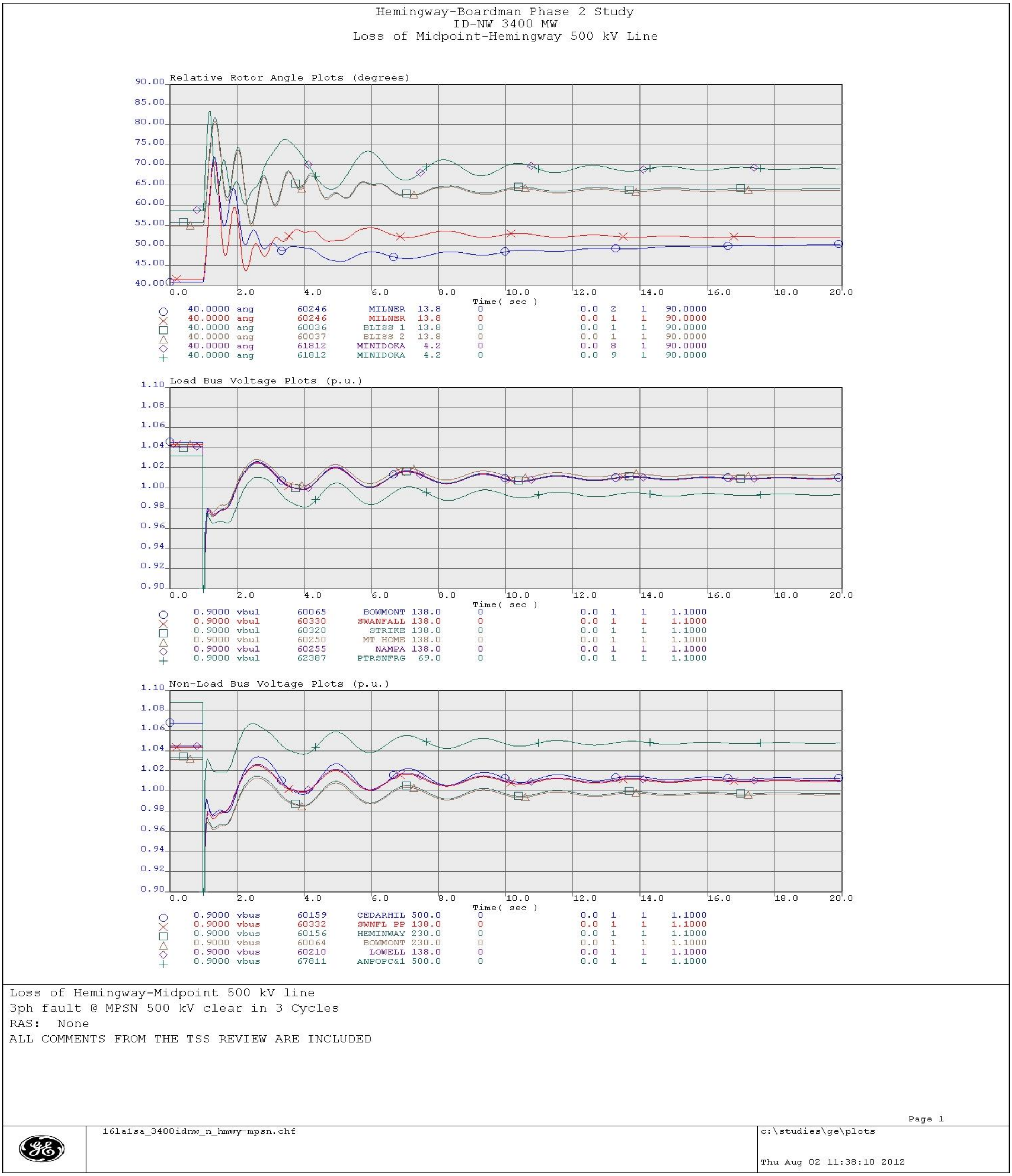
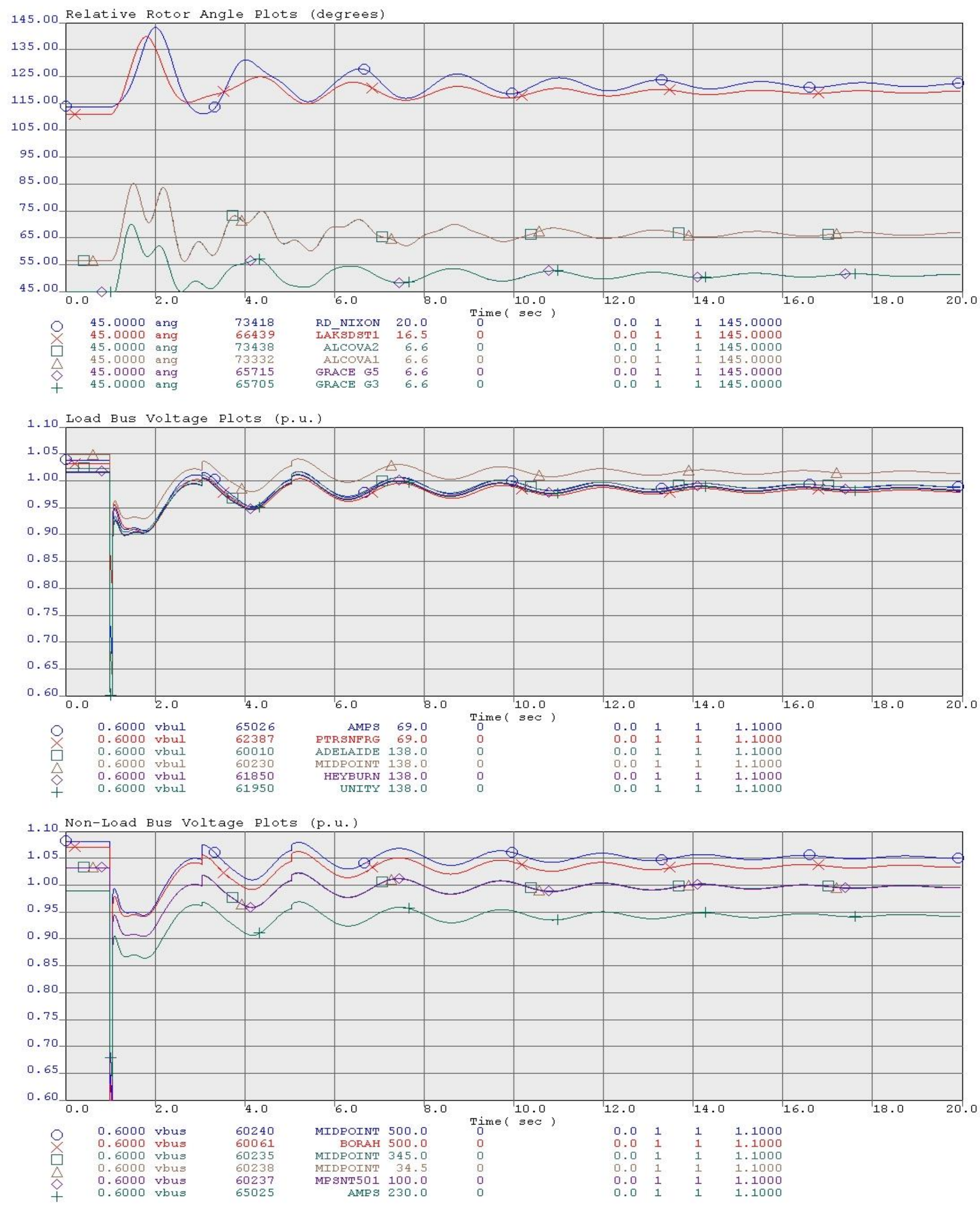


Figure B12: N-1 loss of Hemingway-Midpoint 500 kV

Appendix B - 16la1sa_3400idnw_N Base Case Transient Stability Plots

Hemingway-Boardman Phase 2 Study
ID-NW 3400 MW
Loss of Populus-Hemingway 500 kV Line



Loss of Hemingway-Populus 500 kV line
3ph fault @ PPLS 500 kV clear in 3 Cycles
RAS: Insert Midpoint 500 kV 200 Mvar MSC @ 2 Seconds
Insert Borah 345 kV 175 Mvar MSC @ 4 Seconds
ALL COMMENTS FROM THE TSS REVIEW ARE INCLUDED

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Figure B13: N-1 loss of Hemingway-Populus 500 kV

Appendix B - 16la1sa_3400idnw_N Base Case Transient Stability Plots

Hemingway-Boardman Phase 2 Study
ID-NW 3400 MW
Loss of Hemingway-Summer Lake 500 kV Line

Loss of Hemingway-Summer Lake 500 kV Line
3ph fault @ HMWY 500 kV clear in 3 Cycles
RAS: None
ALL COMMENTS FROM THE TSS REVIEW ARE INCLUDED

Page 1

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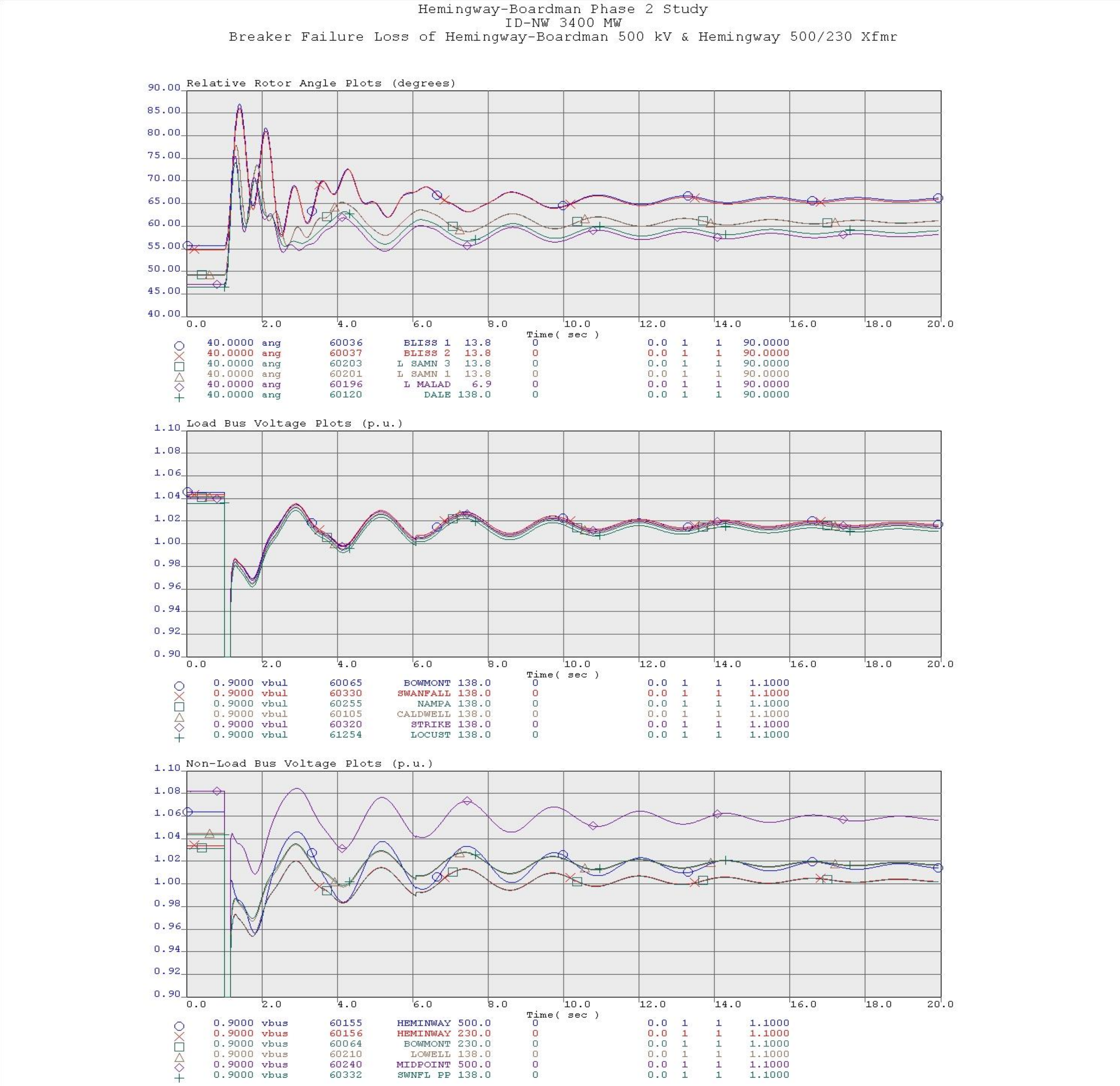
Figure B14: N-1 loss of Hemingway-Summer Lake 500 kV

Appendix B - 16la1sa_3400idnw_N Base Case Transient Stability Plots



Loss of Hemingway-Boardman 500 kV Line and
Hemingway 500/230 kV Transformer
SLG Fault W/ Delayed Clearing 3/10 Cycles
RAS: Inserted LGBP 230 kV 52.2 Mvar MSC @ 5 Seconds
Inserted PTSN 230 kV 31.7 Mvar MSC @ 5 Seconds
ALL COMMENTS FROM THE TSS REVIEW ARE INCLUDED

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Figure B15: Breaker Failure loss of Hemingway-Boardman 500 kV and Hemingway 500/230 kV Transformer

Appendix B - 16la1sa_3400idnw_N Base Case Transient Stability Plots

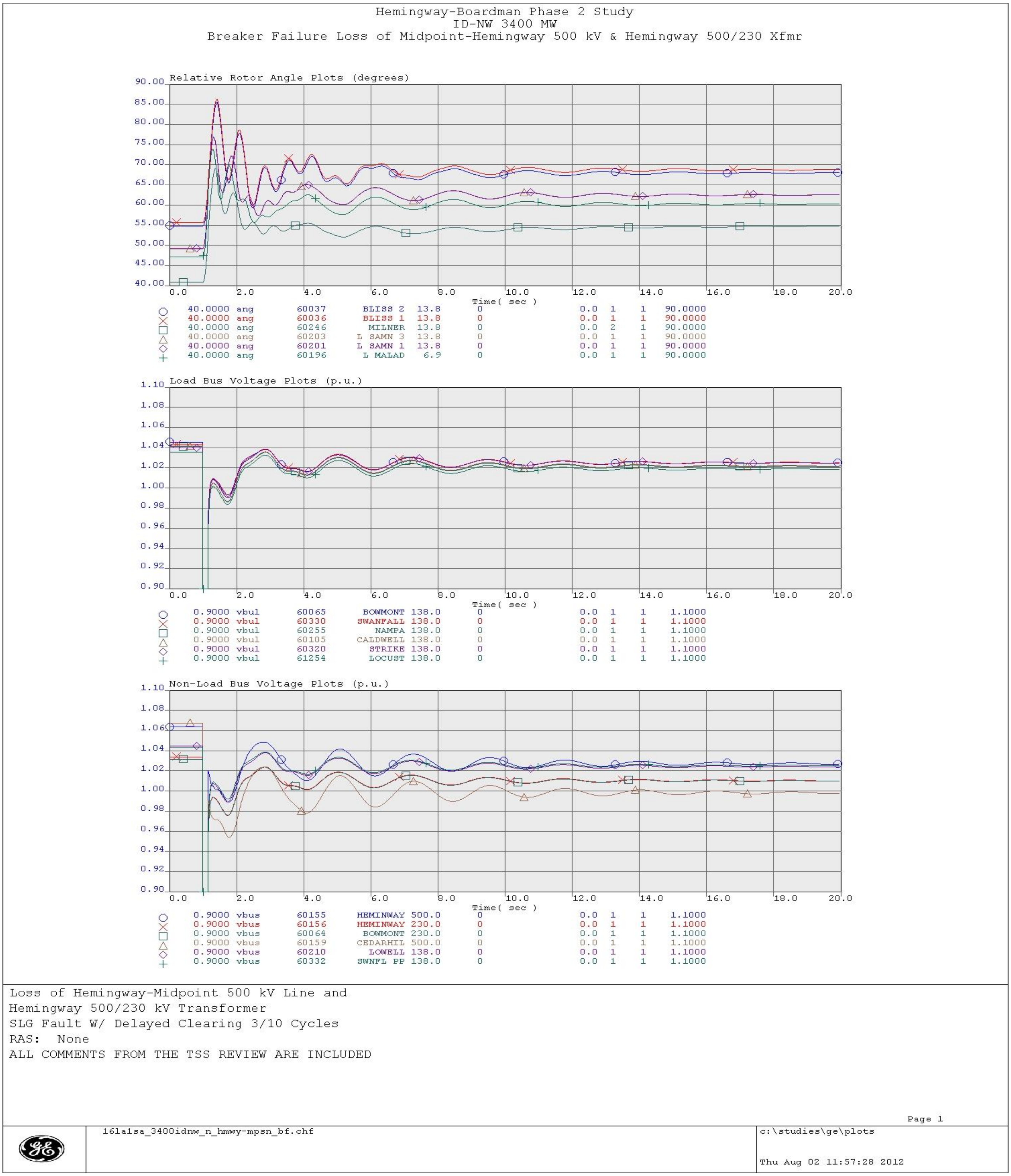


Figure B16: Breaker Failure loss of Hemingway-Midpoint 500 kV and Hemingway 500/230 kV Transformer

Appendix B - 16la1sa_3400idnw_N Base Case Transient Stability Plots

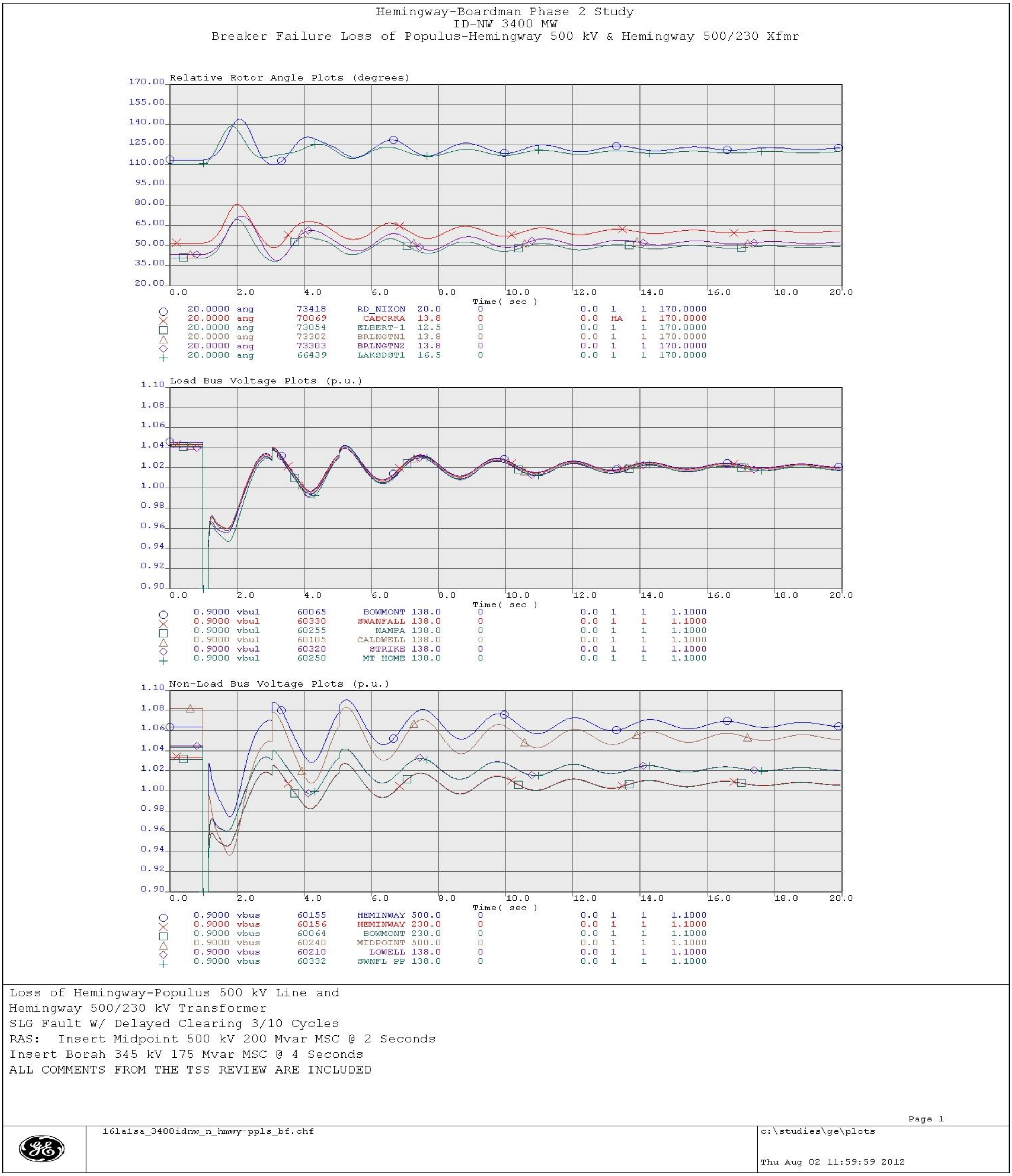
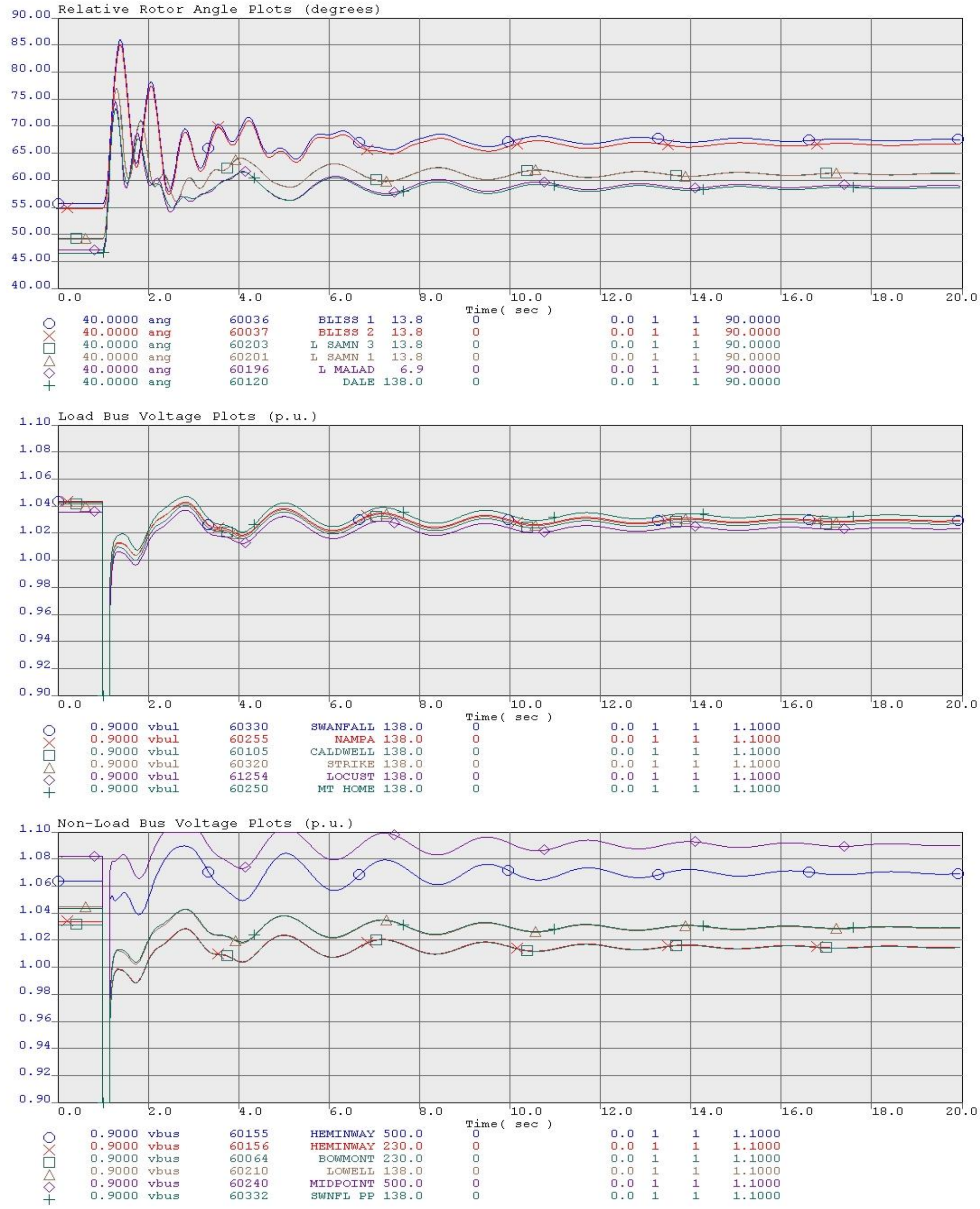


Figure B17: Breaker Failure loss of Hemingway-Populus 500 kV and Hemingway 500/230 kV Transformer

Appendix B - 16la1sa_3400idnw_N Base Case Transient Stability Plots

Hemingway-Boardman Phase 2 Study
ID-NW 3400 MW
Breaker Failure Loss of Hemingway-Summer Lake 500 kV & Hemingway 500/230 Xfmr



Loss of Hemingway-Summer Lake 500 kV and
Hemingway 500/230 kV Transformer
SLG Fault W/ Delayed Clearing 3/10 Cycles
RAS: None
ALL COMMENTS FROM THE TSS REVIEW ARE INCLUDED

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Figure B18: Breaker Failure loss of Hemingway-Summer Lake 500 kV and Hemingway 500/230 kV Transformer

Appendix B - 16la1sa_3400idnw_N Base Case Transient Stability Plots

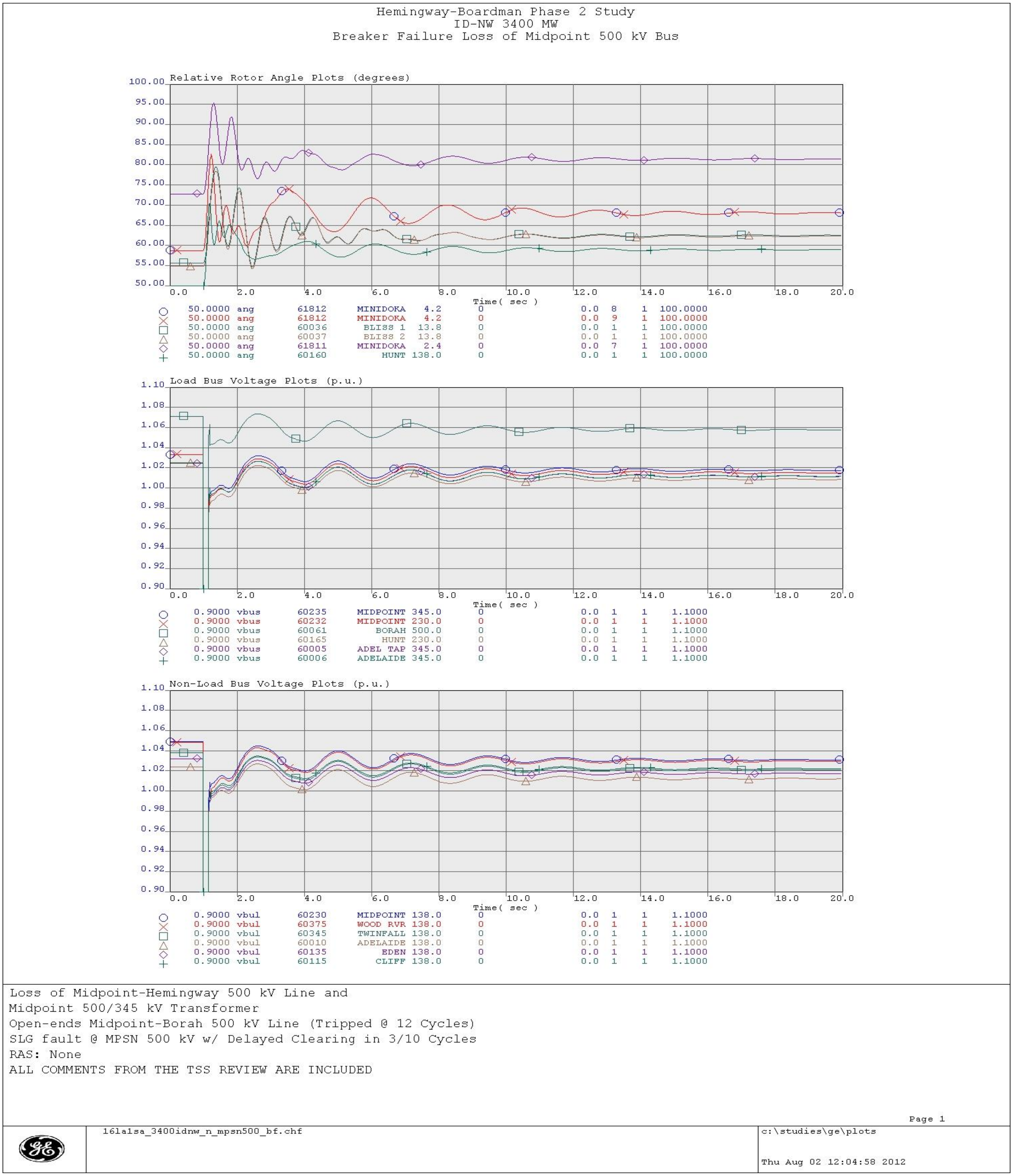

Figure B19: Breaker Failure loss of Midpoint-500 kV Bus

Appendix B - 16la1sa_3400idnw_N Base Case Transient Stability Results

Fault	Disturbance/Outage	RAS Actions		Lowest Swing Voltage Bus (% change)	Lowest Swing Voltage Bus (absolute value)	Lowest Swing Voltage Load Bus (% change)	Lowest Load Bus Frequency (Hz)	Comments
		Cycles	Remedial Action					
N-1 3 Cy 3PH Hemingway 500 kV	Hemingway-Grassland 500 kV	305 305	LaGrande 52 Mvar 230 kV MSC Peterson 31.7 Mvar 230 kV MSC	Ptrsnflt 230 -11.0%	Ptrsnflt 230 0.880	Ptrsnftrg 69 -11.2%	Arapasub 115 59.928	Stable & Damped
N-1 3 Cy 3PH Hemingway 500 kV	Hemingway-Summer Lake 500 kV		None	Ptrsnflt 230 -7.8%	Chromeat 100 0.909	W John Dy 138 -7.2%	Arapasub 115 59.932	Stable & Damped
N-1 3 Cy 3PH Midpoint 500 kV	Hemingway-Midpoint 500 kV		None	Cedarhil 500 -8.6%	Chromeat 100 0.910	Bowmont 138 -6.9%	Waanibe 115 59.940	Stable & Damped
N-1 3 Cy 3PH Populus 500 kV	Hemingway-Populus 500 kV	123 243	Midpoint 500 kV 200 Mvar MSC Borah 345 kV 175 Mvar MSC	Midpoint 500 -12.8%	Scoville 138 0.855	Amps 69 -12.8%	NSS2 69 59.892	Stable & Damped
Breaker Failure 3/10 Cy SLG Hemingway 500 kV	Hemingway-Grassland 500 kV Hemingway 500/230 kV Xfmr	305 305	LaGrande 52 Mvar 230 kV MSC Peterson 31.7 Mvar 230 kV MSC	Ptrsnflt 230 -11.3%	Ptrsnflt 230 0.878	Ptrsnftrg 69 -11.4%	Smokyhlw 115 59.922	Stable & Damped
Breaker Failure 3/10 Cy SLG Hemingway 500 kV	Hemingway-Summer Lake 500 kV Hemingway 500/230 kV Xfmr		None	Ptrsnflt 230 -6.3%	Chromeat 100 0.909	W John Dy 138 -6.4%	Arapasub 115 59.928	Stable & Damped
Breaker Failure 3/10 Cy SLG Hemingway 500 kV	Hemingway-Midpoint 500 kV Hemingway 500/230 kV Xfmr		None	Ptrsnflt 230 -7.8%	Chromeat 100 0.906	Ptrsnftrg 69 -7.9%	Arapasub 115 59.935	Stable & Damped
Breaker Failure 3/10 Cy SLG Hemingway 500 kV	Hemingway-Populus 500 kV Hemingway 500/230 kV Xfmr	123 243	Midpoint 500 kV 200 Mvar MSC Borah 345 kV 175 Mvar MSC	Midpoint 500 -13.5%	Scoville 138 0.853	Amps 69 -13.7%	Arapasub 115 59.893	Stable & Damped
Breaker Failure 3/10 Cy SLG Midpoint 500 kV	Midpoint-Hemingway 500 kV Midpoint 500/345 kV Xfmr Open Midpoint-Borah 500kV		None	Cedarhil 500 -8.8%	Chromeat 100 0.910	Ptrsnftrg 69 -7.0%	Arapasub 115 59.944	Stable & Damped

Appendix B - 16la1sa_3400idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Bus MALIN R3_500.0 (40688)
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Shunt HOT SPR_500.0 (40553) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN Shunt DWORSHAK_500.0 (40369) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN Shunt HOT SPR_500.0 (40553) #s
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Bus HOT SPR_500.0 (40553)
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt DWORSHAK_500.0 (40369) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G1_ 18.0 (47639)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G2_ 18.0 (47640)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP S1_ 18.0 (47641)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 2
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1

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Contingency Studied	Actions Taken in the Contingency
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Bus SANTIAM_500.0 (40941)
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Shunt OSTRNDER_500.0 (40809) #s
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN Bus SNOK TAP_500.0 (41001)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN Bus SNOKING_500.0 (41007)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN Shunt MONROE_500.0 (40749) #s
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR G2_ 20.0 (47744)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2AX_ 4.2 (47746)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2FG_ 13.8 (47747)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR G1_ 20.0 (47740)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1AX_ 4.2 (47742)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1FG_ 13.8 (47743)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Shunt OLY E_230.0 (40794) #s
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Transformer TONO_115.0 (42806) TO PAUL_500.0 (40821) CKT 1
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 109.8 MVR
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN Shunt MONROE_500.0 (40749) #s
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2

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Contingency Studied	Actions Taken in the Contingency
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Transformer ALLSTON_500.0 (40045) TO ALLSTN E_230.0 (40043) CKT 2
BF 4708 Hatwai 500 kV Bus	OPEN Bus HATWAI_500.0 (40521)
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Transformer CHIEF JO_500.0 (40233) TO CHIEF J2_230.0 (40232) CKT 3
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Transformer BIG EDDY_500.0 (40111) TO BIGEDDY1_230.0 (41341) CKT 2
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Bus CGS_ 25.0 (40063)
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN Bus BURNS_500.0 (45029)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R3_500.0 (40688)
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN Bus ROUND BU_500.0 (43485)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Bus MAPLE VL_500.0 (40693)
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M1_500.0 (43115)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
BF 5266 Slatt-Buckly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1

Appendix B - 16la1sa_3400idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS AMPS_ 69.0 (65026) TO 30 MVR
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 15.9 MVR
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	BYPASS SeriesCap MIDPOINT_500.0 (60240) TO MIDHEM11_500.0 (61988) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS AMPS_ 69.0 (65026) TO 30 MVR
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 15.9 MVR
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Bus BURNS_500.0 (45029)
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 400 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BYPASS SeriesCap MIDPOINT_500.0 (60240) TO MIDHEM11_500.0 (61988) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS AMPS_ 69.0 (65026) TO 30 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 400 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
BF Lolo 230kV	OPEN Bus LOLO_230.0 (48197)
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Line COYOTE_500.0 (43123) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Gen BOARD F_ 24.0 (43047) #1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Transformer BOARD F_ 24.0 (43047) TO GRASSLND_500.0 (43049) CKT 1
Bus: Alvey 500 kV	OPEN Bus ALVEY_500.0 (40051)
Bus: Bell BPA 500 kV	OPEN Bus BELL BPA_500.0 (40091)
Bus: Bell BPA 500 kV	OPEN Bus BELL SC_500.0 (40096)
Bus: Bell BPA 500 kV	OPEN Bus COULE R1_500.0 (40288)
Bus: Buckley 500 kV	OPEN Bus BUCKLEY_500.0 (40155)
Bus: Dixonville 500 kV	OPEN Bus DIXONVLE_500.0 (45095)
Bus: Hot Springs 500 kV	OPEN Bus HOT SPR_500.0 (40553)
Bus: Keeler 500 kV	OPEN Bus KEELER_500.0 (40601)
Bus: Rock Creek 500 kV	OPEN Bus DOOLEY T_230.0 (47465)
Bus: Rock Creek 500 kV	OPEN Bus ENRGZR T_230.0 (47823)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE 1_ 34.5 (47829)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE C1_ 34.5 (47865)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE W1_ 0.6 (47866)
Bus: Rock Creek 500 kV	OPEN Bus HARVST W_230.0 (47858)
Bus: Rock Creek 500 kV	OPEN Bus HRVST 1_ 34.5 (47979)
Bus: Rock Creek 500 kV	OPEN Bus HRVST C1_ 34.5 (47980)
Bus: Rock Creek 500 kV	OPEN Bus HRVST W1_ 0.7 (47981)
Bus: Rock Creek 500 kV	OPEN Bus IMRIE_230.0 (47822)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_ 34.5 (47387)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_230.0 (47386)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC C1_ 34.5 (47388)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC W1_ 0.7 (47389)
Bus: Rock Creek 500 kV	OPEN Bus MILLR 1_ 34.5 (47966)
Bus: Rock Creek 500 kV	OPEN Bus MILLR C1_ 34.5 (47967)
Bus: Rock Creek 500 kV	OPEN Bus MILLR W1_ 0.6 (47968)
Bus: Rock Creek 500 kV	OPEN Bus MILLRA S_230.0 (47857)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_230.0 (41402)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_500.0 (41401)
Bus: Rock Creek 500 kV	OPEN Bus TULMN 1_ 34.5 (47826)
Bus: Rock Creek 500 kV	OPEN Bus TULMN C1_ 34.5 (47938)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W1_ 0.7 (47939)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W2_ 0.6 (47940)
Bus: Rock Creek 500 kV	OPEN Bus WHITE CK_230.0 (47827)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 1_ 34.5 (47902)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 2_ 34.5 (47903)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C1_ 34.5 (47904)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C2_ 34.5 (47905)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W1_ 0.7 (47906)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W2_ 0.7 (47907)
Bus: Rock Creek 500 kV	OPEN Bus WILLIS T_230.0 (47824)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 1_ 34.5 (47825)

Appendix B - 16la1sa_3400idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 2_ 34.5 (47493)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 3_ 34.5 (47496)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C1_ 34.5 (47936)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C2_ 34.5 (47494)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C3_ 34.5 (47497)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W1_ 0.7 (47937)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W2_ 0.7 (47495)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W3_ 0.7 (47498)
Bus: Sickler 500 kV	OPEN Bus SICKLER_500.0 (40973)
Bus: Summer Lake 500 kV	OPEN Bus BURNS_500.0 (45029)
Bus: Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
Bus: Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
Bus: Summer Lake 500 kV	OPEN Bus SUMMER L_500.0 (41043)
N-1: Allston-Keeler 500 kV	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
N-1: Allston-Napavine 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-1: Allston-Paul #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-1: Alvery-Dixonville 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO DIXONVLE_500.0 (45095) CKT 1
N-1: Alvey-Marion 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
N-1: Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-1: Ashe-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
N-1: Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-1: Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-1: Bell-Coulee 500 kV	OPEN Bus COULE R1_500.0 (40288)
N-1: Bell-Taft 500 kV	OPEN Bus BELL SC_500.0 (40096)
N-1: Big Eddy-Celilo 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO CELILO1_500.0 (41311) CKT 1
N-1: Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-1: Big Eddy-Knight 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO KNIGHT_500.0 (41450) CKT 1
N-1: Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-1: Boise Bench-Brownlee #3 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-1: Brady-Antelope 230 kV + RAS	OPEN Bus MLCK PHA_230.0 (62355)
N-1: Brady-Antelope 230 kV + RAS	OPEN Line BRADY_230.0 (60073) TO ANTLOPE_230.0 (65075) CKT 1
N-1: Brady-Antelope 230 kV + RAS	OPEN Shunt AMPS_ 69.0 (65026) #1
N-1: Broadview-Garrison #1 500 kV	OPEN Bus GAR1EAST_500.0 (40451)
N-1: Broadview-Garrison #1 500 kV	OPEN Bus TOWN1_500.0 (62013)
N-1: Broadview-Garrison #1 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Brownlee-Ontario 230 kV	OPEN MultiSectionLine BROWNLEE_230.0 (60095) TO ONTARIO_230.0 (60265) CKT 1
N-1: Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-1: Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-1: Buckley-Slatt 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-1: Cal Sub 120 kV Phase Shifter	OPEN Transformer CAL SUB_120.0 (64025) TO CAL S PS_120.0 (64023) CKT 1
N-1: Captain Jack-Olinda 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO OLINDA_500.0 (30020) CKT 1
N-1: CaptJack-Kfalls 500 kV	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
N-1: Cascade Crossing 500 kV	OPEN Bus BETHCRS1_500.0 (43491)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHEL5_500.0 (43041)
N-1: Cascade Crossing 500 kV	OPEN Bus CDR SPRG_500.0 (43950)
N-1: Cascade Crossing 500 kV	OPEN Bus CDRSBET1_500.0 (43951)
N-1: Chief Jo-Coulee 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-1: Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-1: Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-1: Coulee-Hanford 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-1: Coulee-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Covington4-Raver 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-1: Covington5-Raver 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
N-1: Coyote-Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
N-1: CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-1: Dixonville-Meridian 500 kV	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
N-1: Drycreek-Lolo 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO LOLO_230.0 (48197) CKT 1
N-1: Drycreek-N Lewiston 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO N LEWIST_230.0 (48255) CKT 1
N-1: Drycreek-Wala Ava 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO WALA AVA_230.0 (48451) CKT 1
N-1: Dworshak-Hatwai 500 kV	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Taft 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-1: Echo Lake-Maple Valley 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO MAPLE VL_500.0 (40693) CKT 1
N-1: Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-1: Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Echo Lake-Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
N-1: Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-1: Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Goldhill-Placer 115 kV	OPEN Bus FLINT1_115.0 (32236)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSESHE_115.0 (32230)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSHE1_115.0 (32229)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTL1_115.0 (32233)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_ 13.2 (32460)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_115.0 (32234)
N-1: Grassland-Coyote 500 kV	OPEN Line COYOTE_500.0 (43123) TO GRASSLND_500.0 (43049) CKT 1

Appendix B - 16la1sa_3400idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Grassland-Slatt 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
N-1: Grizzly-John Day #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-1: Grizzly-Malin 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZ R3_500.0 (40488) TO PONDROSA_500.0 (40837) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO GRIZZ R3_500.0 (40488) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN MultiSectionLine PONDROSA_500.0 (40837) TO SUMMER L_500.0 (41043) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Grizzly-Round Bu 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO ROUND BU_500.0 (43485) CKT 1
N-1: Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-1: Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-1: Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Harry Allen 345 kV Phase Shifter	OPEN Shunt REDBUTTE_345.0 (66280) #1
N-1: Harry Allen 345 kV Phase Shifter	OPEN Transformer HA PS_345.0 (18002) TO H ALLEN_345.0 (18001) CKT 1
N-1: Harry Allen 345 kV Phase Shifter	OPEN Transformer HA PS_345.0 (18002) TO H ALLEN_345.0 (18001) CKT 2
N-1: Hatwai 500/230 kV Xfmr	OPEN Transformer HATWAI_500.0 (40521) TO HATWAI_230.0 (40519) CKT 1
N-1: Hatwai-Lolo 230 kV	OPEN Line HATWAI_230.0 (40519) TO LOLO_230.0 (48197) CKT 1
N-1: Hatwai-Low Gran 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Hatwai-N Lewiston 230 kV	OPEN Line HATWAI_230.0 (40519) TO N LEWIST_230.0 (48255) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO HURICANE_230.0 (45103) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN MultiSectionLine HURICANE_230.0 (45103) TO WALAWALA_230.0 (45327) CKT 1
N-1: Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 13 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Hemingway-Summer Lake 500 kV	OPEN Line HEMINWAY_500.0 (60155) TO BURNS_500.0 (45029) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN MultiSectionLine BURNS_500.0 (45029) TO SUMMER L_500.0 (41043) CKT 1
N-1: Hill Top 345/230 Xfmr	OPEN Transformer HIL TOP_230.0 (40537) TO HIL TOP_345.0 (64058) CKT 1
N-1: Horse Hv-McNary 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-1: Hot Springs-Taft 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line COYOTECR_345.0 (64032) TO HUMBOLDT_345.0 (64059) CKT 1
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #2_ 99.0 (65014)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #3_ 99.0 (65017)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO &1_345.0 (67582)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO_345.0 (66225)
N-1: Ing500-CusterW 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-1: John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-1: John Day-Rock Ck 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-1: John Day-Slatt 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-1: Kfalls-Meridian 500 kV	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
N-1: Knight-Wautoma 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
N-1: LaGrande-North Powder 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO N POWDER_230.0 (60312) CKT 1
N-1: Lanes-Marion 500 kV	OPEN Line LANE_500.0 (40629) TO MARION_500.0 (40699) CKT 1
N-1: Lit Goose-Central Ferry 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
N-1: Lit Goose-Low Mon 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
N-1: Low Gran-Central Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Low Mon-Sac Tap 500 kV	OPEN Line LOW MON_500.0 (40683) TO SACJWA T_500.0 (40917) CKT 1
N-1: Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
N-1: Malin-Hilltop 230 kV	OPEN Line CANBYTAP_230.0 (40171) TO HIL TOP_230.0 (40537) CKT 1
N-1: Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-1: Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-1: Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-1: Maple Vly-Rocky RH 345 kV	OPEN MultiSectionLine MAPLE VL_345.0 (40691) TO ROCKY RH_345.0 (40891) CKT 1
N-1: Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Line MARION_500.0 (40699) TO SANTIAM_500.0 (40941) CKT 1
N-1: McLouglin-Ostrander 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-1: McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-Board T1 230 kV	OPEN Line BOARD T1_230.0 (40121) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-1: McNary-Longhorn 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
N-1: McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-1: McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-1: McNary-Roundup 230 kV	OPEN Line MCNRY S1_230.0 (41351) TO ROUNDUP_230.0 (40905) CKT 1
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJWA T_500.0 (40917)
N-1: Midpoint-Hemingway 500 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Humboldt 345 kV	OPEN Bus IDAHO-NV_345.0 (64061)
N-1: Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1

Appendix B - 16la1sa_3400idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Olympia-Paul 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
N-1: Ontario-Caldwell 230 kV	OPEN MultiSectionLine CALDWELL_230.0 (60110) TO LANGLEY_230.0 (60266) CKT 1
N-1: Ostrander-Knight 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-1: Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-1: Ostrander-Troutdale 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO TROUTDAL_500.0 (41095) CKT 1
N-1: Oxbow-Brownlee #2 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 2
N-1: Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-1: Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-1: Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO SATSOP_500.0 (40949) CKT 1
N-1: Pearl-Keeler 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pinto-Four Corner 345 kV	CLOSE Shunt PINTO 2_ 13.8 (66228) #1
N-1: Pinto-Four Corner 345 kV	CLOSE Shunt PINTO 3_ 13.8 (66229) #1
N-1: Pinto-Four Corner 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Pinto-Four Corner 345 kV	OPEN Shunt PINTO_138.0 (66230) #1
N-1: Ponderosa A 500/230 kV Xfmr	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Ponderosa B 500/230 kV Xfmr	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Populus-Cedar Hill-Hemingway 500 kV	OPEN MultiSectionLine CEDARHIL_500.0 (60159) TO HEMINWAY_500.0 (60155) CKT 2
N-1: Populus-Cedar Hill-Hemingway 500 kV	OPEN MultiSectionLine POPULUS_500.0 (67794) TO CEDARHIL_500.0 (60159) CKT 2
N-1: Populus-Cedar Hill-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 400 MVR
N-1: Populus-Cedar Hill-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Raver-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-1: Raver-Tacoma 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus H ALLEN_345.0 (18001)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus HA PS_345.0 (18002)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus UTAH-NEV_345.0 (67657)
N-1: Red Butte-Harry Allen 345 kV	OPEN Shunt REDBUTTE_345.0 (66280) #1
N-1: Robinson-Harry Allen 500 kV	OPEN Line ROBINSON_500.0 (64895) TO H ALLEN_500.0 (18450) CKT 1
N-1: Rock Ck-Wautoma 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Round Mtn-Table Mtn 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-1: Roundup-Lagrande 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO ROUNDUP_230.0 (40905) CKT 1
N-1: Schultz-Sickler 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-1: Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-1: Schultz-Wautoma 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Sigurd-Glen Canyon 230 kV	OPEN Bus SIGURDPS_230.0 (66355)
N-1: Slatt 500/230 kV Xfmr	OPEN Transformer SLATT_500.0 (40989) TO SLATT_230.0 (40986) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-1: Snok Tap-Snoking 500 kV	OPEN Line SNOK TAP_500.0 (41001) TO SNOKING_500.0 (41007) CKT 1
N-1: Table Mtn-Tesla 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-1: Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-1: Vantage 500/230 kV Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
N-1: Vantage 500/230 kV Xfmr #2	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 2
N-1: Walla Walla-Talbot 230 kV	OPEN Line TALBOT_230.0 (44912) TO WALAWALA_230.0 (45327) CKT 1
N-1: Walla Walla-Wallula 230 kV	OPEN Line WALAWALA_230.0 (45327) TO WALLULA_230.0 (45331) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	CLOSE Shunt GARRISON_500.0 (40459) #r
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Line BETHEL_230.0 (43039) TO ROUNDB N_230.0 (43483) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1

Appendix B - 16la1sa_3400idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN MultiSectionLine BETHEL_230.0 (43039) TO SANTIAM_230.0 (40939) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN MultiSectionLine BIGEDDY2_230.0 (41342) TO CHEMAWA_230.0 (40213) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Bus PARKDALE_230.0 (40813)
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 2
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO HORSEFLT_230.0 (60102) CKT 4
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 1
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine BRIDGER_345.0 (60085) TO 3MIKNOLL_345.0 (60084) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus GAR1EAST_500.0 (40451)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus GAR2EAST_500.0 (40453)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus TOWN1_500.0 (62013)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus TOWN2_500.0 (62012)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 2_ 22.0 (62049) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt MILLCKT1_ 13.8 (62332) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt MILLCKT2_ 13.8 (62333) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS AMPS_ 69.0 (65026) TO 30 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS BZ EGALL_ 50.0 (62348) TO 20.4 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS JACKRABB_ 50.0 (62349) TO 19.7 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS TAFT_500.0 (41057) TO -186 MVR
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Transformer HELLSCYN_230.0 (60150) TO HELSCYN1_ 14.4 (60151) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine MONROE_230.0 (40747) TO NOVELTY_230.0 (42304) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus CHIEF J3_345.0 (40223)
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus SNOHOMS3_345.0 (40993)
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
N-2: DC-BIPOLE	OPEN Bus CELILO1_500.0 (41311)
N-2: DC-BIPOLE	OPEN Bus CELILO2_500.0 (41312)
N-2: DC-BIPOLE	OPEN Bus CELILO3_230.0 (41313)
N-2: DC-BIPOLE	OPEN Bus CELILO4_230.0 (41314)
N-2: DC-BIPOLE	OPEN Bus SYLMAR1_230.0 (26097)
N-2: DC-BIPOLE	OPEN Bus SYLMAR2_230.0 (26099)
N-2: Double Palo Verde	CHANGE LOAD AT BUS AGUAFAPS_ 69.0 (14400) BY -120 MW (cnst pf)

Appendix B - 16la1sa_3400idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Double Palo Verde	CLOSE Shunt ROBINSON_345.0 (64885) #b1
N-2: Double Palo Verde	OPEN Gen PALOVRD1_ 24.0 (14931) #1
N-2: Double Palo Verde	OPEN Gen PALOVRD2_ 24.0 (14932) #1
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS DURANGO_115.0 (79023) TO 40 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS PINTO_138.0 (66230) TO 64 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS YORKCANY_115.0 (12091) TO 15 MVR
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Line COVINGTN_230.0 (40303) TO MAPLEV12_230.0 (40692) CKT 2
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_345.0 (40691)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus ROCKY RH_345.0 (40891)
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	OPEN Bus PONDROSB_500.0 (40834)
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	OPEN Bus IMNAHA_230.0 (60278)
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus CASCADTP_230.0 (40185)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus WINDSHAR_230.0 (41155)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus ALFALFA_230.0 (40039)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus OUTLOOK_230.0 (45229)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine MCNARY_345.0 (40721) TO ROSS_345.0 (40901) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus ROSS_345.0 (40901)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN Line KING_230.0 (60177) TO MIDPOINT_230.0 (60232) CKT 1

Appendix B - 16la1sa_3400idnw_N Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV	OPEN Line PEARL #_230.0 (43773) TO SHERWOOD_230.0 (43527) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN MultiSectionLine BIGEDDY3_230.0 (41343) TO MCLOUGLN_230.0 (43313) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT5_500.0 (40306)
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus COULEE_300.0 (40285)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus OLYMPIA_300.0 (40795)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Bus CENTR SS_230.0 (47748)
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN Bus CHRISTOP_230.0 (42505)
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 2
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus ADDY N_230.0 (40021)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Line BELL BPA_115.0 (40087) TO BIGELOW_115.0 (40113) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN MultiSectionLine LANCASTR_230.0 (40624) TO NOXONBPA_230.0 (40787) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN Shunt GARRISON_500.0 (40459) #s
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1

Appendix C

16hs2a_3400WoH_2250idnw_N Base Case (West of Hatwai, Path 8)

Appendix C– 16hs2sa_3400WoH_2250idnw_N Case Post-Transient Contingency Results

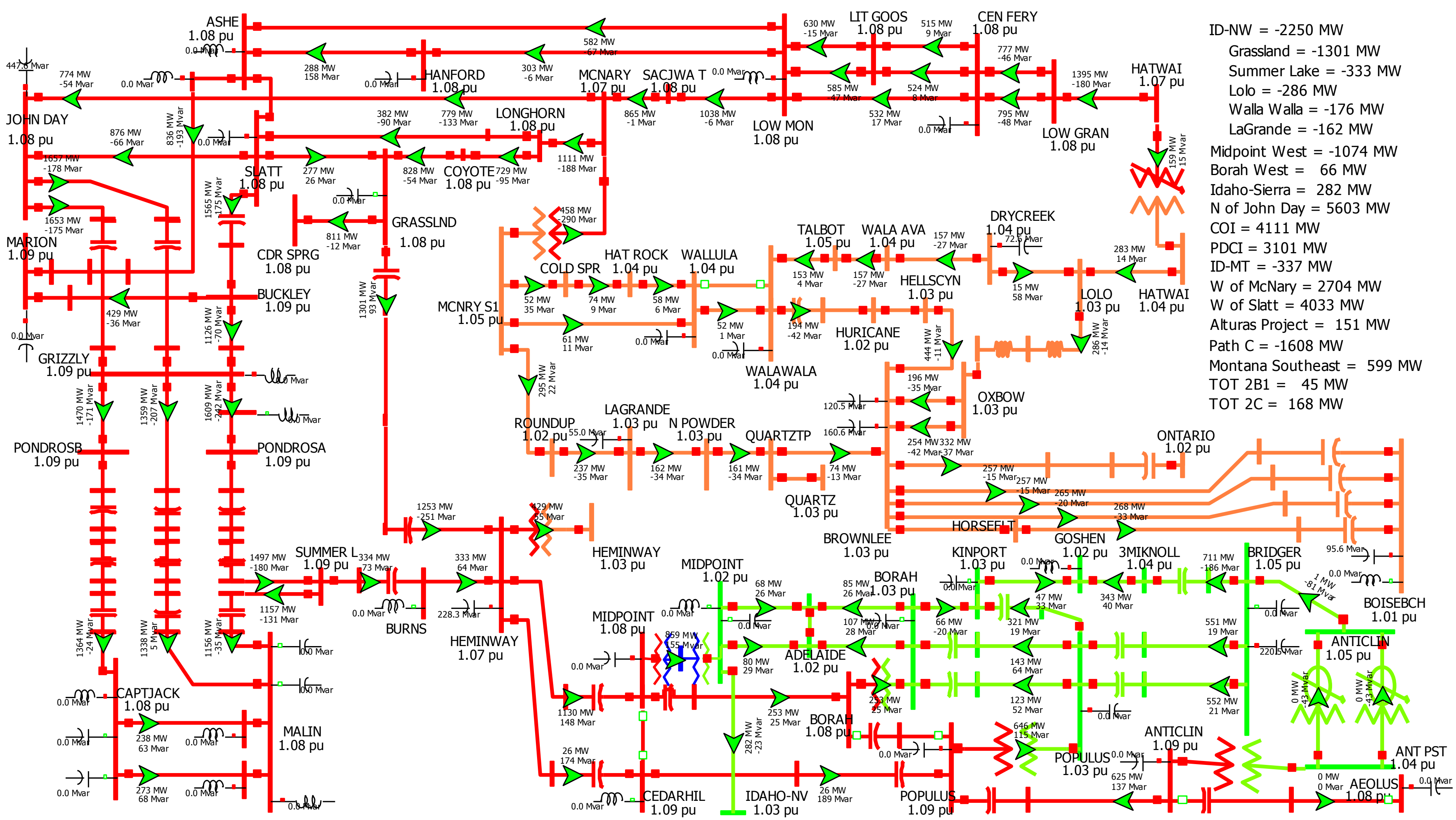


Figure C1: 16hs2sa_3400WoH_2250idnw_N Case **Pre-Contingency**

Appendix C– 16hs2sa_3400WoH_2250idnw_N Case Post-Transient Contingency Results

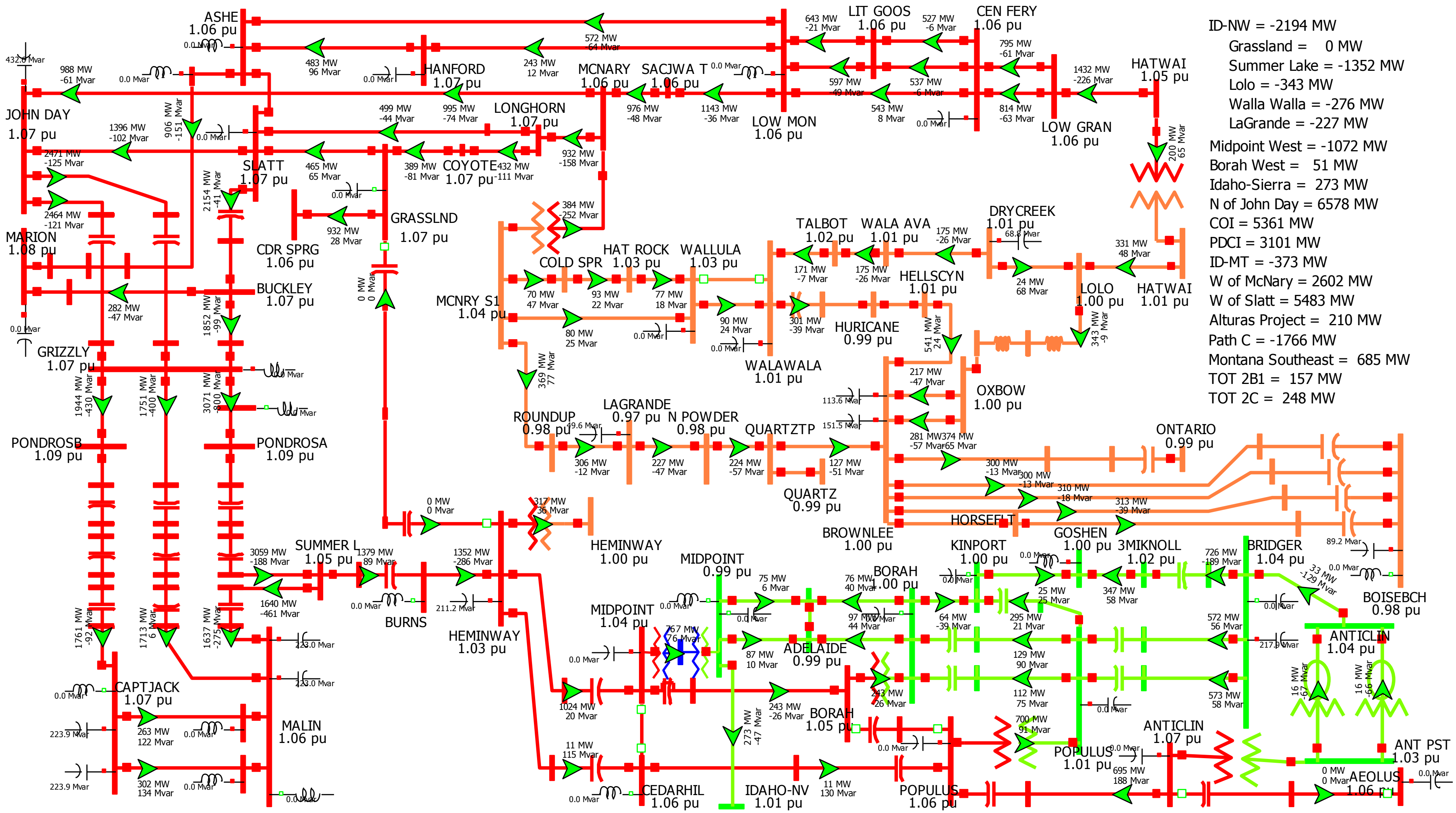


Figure C2: 16hs2sa_3400WoH_2250idnw_N Case **N-1: Hemingway-Grassland 500 kV**

Appendix C– 16hs2sa_3400WoH_2250idnw_N Case Post-Transient Contingency Results

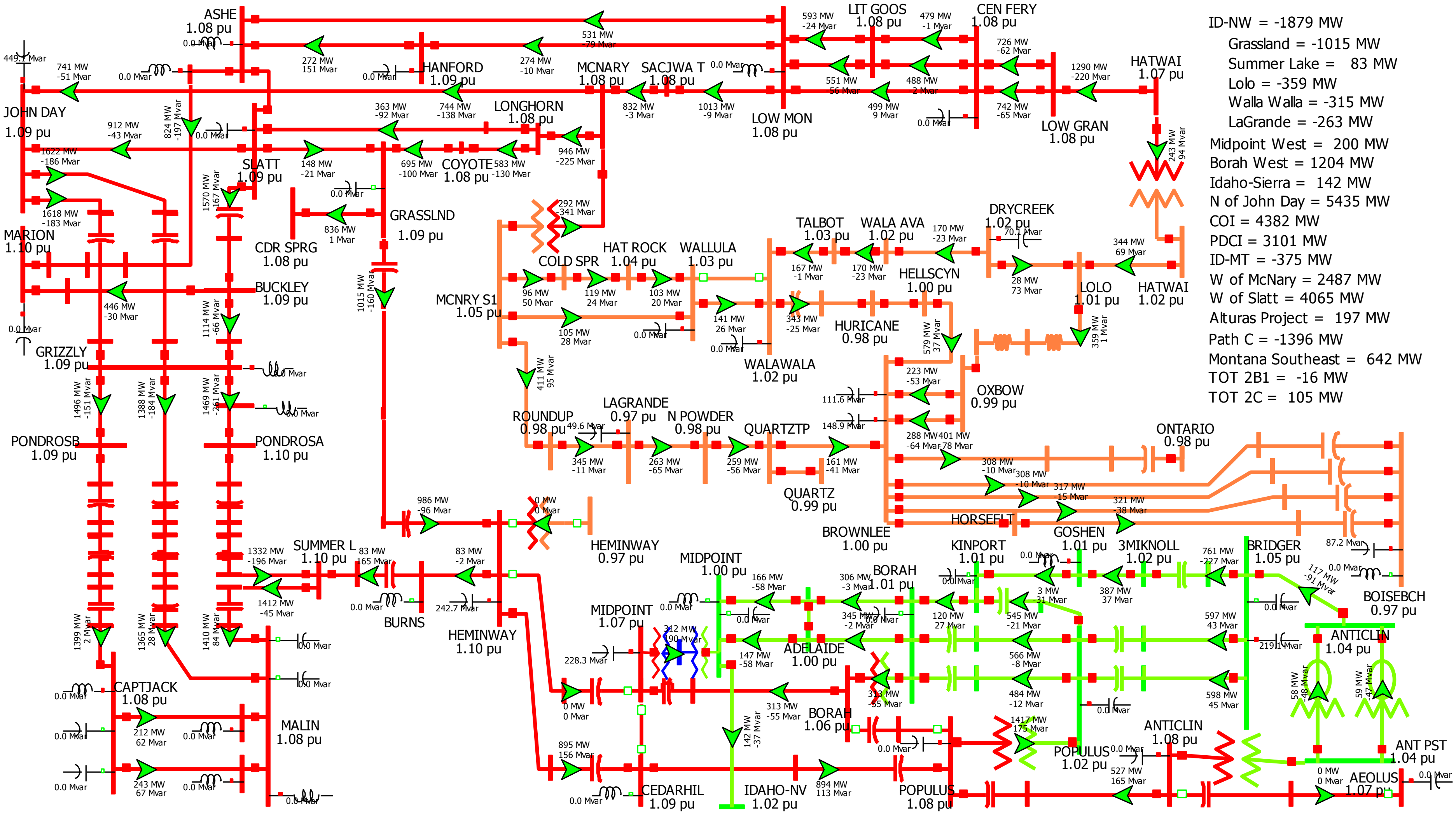
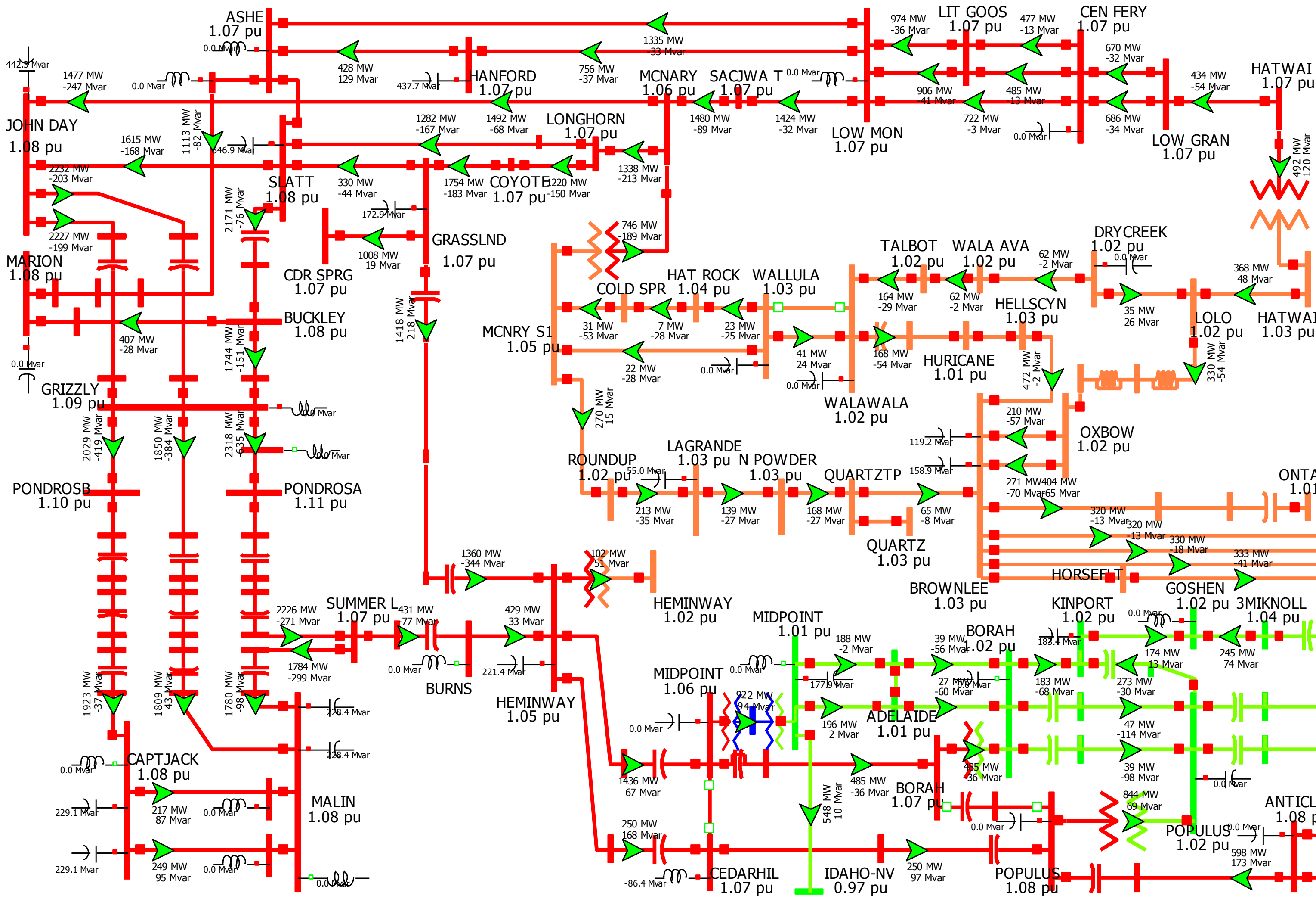


Figure C3: 16hs2sa_3400WoH_2250idnw_N Case **BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr**

Appendix C– 16hs2sa_3400WoH_2250idnw_N Case Post-Transient Contingency Results



ID-NW = -2446 MW
Grassland = -1418 MW
Summer Lake = -429 MW
Lolo = -330 MW
Walla Walla = -151 MW
LaGrande = -139 MW
Midpoint West = -1862 MW
Borah West = -503 MW
Idaho-Sierra = 548 MW
N of John Day = 9446 MW
COI = 5613 MW
PDCI = 3101 MW
ID-MT = -351 MW
W of McNary = 5545 MW
W of Slatt = 6294 MW
Alturas Project = 181 MW
Path C = -1911 MW
Montana Southeast = 630 MW
TOT 2B1 = 228 MW
TOT 2C = 324 MW

Figure C4: 16hs2sa_3400WoH_2250idnw_N Case **N-2: Double Palo Verde**

Appendix C– 16hs2sa_3400WoH_2250idnw_N Case Post-Transient Contingency Results

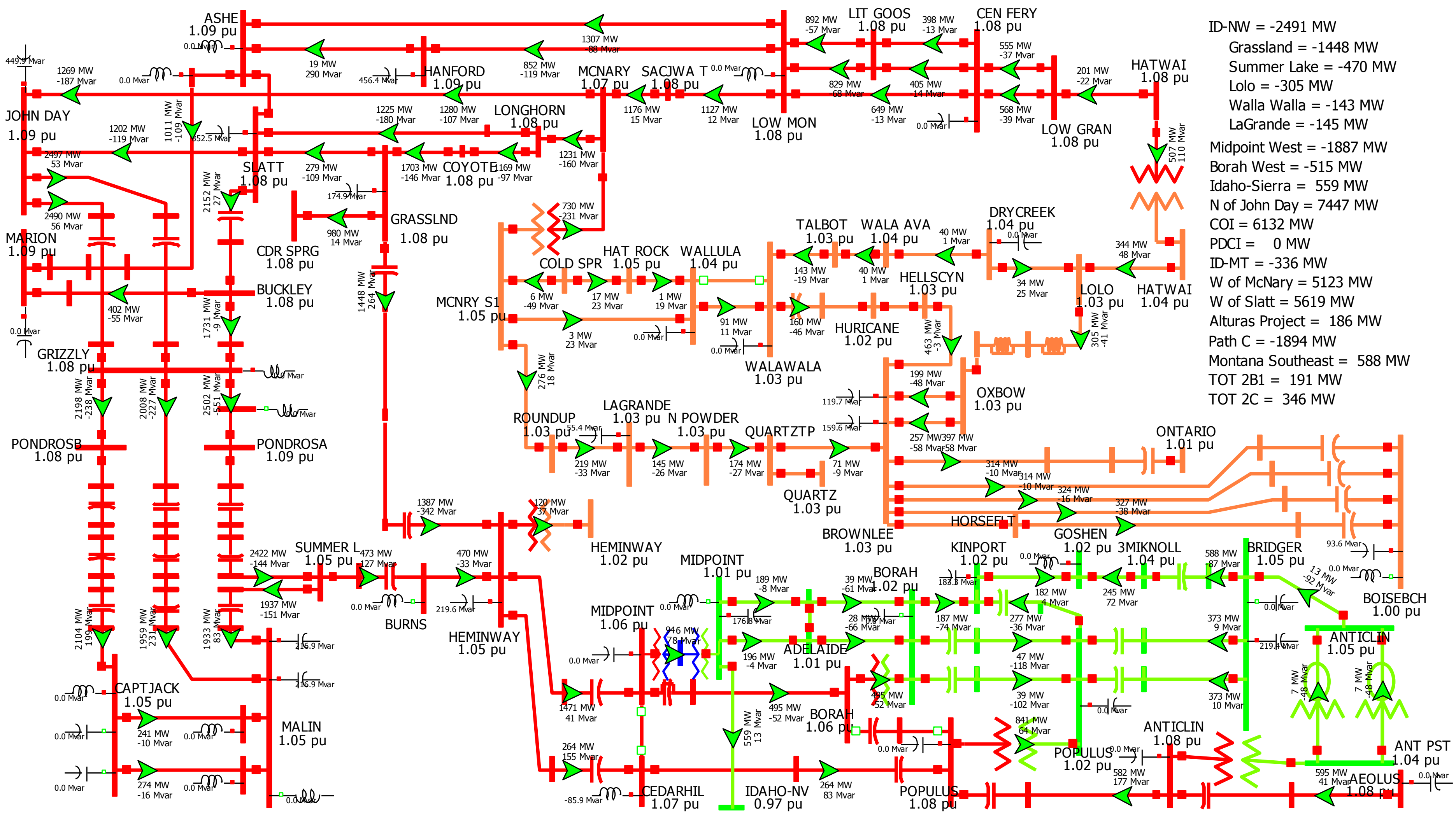


Figure C5: 16hs2sa_3400WoH_2250idnw_N Case **N-2: DC Bipole**

Appendix C- 16hs2a_3400WoH_2250idnw_N Base Case Post-Transient Contingency Results

					ID-NW 1200 Case Results (WoH 3400)				ID-NW 2250 Case Results (WoH 3400)			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	No Violations											
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	No Violations											
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	MERIDINP (45197) -> MERIDINP (45195) CKT 2 at MERIDINP	Branch MVA	650.0	780.0	369.8	651.8	100.3%	83.6%	369.8	665.3	102.3%	85.3%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	979.0	1287.7	667.7	1141.7	116.6%	88.7%	641.6	1143.4	116.8%	88.8%
BF 4003 Hanford-Vantage & Hanford Caps	No Violations											
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations											
BF 4028 Taft-Dworshak & Taft Reactor 500kV + RAS	No Violations											
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1019.6	1054.1	104.5%	82.0%	No Violation			
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	2442.0	3235.5	1462.5	2528.2	103.5%	78.1%	1444.9	2490.2	102.0%	77.0%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	2199.9	3235.5	1460.9	2528.2	114.9%	78.1%	1444.9	2490.2	113.2%	77.0%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	2400.0	3800.0	1807.2	2468.3	102.8%	65.0%	No Violation			
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations											
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations											
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	No Violations											
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	No Violations											
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	PTRSNFUR (62386)	% Δ Volts			0.962	0.904		6.03%	No Violation			
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	PTRSNFLT (62030)	% Δ Volts			0.946	0.890		5.92%	No Violation			
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations											
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	GRIJOH22 (90067) -> GRIJOH21 (90066) CKT 2 at GRIJOH21	Branch Amp	3000.0	4050.0	1917.9	3002.4	100.1%	74.1%	No Violation			
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500kV + RAS	No Violations											
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations											
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	2442.0	3235.5	1462.5	2582.1	105.7%	79.8%	1444.9	2537.0	103.9%	78.4%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	2199.9	3235.5	1460.9	2582.1	117.4%	79.8%	1444.9	2537.0	115.3%	78.4%
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations											
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations											
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations											
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	No Violations											
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	No Violations											
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations											
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations											
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations											
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations											
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	320.0	370.0	270.5	328.8	102.7%	88.9%	271.8	342.1	106.9%	92.4%
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	950.0	1286.0	758.3	1051.0	110.6%	81.7%	674.9	1078.6	113.5%	83.9%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	320.0	370.0	270.5	340.0	106.2%	91.9%	271.8	352.2	110.1%	95.2%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	950.0	1286.0	758.3	1074.3	113.1%	83.5%	674.9	1101.6	116.0%	85.7%
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations											
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations											
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations											
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations											
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1019.6	1153.3	114.3%	89.7%	923.8	1041.2	103.2%	81.0%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations											
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	No Violations											
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations											

Appendix C- 16hs2a_3400WoH_2250idnw_N Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	ID-NW 1200 Case Results (WoH 3400) Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	ID-NW 2250 Case Results (WoH 3400) Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations											
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations											
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations											
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	No Violations											
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations											
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	No Violations											
BF 4530 Raver-Paul & Paul-Satsop 500 kV	No Violations											
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	No Violations											
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations											
BF 4542 Paul-Allston 500 kV & Center G2	No Violations											
BF 4542 Paul-Napavine 500 kV & Center G1	No Violations											
BF 4550 Olympia-Paul & Paul-Allston 500 kV	No Violations											
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	No Violations											
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	No Violations											
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations											
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	No Violations											
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations											
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations											
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations											
BF 4708 Hatwai 500 kV Bus + RAS	No Violations											
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations											
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV + RAS	DRYGULCH (48113) -> DRYGULCH (45097) CKT 1 at DRYGULCH	Branch MVA	20.0	24.0	14.9	21.9	109.5%	91.3%	15.0	22.4	111.9%	93.3%
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV + RAS	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	754.8	921.7	100.2%	88.0%	729.2	922.0	100.2%	88.1%
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations											
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations											
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations											
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations											
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations											
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1386.0	112.0%	99.3%	No Violation			
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	754.8	944.5	102.7%	90.2%	No Violation			
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	725.8	827.4	103.4%	69.0%	No Violation			
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	PTRSNFUR (62386)	% Δ Volts			0.962	0.878		8.73%	No Violation			
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	PTRSNFLT (62030)	% Δ Volts			0.946	0.866		8.46%	No Violation			
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	AMPS (65025)	% Δ Volts			0.955	0.886		7.23%	No Violation			
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1393.3	112.6%	99.8%	No Violation			
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	754.8	951.5	103.4%	90.9%	No Violation			
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	725.8	832.0	104.0%	69.3%	No Violation			
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	PTRSNFUR (62386)	% Δ Volts			0.962	0.878		8.73%	No Violation			
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	PTRSNFLT (62030)	% Δ Volts			0.946	0.866		8.46%	No Violation			
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	AMPS (65025)	% Δ Volts			0.955	0.888		7.02%	No Violation			
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations											
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	No Violations											
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	No Violations											
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	No Violations											

Appendix C- 16hs2a_3400WoH_2250idnw_N Base Case Post-Transient Contingency Results

					ID-NW 1200 Case Results (WoH 3400)				ID-NW 2250 Case Results (WoH 3400)			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations											
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	No Violations											
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1275.5	103.1%	91.4%	No Violation			
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1019.6	1051.4	104.2%	81.8%	No Violation			
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	PTRSNFUR (62386)	% Δ Volts			0.962	0.911		5.30%	No Violation			
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	GRIJOH22 (90067) -> GRIJOH21 (90066) CKT 2 at GRIJOH22	Branch Amp	3000.0	4050.0	1917.9	3003.3	100.1%	74.2%	No Violation			
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations											
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations											
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations											
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations											
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations											
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations											
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	No Violations											
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	No Violations											
BF 5214 Low Mon-McNary & Calpine PH 500 kV	No Violations											
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations											
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations											
BF 5266 Slatt-Buckly 500 kV	No Violations											
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations											
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations											
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	Contingency Unavailable				1081.6	1386.1	112.0%	99.3%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	Contingency Unavailable				729.2	947.2	103.0%	90.5%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	Contingency Unavailable				711.1	811.8	101.5%	67.7%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1344.6	108.7%	96.3%	1081.6	1244.8	100.6%	89.2%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	725.8	809.2	101.1%	67.4%	No Violation			
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	PTRSNFUR (62386)	% Δ Volts			0.962	0.894		7.07%	No Violation			
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts			0.946	0.882		6.77%	No Violation			
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	AMPS (65025)	% Δ Volts			0.955	0.900		5.76%	No Violation			
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1343.7	108.6%	96.3%	1081.6	1451.6	117.3%	104.0%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	No Violation				729.2	993.2	108.0%	94.9%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	725.8	804.1	100.5%	67.0%	711.1	807.7	101.0%	67.3%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HEMINWAY (60156)	% Δ Volts			No Violation				1.034	0.968		6.38%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	LAGRANDE (40619)	% Δ Volts			No Violation				0.977	0.921		5.73%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	BOWMONT (60064)	% Δ Volts			No Violation				1.026	0.968		5.65%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	BOWMONT (60065)	% Δ Volts			No Violation				1.040	0.983		5.48%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	CHESTNUT (60211)	% Δ Volts			No Violation				1.025	0.973		5.07%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HAPPYVLY (60257)	% Δ Volts			No Violation				1.027	0.975		5.06%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	LAGRANDE (40621)	% Δ Volts			No Violation				1.027	0.975		5.06%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	PTRSNFUR (62386)	% Δ Volts			0.962	0.891		7.38%	No Violation			
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts			0.946	0.878		7.19%	No Violation			
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	AMPS (65025)	% Δ Volts			0.955	0.891		6.70%	No Violation			
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	MIDPOINT (60240)	% Δ Volts			1.092	1.033		5.40%	No Violation			
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	No Violations											
BF Lolo 230kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1282.2	103.7%	91.9%	No Violation			

Appendix C- 16hs2a_3400WoH_2250idnw_N Base Case Post-Transient Contingency Results

					ID-NW 1200 Case Results (WoH 3400)				ID-NW 2250 Case Results (WoH 3400)			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
BF McNary 230 kV SECT 1	No Violations											
BF McNary 230 kV SECT 2	No Violations											
BF McNary 230 kV SECT 3	FRANKLIN (40443)	% Δ Volts			1.005	0.947		5.77%	1.005	0.946		5.87%
Bus: Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1019.6	1140.8	113.1%	88.8%	923.8	1030.2	102.1%	80.2%
Bus: Bell BPA 500 kV	No Violations											
Bus: Buckley 500 kV	No Violations											
Bus: Dixonville 500 kV	No Violations											
Bus: Hot Springs 500 kV	DIXON MV (40348)	% Δ Volts			1.024	0.969		5.37%	No Violation			
Bus: Hot Springs 500 kV	HOT SPR (40551)	% Δ Volts			1.034	0.981		5.13%	No Violation			
Bus: Keeler 500 kV + RAS	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	94.0	139.0	74.7	95.1	101.1%	68.4%	No Violation			
Bus: Rock Creek 500 kV	No Violations											
Bus: Sickler 500 kV	No Violations											
Bus: Summer Lake 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1393.7	112.7%	99.8%	No Violation			
Bus: Summer Lake 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	754.8	950.5	103.3%	90.8%	No Violation			
Bus: Summer Lake 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	725.8	831.0	103.9%	69.3%	No Violation			
Bus: Summer Lake 500 kV	PTRSNFUR (62386)	% Δ Volts			0.962	0.874		9.15%	No Violation			
Bus: Summer Lake 500 kV	PTRSNFLT (62030)	% Δ Volts			0.946	0.863		8.77%	No Violation			
Bus: Summer Lake 500 kV	AMPS (65025)	% Δ Volts			0.955	0.883		7.54%	No Violation			
N-1: Allston-Keeler 500 kV + RAS	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	94.0	139.0	74.7	95.1	101.2%	68.4%	No Violation			
N-1: Allston-Napavine 500 kV	No Violations											
N-1: Allston-Paul #2 500 kV	No Violations											
N-1: Alvery-Dixonville 500 kV	No Violations											
N-1: Alvey-Marion 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1019.6	1196.0	118.5%	93.1%	923.8	1083.3	107.4%	84.3%
N-1: Ashe-Hanford 500 kV	No Violations											
N-1: Ashe-Low Mon 500 kV	No Violations											
N-1: Ashe-Marion 500 kV	No Violations											
N-1: Ashe-Slatt 500 kV	No Violations											
N-1: Bell-Coulee 500 kV	No Violations											
N-1: Bell-Taft 500 kV	No Violations											
N-1: Big Eddy-Celilo 500 kV	No Violations											
N-1: Big Eddy-John Day 500 kV	No Violations											
N-1: Big Eddy-Knight 500 kV	No Violations											
N-1: Big Eddy-Ostrander 500 kV	No Violations											
N-1: Boise Bench-Brownlee #3 230 kV	No Violations											
N-1: Brady-Antelope 230 kV	No Violations											
N-1: Broadview-Garrison #1 500 kV	No Violations											
N-1: Brownlee-Ontario 230 kV	No Violations											
N-1: Buckley-Grizzly 500 kV	No Violations											
N-1: Buckley-Marion 500 kV	No Violations											
N-1: Buckley-Slatt 500 kV	No Violations											
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 1 at COTWDWAP	Branch Amp	785.7	926.3	275.5	786.3	100.1%	84.9%	326.0	821.7	104.6%	88.7%
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 2 at COTWDWAP	Branch Amp	785.7	926.3	275.5	786.3	100.1%	84.9%	326.0	821.7	104.6%	88.7%
N-1: Captain Jack-Olinda 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	2199.9	3235.5	1460.9	2243.4	102.0%	69.3%	No Violation			
N-1: CaptJack-Kfalls 500 kV	No Violations											

Appendix C- 16hs2a_3400WoH_2250idnw_N Base Case Post-Transient Contingency Results

					ID-NW 1200 Case Results (WoH 3400)				ID-NW 2250 Case Results (WoH 3400)			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-1: Cascade Crossing 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	No Violation				923.8	1029.7	102.0%	80.1%
N-1: Chief Jo-Coulee 500 kV	No Violations											
N-1: Chief Jo-Monroe 500 kV	No Violations											
N-1: Chief Jo-Sickler 500 kV	No Violations											
N-1: Coulee-Hanford 500 kV	No Violations											
N-1: Coulee-Schultz 500 kV	No Violations											
N-1: Covington4-Raver 500 kV	No Violations											
N-1: Covington5-Raver 500 kV	No Violations											
N-1: Coyote-Longhorn 500 kV	No Violations											
N-1: CusterW-Monroe 500 kV	No Violations											
N-1: Dixonville-Meridian 500 kV	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	979.0	1287.7	667.7	1096.1	112.0%	85.1%	641.6	1098.2	112.2%	85.3%
N-1: Drycreek-Lolo 230 kV	No Violations											
N-1: Drycreek-N Lewiston 230 kV	No Violations											
N-1: Drycreek-Wala Ava 230 kV	No Violations											
N-1: Dworshak-Hatwai 500 kV + RAS	No Violations											
N-1: Dworshak-Taft 500 kV + RAS	No Violations											
N-1: Echo Lake-Maple Valley 500 kV	No Violations											
N-1: Echo Lake-Raver 500 kV	No Violations											
N-1: Echo Lake-Schultz 500 kV	No Violations											
N-1: Echo Lake-Snok Tap 500 kV	No Violations											
N-1: Garrison-Taft #2 500 kV	No Violations											
N-1: Goldhill-Placer 115 kV	No Violations											
N-1: Grassland-Coyote 500 kV	No Violations											
N-1: Grassland-Slatt 500 kV	No Violations											
N-1: Grizzly-John Day #2 500 kV	No Violations											
N-1: Grizzly-Malin 500 kV	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	2400.0	3800.0	1807.2	2475.4	103.1%	65.1%	No Violation			
N-1: Grizzly-Ponderosa A-Summer L 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1247.6	100.9%	89.4%	No Violation			
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	2400.0	3800.0	1807.2	2469.1	102.9%	65.0%	No Violation			
N-1: Grizzly-Round Bu 500 kV	No Violations											
N-1: Hanford-Low Mon 500 kV	No Violations											
N-1: Hanford-Vantage 500 kV	No Violations											
N-1: Hanford-Wautoma 500 kV	No Violations											
N-1: Hatwai 500/230 kV Xfmr + RAS	No Violations											
N-1: Hatwai-Lolo 230 kV	No Violations											
N-1: Hatwai-Low Gran 500 kV + RAS	DRYGULCH (48113) -> DRYGULCH (45097) CKT 1 at DRYGULCH	Branch MVA	20.0	24.0	14.9	20.2	101.1%	84.2%	15.0	22.4	111.9%	93.2%
N-1: Hatwai-Low Gran 500 kV + RAS	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	No Violation				729.2	921.8	100.2%	88.1%
N-1: Hatwai-N Lewiston 230 kV	No Violations											
N-1: Hells Canyon-Brownlee 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	754.8	951.4	103.4%	90.9%	No Violation			
N-1: Hells Canyon-Walla Walla 230 kV	No Violations											
N-1: Hemingway-Grassland 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	Contingency Unavailable				1081.6	1312.2	106.1%	94.0%
N-1: Hemingway-Grassland 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	Contingency Unavailable				711.1	812.5	101.6%	67.7%
N-1: Hemingway-Grassland 500 kV	PTRSNFUR (62386)	% Δ Volts			Contingency Unavailable				0.982	0.913		7.03%
N-1: Hemingway-Grassland 500 kV	PTRSNFLT (62030)	% Δ Volts			Contingency Unavailable				0.965	0.900		6.74%
N-1: Hemingway-Grassland 500 kV	AMPS (65025)	% Δ Volts			Contingency Unavailable				0.969	0.912		5.88%

Appendix C- 16hs2a_3400WoH_2250idnw_N Base Case Post-Transient Contingency Results

					ID-NW 1200 Case Results (WoH 3400)				ID-NW 2250 Case Results (WoH 3400)			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	Contingency Unavailable				1081.6	1305.0	105.5%	93.5%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	Contingency Unavailable				711.1	814.1	101.8%	67.8%
N-1: Hemingway-Summer Lake 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1345.2	108.7%	96.4%	No Violation			
N-1: Hemingway-Summer Lake 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	725.8	807.3	100.9%	67.3%	No Violation			
N-1: Hemingway-Summer Lake 500 kV	PTRSNFUR (62386)	% Δ Volts			0.962	0.897		6.76%	No Violation			
N-1: Hemingway-Summer Lake 500 kV	PTRSNFLT (62030)	% Δ Volts			0.946	0.884		6.55%	No Violation			
N-1: Hemingway-Summer Lake 500 kV	AMPS (65025)	% Δ Volts			0.955	0.901		5.65%	No Violation			
N-1: Hill Top 345/230 Xfmr	No Violations											
N-1: Horse Hv-McNary 230 kV	No Violations											
N-1: Hot Springs-Taft 500 kV	HOT SPR (40553)	% Δ Volts			1.054	0.980		7.02%	1.064	0.989		7.05%
N-1: Hot Springs-Taft 500 kV	DIXON MV (40348)	% Δ Volts			1.024	0.968		5.47%	No Violation			
N-1: Hot Springs-Taft 500 kV	HOT SPR (40551)	% Δ Volts			1.034	0.980		5.22%	No Violation			
N-1: Humboldt-Coyote Ck 345 kV	No Violations											
N-1: Huntington-Pinto-Four Corners 345 kV	No Violations											
N-1: Ing500-CusterW 500 kV	No Violations											
N-1: John Day-Marion 500 kV	No Violations											
N-1: John Day-Rock Ck 500 kV	No Violations											
N-1: John Day-Slatt 500 kV	No Violations											
N-1: Kfalls-Meridian 500 kV	No Violations											
N-1: Knight-Wautoma 500 kV	No Violations											
N-1: LaGrande-North Powder 230 kV	No Violations											
N-1: Lanes-Marion 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1019.6	1088.8	107.9%	84.7%	No Violation			
N-1: Lit Goose-Central Ferry 500 kV	No Violations											
N-1: Lit Goose-Low Mon 500 kV	No Violations											
N-1: Low Gran-Central Ferry 500 kV	No Violations											
N-1: Low Mon-Sac Tap 500 kV	No Violations											
N-1: Malin 500/230 Xfmr	No Violations											
N-1: Malin-Hilltop 230 kV	No Violations											
N-1: Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	2442.0	3235.5	1462.5	2530.2	103.6%	78.2%	1444.9	2492.9	102.1%	77.0%
N-1: Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	2199.9	3235.5	1460.9	2530.2	115.0%	78.2%	1444.9	2492.9	113.3%	77.0%
N-1: Malin-Round Mtn #2 500 kV	No Violations											
N-1: Malin-Summer Lake 500 kV	No Violations											
N-1: Maple Vly-Rocky RH 345 kV	No Violations											
N-1: Marion-Pearl 500 kV	No Violations											
N-1: Marion-Santiam 500 kV	No Violations											
N-1: McLouglin-Ostrander 230 kV	No Violations											
N-1: McNary 500/230 kV Xfmr	No Violations											
N-1: McNary S2-McNary S3 230 kV	No Violations											
N-1: McNary-Board T1 230 kV	No Violations											
N-1: McNary-John Day 500 kV	No Violations											
N-1: McNary-Longhorn 500 kV	No Violations											
N-1: McNary-Ross 345 kV	No Violations											
N-1: McNary-Roundup 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1284.1	103.8%	92.0%	No Violation			
N-1: McNary-Sac Tap-Low Mon 500 kV	No Violations											

Appendix C- 16hs2a_3400WoH_2250idnw_N Base Case Post-Transient Contingency Results

					ID-NW 1200 Case Results (WoH 3400)				ID-NW 2250 Case Results (WoH 3400)			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-1: Midpoint-Hemingway 500 kV	No Violations											
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	No Violations											
N-1: Midpoint-Humboldt 345 kV	No Violations											
N-1: Napavine-Paul 500 kV	No Violations											
N-1: Olympia-Paul 500 kV	No Violations											
N-1: Ontario-Caldwell 230 kV	No Violations											
N-1: Ostrander-Knight 500 kV	No Violations											
N-1: Ostrander-Pearl 500 kV	No Violations											
N-1: Ostrander-Troutdale 500 kV	No Violations											
N-1: Oxbow-Brownlee #2 230 kV	No Violations											
N-1: Oxbow-Lolo 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1284.6	103.8%	92.0%	No Violation			
N-1: Paul-Satsop 500 kV	No Violations											
N-1: Pearl-Keeler 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	320.0	370.0	270.5	329.8	103.1%	89.1%	271.8	344.1	107.5%	93.0%
N-1: Pearl-Keeler 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	950.0	1286.0	758.3	1054.0	110.9%	82.0%	674.9	1084.8	114.2%	84.4%
N-1: Pinto-Four Corner 345 kV	No Violations											
N-1: Ponderosa A 500/230 kV Xfmr	No Violations											
N-1: Ponderosa B 500/230 kV Xfmr	No Violations											
N-1: Raver-Paul 500 kV	No Violations											
N-1: Raver-Tacoma 500 kV	No Violations											
N-1: Red Butte-Harry Allen 345 kV	No Violations											
N-1: Robinson-Harry Allen 500 kV	No Violations											
N-1: Rock Ck-Wautoma 500 kV	No Violations											
N-1: Roundup-Lagrande 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1256.9	101.6%	90.0%	No Violation			
N-1: Schultz-Sickler 500 kV	No Violations											
N-1: Schultz-Vantage 500 kV	No Violations											
N-1: Schultz-Wautoma 500 kV	No Violations											
N-1: Sigurd-Glen Canyon 230 kV	No Violations											
N-1: Slatt 500/230 kV Xfmr	No Violations											
N-1: Slatt-Longhorn 500 kV	No Violations											
N-1: Snok Tap-Snoking 500 kV	No Violations											
N-1: Vantage 500/230 kV Xfmr #1	No Violations											
N-1: Vantage 500/230 kV Xfmr #2	No Violations											
N-1: Walla Walla-Talbot 230 kV	No Violations											
N-1: Walla Walla-Wallula 230 kV	No Violations											
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations											
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations											
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations											
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	No Violations											
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations											
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations											
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	No Violations											
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations											
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations											
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations											

Appendix C- 16hs2a_3400WoH_2250idnw_N Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	ID-NW 1200 Case Results (WoH 3400) Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	ID-NW 2250 Case Results (WoH 3400) Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations											
N-2: Bridger-Populus #1 & #2 345 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	725.8	859.7	107.5%	71.6%	711.1	815.4	101.9%	68.0%
N-2: Bridger-Populus #1 & #2 345 kV + RAS	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1355.8	109.6%	97.1%	No Violation			
N-2: Bridger-Populus #1 & #2 345 kV + RAS	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	754.8	931.0	101.2%	88.9%	No Violation			
N-2: Bridger-Populus #1 & #2 345 kV + RAS	PTRSNFLT (62030)	% Δ Volts			0.946	0.839		11.31%	No Violation			
N-2: Bridger-Populus #1 & #2 345 kV + RAS	AMPS (65025)	% Δ Volts			0.955	0.857		10.26%	No Violation			
N-2: Bridger-Populus #1 & #2 345 kV + RAS	BIGGRASS (65155)	% Δ Volts			0.982	0.909		7.43%	No Violation			
N-2: Bridger-Populus #1 & #2 345 kV + RAS	DILLON S (62084)	% Δ Volts			0.965	0.906		6.11%	No Violation			
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SPAR CYN (66765)	% Δ Volts			0.983	0.924		6.00%	No Violation			
N-2: Bridger-Populus #1 & #2 345 kV + RAS	LOST RIV (65910)	% Δ Volts			0.988	0.931		5.77%	No Violation			
N-2: Bridger-Populus #1 & #2 345 kV + RAS	ANTLOPE (65075)	% Δ Volts			0.991	0.935		5.65%	No Violation			
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SHERDNMT (62158)	% Δ Volts			0.964	0.913		5.29%	No Violation			
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SCOV IPC (65015)	% Δ Volts			0.969	0.919		5.16%	No Violation			
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SCOVILLE (65010)	% Δ Volts			0.969	0.919		5.16%	No Violation			
N-2: Bridger-Populus #1 & #2 345 kV + RAS	ANTLOPE (65080)	% Δ Volts			0.973	0.923		5.14%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	725.8	876.2	109.5%	73.0%	711.1	830.8	103.8%	69.2%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1362.4	110.1%	97.6%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	754.8	934.5	101.6%	89.3%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	BIGGRASS (65155)	% Δ Volts			0.982	0.866		11.81%	0.983	0.920		6.41%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	AMPS (65025)	% Δ Volts			0.955	0.821		14.03%	0.969	0.913		5.78%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	PTRSNFUR (62386)	% Δ Volts			0.962	0.826		14.14%	0.982	0.928		5.50%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	PTRSNFLT (62030)	% Δ Volts			0.946	0.805		14.90%	0.965	0.914		5.28%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SPAR CYN (66765)	% Δ Volts			0.983	0.894		9.05%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	DILLON S (62084)	% Δ Volts			0.965	0.880		8.81%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	LOST RIV (65910)	% Δ Volts			0.988	0.902		8.70%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	ANTLOPE (65075)	% Δ Volts			0.991	0.907		8.48%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SCOV IPC (65015)	% Δ Volts			0.969	0.894		7.74%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SCOVILLE (65010)	% Δ Volts			0.969	0.894		7.74%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	ANTLOPE (65080)	% Δ Volts			0.973	0.898		7.71%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SHERDNMT (62158)	% Δ Volts			0.964	0.890		7.68%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	ENNIS MT (62065)	% Δ Volts			0.963	0.896		6.96%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	JEFERSON (65851)	% Δ Volts			1.011	0.946		6.43%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	BRADLEYC (62064)	% Δ Volts			0.963	0.902		6.33%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	JEFFERSN (65850)	% Δ Volts			1.007	0.944		6.26%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	BRADLEYC (62105)	% Δ Volts			0.940	0.883		6.06%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	MADISON (62022)	% Δ Volts			0.940	0.883		6.06%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	HAR-PONY (62251)	% Δ Volts			0.935	0.881		5.78%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	THREFORK (62248)	% Δ Volts			0.932	0.881		5.47%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	MAYFLWRT (62155)	% Δ Volts			0.934	0.883		5.46%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	JACKRABB (62349)	% Δ Volts			0.994	0.940		5.43%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	MONTTALC (62253)	% Δ Volts			0.931	0.881		5.37%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	WILLWCKM (62252)	% Δ Volts			0.931	0.881		5.37%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	TRIDENT (62020)	% Δ Volts			0.951	0.900		5.36%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	RIGBY (66295)	% Δ Volts			0.999	0.946		5.31%	No Violation			

Appendix C- 16hs2a_3400WoH_2250idnw_N Base Case Post-Transient Contingency Results

					ID-NW 1200 Case Results (WoH 3400)				ID-NW 2250 Case Results (WoH 3400)			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	BZ EGALL (62348)	% Δ Volts			0.981	0.929		5.30%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	RENOVA (62145)	% Δ Volts			0.933	0.884		5.25%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	TRIDENT (62073)	% Δ Volts			0.933	0.884		5.25%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	EUSTIS (62244)	% Δ Volts			0.929	0.881		5.17%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	JACKRABT (62256)	% Δ Volts			0.969	0.919		5.16%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	THREERIV (62021)	% Δ Volts			0.936	0.888		5.13%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	BOULEVRD (65200)	% Δ Volts			0.970	0.921		5.05%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	BOZMN WS (62324)	% Δ Volts			0.970	0.921		5.05%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	IDFLS UP (65835)	% Δ Volts			0.970	0.921		5.05%	No Violation			
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	ANDERSON (65035)	% Δ Volts			0.975	0.926		5.03%	No Violation			
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	No Violations											
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	MCNRY S1 (41351) -> ROUNDUP (40905) CKT 1 at ROUNDUP	Branch Amp	1070.1	1329.9	750.8	1143.6	106.9%	86.0%	No Violation			
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	725.8	807.9	101.0%	67.3%	No Violation			
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	PTRSNFUR (62386)	% Δ Volts			0.962	0.897		6.76%	No Violation			
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	PTRSNFLT (62030)	% Δ Volts			0.946	0.884		6.55%	No Violation			
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	AMPS (65025)	% Δ Volts			0.955	0.903		5.45%	No Violation			
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	ATHENA (45015)	% Δ Volts			0.977	0.926		5.22%	No Violation			
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	PILOT RK (45413)	% Δ Volts			0.977	0.926		5.22%	No Violation			
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	MISSIONT (47191)	% Δ Volts			0.986	0.936		5.07%	No Violation			
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	PENDLTON (45235)	% Δ Volts			0.987	0.937		5.07%	No Violation			
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	BUCKAROO (45027)	% Δ Volts			0.988	0.938		5.06%	No Violation			
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	LAGRANDE (40619)	% Δ Volts			0.971	0.922		5.05%	No Violation			
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	PENDLT T (41248)	% Δ Volts			0.991	0.941		5.05%	No Violation			
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	754.8	930.1	101.1%	88.9%	No Violation			
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations											
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations											
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations											
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations											
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations											
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations											
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations											
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations											
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations											
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	No Violations											
N-2: DC-BIPOLE	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at VINCENT	Branch Amp	2134.0	3499.9	1465.0	2166.1	101.5%	61.9%	1531.1	2220.4	104.0%	63.4%
N-2: DC-BIPOLE	MIDWAY (30060) -> MIDVIN11 (30061) CKT 1 at MIDWAY	Branch Amp	2134.0	3499.9	1445.2	2134.9	100.0%	61.0%	1509.8	2187.8	102.5%	62.5%
N-2: DC-BIPOLE	MIDVIN12 (30062) -> VINCENT (24156) CKT 1 at MIDVIN12	Branch Amp	2134.0	3499.9	No Violation				1490.1	2160.3	101.2%	61.7%
N-2: DC-BIPOLE	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	2400.0	3200.0	1800.6	2873.7	119.7%	89.8%	1601.7	2613.5	108.9%	81.7%
N-2: DC-BIPOLE	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	2400.0	3800.0	1807.2	2887.7	120.3%	76.0%	1610.2	2630.2	109.6%	69.2%
N-2: DC-BIPOLE	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	2199.9	3280.5	1633.4	2207.5	100.3%	67.3%	1658.0	2213.4	100.6%	67.5%
N-2: Double Palo Verde	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	2400.0	3200.0	1800.6	2676.6	111.5%	83.6%	1601.7	2405.9	100.2%	75.2%
N-2: Double Palo Verde	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	2400.0	3800.0	1807.2	2694.3	112.3%	70.9%	1610.2	2426.1	101.1%	63.8%
N-2: Double Palo Verde	PTRSNFUR (62386)	% Δ Volts			0.962	0.898		6.65%	No Violation			
N-2: Double Palo Verde	PTRSNFLT (62030)	% Δ Volts			0.946	0.885		6.45%	No Violation			

Appendix C- 16hs2a_3400WoH_2250idnw_N Base Case Post-Transient Contingency Results

					ID-NW 1200 Case Results (WoH 3400)				ID-NW 2250 Case Results (WoH 3400)			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-2: Double Palo Verde	AMPS (65025)	% Δ Volts			0.955	0.904		5.34%	No Violation			
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations											
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations											
N-2: Garrison-Taft #1 & #2 500 kV + RAS	No Violations											
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	2400.0	3800.0	1807.2	3703.4	154.3%	97.5%	1610.2	3319.7	138.3%	87.4%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM11	Branch Amp	2700.0	4000.0	1206.1	3146.6	116.5%	78.7%	1231.0	3077.8	114.0%	76.9%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	GRIZZ R3 (40488) -> PONDROSA (40837) CKT 1 at GRIZZ R3	Branch Amp	3780.0	3780.0	1917.1	3900.4	103.2%	103.2%	No Violation			
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	GRIZZLY (40489) -> GRIZZ R3 (40488) CKT 1 at GRIZZ R3	Branch Amp	3780.0	3780.0	1922.4	3900.4	103.2%	103.2%	No Violation			
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1019.6	1062.5	105.3%	82.7%	No Violation			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	2400.0	3800.0	1567.0	3584.9	149.4%	94.3%	1471.2	3127.4	130.3%	82.3%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	2400.0	3800.0	1549.3	3566.1	148.6%	93.8%	1454.0	3110.0	129.6%	81.8%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON11 (90137) -> CAPTJACK (45035) CKT 1 at CAPPON11	Branch Amp	3220.0	3220.0	1549.3	3566.1	110.7%	110.7%	No Violation			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	GRIZZLY (40489) -> PONDROSB (40834) CKT 1 at GRIZZLY	Branch Amp	3500.0	3500.0	1681.4	3773.4	107.8%	107.8%	No Violation			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	PONDROSB (40834) -> CAPPON16 (90142) CKT 1 at PONDROSB	Branch Amp	3500.0	3500.0	1584.0	3601.0	102.9%	102.9%	No Violation			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON15 (90141) -> CAPPON14 (90140) CKT 1 at CAPPON15	Branch Amp	3500.0	3500.0	1567.0	3584.9	102.4%	102.4%	No Violation			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON13 (90139) -> CAPPON12 (90138) CKT 1 at CAPPON13	Branch Amp	3500.0	3800.0	1558.8	3580.8	102.3%	94.2%	No Violation			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1237.0	1396.0	1124.9	1300.1	105.1%	93.1%	No Violation			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1019.6	1062.8	105.3%	82.7%	No Violation			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	PTRSNFUR (62386)	% Δ Volts			0.962	0.906		5.82%	No Violation			
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	PTRSNFLT (62030)	% Δ Volts			0.946	0.893		5.60%	No Violation			
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	2400.0	3800.0	1567.0	3186.4	132.8%	83.9%	1471.2	3067.2	127.8%	80.7%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	2400.0	3800.0	1549.3	3172.6	132.2%	83.5%	1454.0	3054.6	127.3%	80.4%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1019.6	1053.2	104.4%	81.9%	No Violation			
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations											
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations											
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations											
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations											
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1019.6	1068.7	105.9%	83.2%	No Violation			
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	2900.0	4350.0	2034.9	3483.3	120.1%	80.1%	No Violation			
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH11	Branch Amp	3000.0	4050.0	1922.9	3886.3	129.5%	96.0%	1762.2	3379.6	112.7%	83.4%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	JOHN DAY (40585) -> GRIJOH12 (90065) CKT 1 at JOHN DAY	Branch Amp	3500.0	3500.0	1931.9	3892.8	111.2%	111.2%	No Violation			
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH11 (90064) -> GRIZZLY (40489) CKT 1 at GRIJOH11	Branch Amp	3500.0	3500.0	1922.9	3886.3	111.0%	111.0%	No Violation			
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	1009.1	1285.2	1019.6	1055.7	104.6%	82.1%	No Violation			
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations											
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations											
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations											
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations											
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations											
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations											
N-2: Lower Granite-Central Ferry #1 & #2 500 kV + RAS Open 69 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	920.0	1046.8	754.8	953.7	103.7%	91.1%	729.2	954.4	103.7%	91.2%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	2667.4	4099.2	1619.4	3112.8	116.7%	75.9%	1576.0	3033.1	113.7%	74.0%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI11	Branch Amp	2667.4	4099.2	1595.8	3027.9	113.5%	73.9%	1551.0	2948.6	110.5%	71.9%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPTJACK	Branch Amp	2667.4	4099.2	1595.8	3027.9	113.5%	73.9%	1551.0	2948.6	110.5%	71.9%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations											

Appendix C- 16hs2a_3400WoH_2250idnw_N Base Case Post-Transient Contingency Results

					ID-NW 1200 Case Results (WoH 3400)				ID-NW 2250 Case Results (WoH 3400)			
Contingency Studied	Element Overloaded	Violation Type	Limit A	Limit B	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts	Pre Cont. Value	Post Cont. Value	% Limit A	% Limit B or % Δ Volts
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	No Violations											
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations											
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations											
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	No Violations											
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations											
N-2: Paul-Raver & Raver-Covingt4 500 kV	No Violations											
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at HORIZN	Branch MVA	320.0	370.0	270.5	331.9	103.7%	89.7%	271.8	345.7	108.0%	93.4%
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	950.0	1286.0	758.3	1059.4	111.5%	82.4%	674.9	1089.0	114.6%	84.7%
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations											
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	TROUTPP2 (45303) -> GRESHAM (43215) CKT 1 at GRESHAM	Branch Amp	948.9	1164.7	700.5	1036.5	109.2%	89.0%	No Violation			
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	TROUTPP1 (45301) -> LINNEMAN (43291) CKT 1 at LINNEMAN	Branch Amp	1009.1	1199.9	736.4	1064.6	105.5%	88.7%	No Violation			
N-2: Raver-Covington #1 & #2 500 kV	No Violations											
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations											
N-2: Raver-Paul & Napavine-Paul 500 kV	No Violations											
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations											
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations											
N-2: Raver-Schultz #1 & #2 500 kV	No Violations											
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations											
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations											
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	No Violations											
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	No Violations											
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	800.0	1199.9	725.8	813.4	101.7%	67.8%	711.1	822.1	102.8%	68.5%
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	PTRSNFUR (62386)	% Δ Volts			No Violation				0.982	0.920		6.31%
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	PTRSNFLT (62030)	% Δ Volts			No Violation				0.965	0.906		6.11%
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	AMPS (65025)	% Δ Volts			No Violation				0.969	0.917		5.37%
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV + RAS	No Violations											
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV + RAS	No Violations											
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	No Violations											
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	No Violations											
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	No Violations											
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations											
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations											
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations											

Appendix C - 16hs2a_3400WoH_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Bell		Brownlee		Hatwai		Hemingway		Taft	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 11L12 MERIDIAN-KLAM FALLS 500 KV+KFGEN2+ST	0.85	-1891	0.82	-1001	0.79	-2116	0.81	-2255	0.92	-1401
BF 11L22 CAPT JACK-KLAM FALLS 500 KV+KFGEN2+ST	0.85	-1889	0.82	-989	0.79	-2106	0.81	-2221	0.92	-1389
BF 11R1 MERIDIAN-KLAM FALLS 500 KV & MERIDIAN 500/230 KV XFMR	0.84	-1954	0.82	-1008	0.79	-2152	0.80	-2272	0.92	-1438
BF 11R6 MERIDIAN-DIXONVILLE 500 KV & MERIDIAN 500/230 KV XFMR	0.85	-1918	0.83	-976	0.79	-2117	0.81	-2187	0.93	-1402
BF 4003 HANFORD-VANTAGE & HANFORD CAPS	0.85	-1917	0.82	-1011	0.79	-2097	0.80	-2292	0.92	-1405
BF 4019 CAPTJACK-MALIN #2 & MALIN 500/230 XFMR	0.84	-1954	0.82	-1006	0.79	-2154	0.81	-2261	0.92	-1438
BF 4028 TAFT-DWORSHAK & TAFT REACTOR 500KV + RAS	0.87	-1501	0.82	-1089	0.70	-2007	0.80	-2399	0.93	-1082
BF 4046 JOHN DAY-GRIZZLY #2 & GRIZZLY-MALIN #2 500 KV	0.86	-1854	0.83	-926	0.81	-2033	0.81	-2055	0.93	-1331
BF 4064 CAPTJACK-MALIN & MALIN-ROUND MTN #1 500 KV	0.85	-1927	0.83	-991	0.79	-2144	0.81	-2207	0.93	-1414
BF 4072 GRIZZLY-MALIN #2 & MALIN-ROUND MTN #2 500 KV	0.85	-1884	0.83	-951	0.80	-2089	0.81	-2093	0.93	-1374
BF 4095 LOW MON-HANFORD & HANFORD-WAUTOMA 500 KV	0.84	-1925	0.82	-1009	0.78	-2068	0.80	-2287	0.92	-1420
BF 4104 ASHE-HANFORD & HANFORD-WAUTOMA 500 KV	0.85	-1929	0.82	-1011	0.79	-2115	0.80	-2290	0.92	-1422
BF 4111 HOT SPRINGS-TAFT & TAFT-DWORSHAK 500 KV	0.86	-1668	0.82	-1079	0.70	-2002	0.80	-2365	0.92	-1148
BF 4114 GARRISON-TAFT #1 +TAFT REACTOR 500KV	0.9	-1416	0.82	-1012	0.88	-1568	0.81	-2256	0.94	-943
BF 4119 GARRISON-TAFT #1 & TAFT-BELL 500 KV	0.8	-1350	0.82	-1006	0.88	-1235	0.81	-2240	0.92	-667
BF 4131 SLATT-JOHN DAY & JOHN DAY-GRIZZLY #2 500 KV	0.85	-1900	0.83	-960	0.80	-2088	0.81	-2139	0.93	-1384
BF 4143 (OR 4134) JOHN DAY-GRIZZLY #1 & JOHN DAY CAPS 500 KV	0.85	-1870	0.83	-956	0.80	-2069	0.81	-2140	0.93	-1367
BF 4148 HOT SPRINGS-TAFT & GARRISON-TAFT #2 500KV + RAS	0.89	-1628	0.82	-1046	0.85	-1890	0.80	-2337	0.93	-1146
BF 4170 JOHN DAY-MARION & JOHN DAY CAPS 500 KV	0.84	-1927	0.82	-998	0.79	-2129	0.80	-2242	0.92	-1422
BF 4186 (OR 4582) MALIN-ROUND MTN 500 KV & MALIN 500/230 XFMR	0.85	-1923	0.83	-983	0.79	-2140	0.81	-2180	0.93	-1411
BF 4194 ROCK CK-JOHN DAY & BIG EDDY-JOHN DAY 500 KV	0.85	-1916	0.82	-995	0.80	-2084	0.81	-2258	0.93	-1395
BF 4197 JOHN DAY-BIG EDDY #1 & JOHN DAY CAPS 500 KV	0.84	-1946	0.82	-1006	0.79	-2142	0.80	-2266	0.92	-1434
BF 4202 JOHN DAY-BIG EDDY#2 & BIG EDDY-OSTRANDER 500 KV	0.84	-1968	0.82	-1016	0.78	-2180	0.80	-2292	0.92	-1451
BF 4231 MCNARY-LONGHORN 500 KV & MCNARY 500/230 KV XFMR	0.85	-1932	0.82	-952	0.79	-2148	0.81	-2287	0.93	-1424
BF 4234 MCNARY-LONGHORN & MCNARY-HERMCALP 500 KV	0.85	-1863	0.82	-1014	0.79	-2072	0.80	-2359	0.92	-1389
BF 4247 LIT GOOS-LOW MON #2 & LOW MON-MCNARY 500 KV	0.85	-1841	0.82	-1002	0.80	-1924	0.81	-2275	0.93	-1358
BF 4259 LIT GOOS-LOW MON #2 & LOW MON-HANFORD 500 KV	0.85	-1908	0.82	-1009	0.78	-2019	0.80	-2287	0.92	-1408
BF 4268 MONROE-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.85	-1788	0.82	-1015	0.80	-2047	0.80	-2295	0.93	-1336
BF 4276 ING500-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.84	-1883	0.82	-1016	0.79	-2127	0.80	-2299	0.92	-1403
BF 4280 KEELER-PEARL & PEARL-MARION 500 KV + RAS	0.85	-1916	0.82	-1005	0.79	-2116	0.81	-2267	0.92	-1400
BF 4280 KEELER-PEARL & PEARL-OSTRANDER 500 KV + RAS	0.85	-1918	0.82	-1007	0.79	-2122	0.80	-2278	0.92	-1404
BF 4287 PEARL-OSTRANDER 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.84	-1954	0.82	-1011	0.79	-2149	0.80	-2282	0.92	-1438
BF 4293 SCHULTZ-RAVER & RAVER COVINGTON5 500 KV	0.84	-1961	0.82	-1016	0.78	-2162	0.80	-2299	0.92	-1445
BF 4336 CHIEF JO-SICKLER 500 KV & SICKLER 500/230 XFMR	0.84	-1932	0.82	-1016	0.79	-2138	0.80	-2301	0.92	-1430
BF 4336 SICKLER-SCHULTZ 500 KV & SICKLER 500/230 XFMR	0.84	-1937	0.82	-1016	0.79	-2140	0.80	-2301	0.92	-1433
BF 4377 ASHE-MARION & MARION-ALVEY 500 KV + RAS	0.84	-1806	0.82	-1020	0.79	-2101	0.80	-2322	0.92	-1406
BF 4386 BUCKLEY-MARION & MARION-SANTIAM 500 KV	0.84	-1960	0.82	-1010	0.78	-2162	0.80	-2270	0.92	-1443
BF 4432 OSTRANDER-TROUTDALE & SPLIT OSTRANDER 500 KV	0.84	-1961	0.82	-1012	0.78	-2162	0.80	-2286	0.92	-1444
BF 4439 BIG EDDY-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.84	-1967	0.82	-1016	0.78	-2177	0.80	-2296	0.92	-1449
BF 4442 BIG EDDY-OSTRANDER 500 KV & OSTRANDER-MCLOUGHLIN 230 KV	0.84	-1966	0.82	-1015	0.78	-2174	0.80	-2293	0.92	-1448
BF 4448 KNIGHT-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.84	-1961	0.82	-1013	0.78	-2161	0.80	-2288	0.92	-1443
BF 4450 KNIGHT-OSTRANDER & OSTRANDER-PEARL 500 KV	0.84	-1959	0.82	-1012	0.78	-2158	0.80	-2286	0.92	-1442
BF 4502 PAUL-ALLSTON & ALLSTON-KEELER 500 KV + RAS	0.84	-1694	0.81	-1071	0.79	-2015	0.80	-2483	0.91	-1351
BF 4510 PEARL-MARION 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.84	-1929	0.82	-1007	0.79	-2135	0.80	-2268	0.92	-1423

Appendix C - 16hs2a_3400WoH_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Bell		Brownlee		Hatwai		Hemingway		Taft	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 4526 CUSTERW-MONROE & MONROE-ECHO LAKE 500 KV + RAS	0.81	-2229	0.81	-1082	0.73	-2436	0.79	-2487	0.9	-1688
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV	0.85	-1915	0.82	-1009	0.79	-2122	0.80	-2283	0.92	-1409
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV + RAS	0.85	-1915	0.82	-1009	0.79	-2122	0.80	-2283	0.92	-1409
BF 4540 PAUL-NAPAVINE & PAUL-SATSOP 500 KV	0.84	-1947	0.82	-1014	0.79	-2147	0.80	-2294	0.92	-1434
BF 4542 PAUL-ALLSTON 500 KV & CENTER G2	0.84	-1914	0.82	-1032	0.78	-2133	0.80	-2351	0.92	-1428
BF 4542 PAUL-NAPAVINE 500 KV & CENTER G1	0.84	-1922	0.82	-1035	0.78	-2159	0.80	-2358	0.92	-1438
BF 4550 OLYMPIA-PAUL & PAUL-ALLSTON 500 KV	0.84	-1934	0.82	-1013	0.79	-2140	0.80	-2290	0.92	-1427
BF 4554 OLYMPIA-PAUL 500 KV & TONO 500/115 XFMR	0.84	-1975	0.82	-1020	0.78	-2192	0.80	-2307	0.92	-1457
BF 4572 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.85	-1861	0.82	-938	0.80	-1976	0.81	-2271	0.93	-1368
BF 4630 CEN FERRY-LIT GOOS #1 & LIT GOOS-LOW MON #1 500 KV	0.84	-1920	0.82	-1013	0.79	-2058	0.80	-2294	0.92	-1419
BF 4652 TAFT-DWORSHAK & TAFT-HATWAI 500 KV + RAS	0.87	-1480	0.82	-1108	0.70	-2000	0.80	-2440	0.93	-1070
BF 4672 MONROE-CHIEF JO 500 KV & MONROE CAPS	0.84	-1917	0.82	-1014	0.79	-2129	0.80	-2295	0.92	-1425
BF 4676 LIT GOOS-LOW MON & LOW MON-ASHE 500 KV	0.85	-1898	0.82	-1005	0.79	-1972	0.80	-2283	0.92	-1397
BF 4690 PAUL-ALLSTON 500 KV & ALLSTON 500/230 XFMR	0.84	-1928	0.82	-1011	0.79	-2137	0.80	-2288	0.92	-1423
BF 4708 HATWAI 500 KV BUS + RAS	0.85	-1675	0.82	-1074	0.00	0	0.80	-2397	0.93	-1300
BF 4728 COULEE-CHIEF JO 500 KV & CHEIF JO 500/230 XFMR	0.85	-1871	0.82	-1014	0.79	-2110	0.80	-2294	0.92	-1396
BF 4776 HATWAI-LOW GRAN & LOW GRAN-CEN FERRY 500 KV + RAS	0.86	-1676	0.82	-982	0.77	-1073	0.81	-2344	0.93	-1289
BF 4870 JOHN DAY-BIG EDDY 500 KV & BIG EDDY 500/230 KV	0.84	-1972	0.82	-1019	0.78	-2185	0.80	-2301	0.92	-1453
BF 4888 ASHE-SLATT & CGS 500 KV	0.84	-1853	0.82	-1049	0.79	-2048	0.80	-2422	0.92	-1398
BF 4891 LOW MON-ASHE & ASHE-SLATT 500 KV	0.86	-1845	0.82	-992	0.80	-1938	0.81	-2269	0.93	-1353
BF 4901 LOW MON-ASHE & ASHE-HANFORD 500 KV	0.85	-1882	0.82	-997	0.80	-1949	0.81	-2280	0.93	-1380
BF 4940 LOW MON-ASHE & ASHE-MARION 500 KV	0.85	-1868	0.82	-980	0.80	-1948	0.81	-2219	0.93	-1367
BF 4957 SUMMER L-MALIN & SUMMER L-HEMINGWAY 500 KV	0.86	-1859	0.84	-843	0.81	-2040	0.82	-1461	0.94	-1325
BF 4959 GRIZZLY-SUMMER L & SUMMER L-MALIN 500 KV	0.86	-1856	0.84	-880	0.81	-2036	0.82	-1537	0.94	-1323
BF 4996 CAPTJACK-MALIN #1 & #2 500 KV	0.84	-1953	0.82	-1003	0.79	-2156	0.80	-2252	0.92	-1437
BF 5003 SLATT-BUCKLEY & SLATT-BOARDMAN 500 KV	0.85	-1914	0.83	-976	0.79	-2112	0.81	-2183	0.93	-1402
BF 5006 SLATT-LONGHORN & SLATT-GRASSLAND 500 KV	0.84	-1959	0.82	-1011	0.78	-2157	0.80	-2270	0.92	-1442
BF 5015 ASHE-SLATT & SLATT-BUCKLEY 500 KV	0.86	-1848	0.83	-964	0.80	-2014	0.81	-2185	0.93	-1350
BF 5018 ASHE-SLATT & SLATT-JOHN DAY 500 KV	0.85	-1891	0.82	-992	0.80	-2051	0.81	-2247	0.93	-1381
BF 5021 SLATT-JOHN DAY & SLATT-LONGHORN 500 KV	0.84	-1958	0.82	-1004	0.78	-2157	0.80	-2253	0.92	-1442
BF 5028 BUCKLEY-GRIZZLY & GRIZZLY-SUMMER LAKE 500 KV	0.87	-1807	0.83	-891	0.82	-1989	0.82	-1962	0.94	-1306
BF 5040 GRIZZLY-JOHN DAY & GRIZZLY-ROUND BU 500 KV	0.85	-1895	0.83	-963	0.80	-2087	0.81	-2160	0.93	-1380
BF 5114 ECHO LAKE-RAVER & ECHO LAKE- SNOK TAP 500 KV	0.85	-1857	0.82	-1015	0.79	-2078	0.80	-2296	0.92	-1379
BF 5117 ECHO LAKE-MAPLE VALLEY & ECHO LAKE-RAVER 500 KV	0.85	-1898	0.82	-1016	0.79	-2129	0.80	-2298	0.92	-1418
BF 5148 COULEE-SCHULTZ & ECHO LAKE-SCHULTZ 500 KV	0.85	-1882	0.82	-1010	0.79	-2089	0.80	-2285	0.92	-1386
BF 5170 WAUTOMA-SCHULTZ & SCHULTZ-RAVER 500 KV	0.85	-1898	0.82	-1009	0.79	-2079	0.80	-2285	0.93	-1383
BF 5179 VANTAGE-SCHULTZ & SCHULTZ-RAVER #4	0.84	-1927	0.82	-1015	0.79	-2128	0.80	-2295	0.92	-1423
BF 5187 MCNARY-LONGHORN & LONGHORN-SLATT 500 KV	0.85	-1923	0.82	-985	0.79	-2138	0.81	-2287	0.93	-1414
BF 5193 GRASSLAND-COYOTE & COYOTE-LONGHORN 500 KV	0.84	-1888	0.82	-1020	0.79	-2111	0.80	-2335	0.92	-1405
BF 5211 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.85	-1861	0.82	-938	0.80	-1976	0.81	-2271	0.93	-1368
BF 5214 LOW MON-MCNARY & CALPINE PH 500 KV	0.85	-1813	0.82	-1024	0.80	-1929	0.81	-2333	0.93	-1345
BF 5250 HANFORD-WAUTOMA#1 & WAUTOMA-KNIGHT 500 KV	0.85	-1896	0.82	-992	0.80	-2060	0.81	-2252	0.93	-1383
BF 5259 HANFORD-WAUTOMA#2 & WAUTOMA-ROCK CK 500 KV	0.85	-1884	0.82	-992	0.80	-2054	0.81	-2257	0.93	-1376
BF 5266 SLATT-BUCKLY 500 KV	0.85	-1918	0.83	-979	0.79	-2135	0.81	-2199	0.93	-1409

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Contingency	Bell		Brownlee		Hatwai		Hemingway		Taft	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 5339 VANTAGE-SCHULTZ 500 KV & VANTAGE 500/230 XFMR #1	0.84	-1939	0.82	-1016	0.79	-2135	0.80	-2298	0.92	-1429
BF 5345 VANTAGE-HANFORD 500 KV & VANTAGE 500/230 XFMR #1	0.85	-1916	0.82	-1010	0.79	-2097	0.80	-2292	0.92	-1406
BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.89	-1671	0.89	-491	0.85	-1796	0.85	-1544	0.95	-1152
BF IPC HEMINGWAY-SUMMER L 500 KV & HEMINGWAY 500/230 XFMR	0.85	-1883	0.88	-552	0.80	-2068	0.82	-1394	0.93	-1376
BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.88	-1732	0.89	-350	0.84	-1847	0.71	-1928	0.95	-1212
BF IPC POPULUS-CHILL-HEMINGWAY 500 KV & HEM 500/230 XFMR	0.84	-1924	0.88	-605	0.79	-2123	0.79	-1956	0.92	-1422
BF LOLO 230KV	0.85	-1919	0.82	-1013	0.80	-2079	0.80	-2255	0.93	-1402
BF MCNARY 230 KV SECT 1	0.84	-1897	0.82	-1057	0.79	-2111	0.80	-2386	0.92	-1417
BF MCNARY 230 KV SECT 2	0.84	-1934	0.82	-1034	0.78	-2136	0.80	-2335	0.92	-1433
BF MCNARY 230 KV SECT 3	0.84	-1927	0.82	-1024	0.78	-2125	0.80	-2327	0.92	-1431
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.8973	-1554	0.846	-717	0.87	-1694	0.84	-1483	0.9656	-1067
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV+PTSN	0.898	-1612	0.846	-724	0.86	-1751	0.83	-1502	0.9567	-1108
BF PGE GRASSLAND-COYOTE SP 500KV & CARTY GAS PLANT	0.8483	-1892	0.815	-1017	0.79	-2108	0.80	-2306	0.9183	-1402
BF PGE GRASSLAND-SLATT 500KV & BOARDMAN PLANT	0.8475	-1881	0.816	-1027	0.79	-2100	0.80	-2329	0.9175	-1399
BUS: ALVEY 500 KV + RAS	0.83	-1846	0.82	-1028	0.78	-2178	0.80	-2334	0.91	-1443
BUS: BELL BPA 500 KV	0	0	0.82	-1006	0.84	-1678	0.81	-2283	0.94	-702
BUS: BUCKLEY 500 KV	0.85	-1905	0.83	-962	0.80	-2089	0.81	-2147	0.93	-1394
BUS: DIXONVILLE 500 KV	0.85	-1915	0.83	-968	0.80	-2099	0.81	-2167	0.93	-1394
BUS: HOT SPRINGS 500 KV	0.88	-1569	0.82	-1015	0.84	-1864	0.81	-2283	0.94	-1196
BUS: KEELER 500 KV + RAS	0.84	-1697	0.81	-1072	0.79	-2022	0.80	-2484	0.91	-1357
BUS: ROCK CREEK 500 KV	0.85	-1880	0.82	-991	0.80	-2054	0.81	-2254	0.93	-1374
BUS: SICKLER 500 KV	0.84	-1922	0.82	-1015	0.79	-2132	0.80	-2300	0.92	-1424
BUS: SUMMER LAKE 500 KV	0.86	-1834	0.85	-833	0.81	-2016	0.82	-1441	0.94	-1316
N-1: ALLSTON-KEELER 500 KV + RAS	0.84	-1698	0.81	-1072	0.79	-2024	0.80	-2486	0.91	-1357
N-1: ALLSTON-NAPAVINE 500 KV	0.84	-1926	0.82	-1011	0.79	-2136	0.80	-2287	0.92	-1422
N-1: ALLSTON-PAUL #2 500 KV	0.84	-1926	0.82	-1011	0.79	-2137	0.80	-2287	0.92	-1422
N-1: ALVERY-DIXONVILLE 500 KV	0.85	-1913	0.83	-967	0.80	-2097	0.81	-2160	0.93	-1393
N-1: ALVEY-MARION 500 KV	0.85	-1914	0.83	-975	0.79	-2103	0.81	-2182	0.93	-1398
N-1: ASHE-HANFORD 500 KV	0.84	-1949	0.82	-1015	0.78	-2131	0.80	-2297	0.92	-1434
N-1: ASHE-LOW MON 500 KV	0.84	-1917	0.82	-1008	0.79	-2025	0.80	-2289	0.92	-1417
N-1: ASHE-MARION 500 KV	0.85	-1896	0.82	-986	0.79	-2065	0.81	-2227	0.93	-1387
N-1: ASHE-SLATT 500 KV	0.85	-1884	0.82	-996	0.80	-2050	0.81	-2276	0.93	-1376
N-1: BELL-COULEE 500 KV	0.88	-918	0.82	-1006	0.87	-1339	0.81	-2277	0.94	-866
N-1: BELL-TAFT 500 KV	0.8	-1392	0.82	-1009	0.87	-1461	0.81	-2276	0.94	-855
N-1: BIG EDDY-CELILO 500 KV	0.84	-1967	0.82	-1017	0.78	-2174	0.80	-2301	0.92	-1447
N-1: BIG EDDY-JOHN DAY 500 KV	0.84	-1969	0.82	-1018	0.78	-2181	0.80	-2299	0.92	-1451
N-1: BIG EDDY-KNIGHT 500 KV	0.85	-1932	0.82	-1009	0.79	-2142	0.80	-2285	0.92	-1425
N-1: BIG EDDY-OSTRANDER 500 KV	0.84	-1967	0.82	-1016	0.78	-2177	0.80	-2295	0.92	-1449
N-1: BOISE BENCH-BROWNLEE #3 230 KV	0.84	-1956	0.82	-955	0.79	-2160	0.81	-2189	0.92	-1439
N-1: BRADY-ANTELOPE 230 KV	0.85	-1925	0.82	-1014	0.79	-2142	0.81	-2290	0.92	-1417
N-1: BROADVIEW-GARRISON #1 500 KV	0.93	-1329	0.82	-1018	0.90	-1528	0.81	-2281	0.97	-881
N-1: BROWNLEE-ONTARIO 230 KV	0.84	-1950	0.83	-922	0.79	-2159	0.82	-2103	0.92	-1435
N-1: BUCKLEY-GRIZZLY 500 KV	0.85	-1920	0.83	-980	0.79	-2131	0.81	-2208	0.93	-1408
N-1: BUCKLEY-MARION 500 KV	0.84	-1959	0.82	-1010	0.78	-2162	0.80	-2273	0.92	-1443

Appendix C - 16hs2a_3400WoH_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

	Bell		Brownlee		Hatwai		Hemingway		Taft	
Contingency	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: BUCKLEY-SLATT 500 KV	0.85	-1918	0.83	-979	0.79	-2135	0.81	-2199	0.93	-1409
N-1: CAPTAIN JACK-OLINDA 500 KV	0.85	-1897	0.83	-961	0.80	-2093	0.81	-2107	0.93	-1382
N-1: CAPTJACK-KFALLS 500 KV	0.85	-1925	0.83	-981	0.79	-2139	0.81	-2192	0.93	-1411
N-1: CASCADE CROSSING 500 KV	0.84	-1957	0.82	-1002	0.78	-2159	0.80	-2242	0.92	-1442
N-1: CHIEF JO-COULEE 500 KV	0.84	-1913	0.82	-1016	0.79	-2137	0.80	-2298	0.92	-1423
N-1: CHIEF JO-MONROE 500 KV	0.84	-1953	0.82	-1015	0.78	-2147	0.80	-2297	0.92	-1439
N-1: CHIEF JO-SICKLER 500 KV	0.84	-1937	0.82	-1016	0.79	-2143	0.80	-2298	0.92	-1430
N-1: COULEE-HANFORD 500 KV	0.85	-1865	0.82	-1010	0.80	-2032	0.81	-2287	0.93	-1361
N-1: COULEE-SCHULTZ 500 KV	0.85	-1889	0.82	-1012	0.79	-2103	0.80	-2289	0.92	-1391
N-1: COVINGTON4-RAVER 500 KV	0.84	-1972	0.82	-1018	0.78	-2183	0.80	-2302	0.92	-1452
N-1: COVINGTON5-RAVER 500 KV	0.84	-1972	0.82	-1018	0.78	-2183	0.80	-2302	0.92	-1452
N-1: COYOTE-LONGHORN 500 KV	0.84	-1967	0.82	-1017	0.78	-2174	0.80	-2301	0.92	-1448
N-1: CUSTERW-MONROE 500 KV	0.85	-1802	0.82	-1015	0.80	-2055	0.80	-2296	0.92	-1346
N-1: DIXONVILLE-MERIDIAN 500 KV	0.85	-1918	0.83	-976	0.79	-2115	0.81	-2187	0.93	-1402
N-1: DRYCREEK-LOLO 230 KV	0.84	-1965	0.82	-1016	0.78	-2173	0.80	-2299	0.92	-1446
N-1: DRYCREEK-N LEWISTON 230 KV	0.84	-1956	0.82	-1020	0.78	-2155	0.80	-2301	0.92	-1440
N-1: DRYCREEK-WALA AVA 230 KV	0.85	-1914	0.82	-1028	0.79	-2083	0.80	-2295	0.92	-1414
N-1: DWORSHAK-HATWAI 500 KV + RAS	0.87	-1636	0.82	-1098	0.70	-1982	0.80	-2407	0.94	-1150
N-1: DWORSHAK-TAFT 500 KV + RAS	0.87	-1501	0.82	-1089	0.70	-2007	0.80	-2399	0.93	-1082
N-1: ECHO LAKE-MAPLE VALLEY 500 KV	0.84	-1966	0.82	-1018	0.78	-2180	0.80	-2303	0.92	-1453
N-1: ECHO LAKE-RAVER 500 KV	0.84	-1944	0.82	-1016	0.79	-2149	0.80	-2300	0.92	-1434
N-1: ECHO LAKE-SCHULTZ 500 KV	0.84	-1958	0.82	-1016	0.78	-2155	0.80	-2297	0.92	-1443
N-1: ECHO LAKE-SNOK TAP 500 KV	0.85	-1857	0.82	-1015	0.79	-2080	0.80	-2296	0.92	-1380
N-1: GARRISON-TAFT #2 500 KV	0.9	-1416	0.82	-1012	0.88	-1568	0.81	-2256	0.94	-943
N-1: GOLDHILL-PLACER 115 KV	0.84	-1974	0.82	-1019	0.78	-2185	0.80	-2305	0.92	-1453
N-1: GRASSLAND-COYOTE 500 KV	0.84	-1946	0.82	-1009	0.79	-2153	0.80	-2289	0.92	-1433
N-1: GRASSLAND-SLATT 500 KV	0.84	-1961	0.82	-1015	0.78	-2160	0.80	-2283	0.92	-1442
N-1: GRIZZLY-JOHN DAY #2 500 KV	0.85	-1899	0.83	-966	0.80	-2089	0.81	-2170	0.93	-1383
N-1: GRIZZLY-MALIN 500 KV	0.85	-1908	0.83	-957	0.80	-2092	0.81	-2125	0.93	-1389
N-1: GRIZZLY-PONDEROSA A-SUMMER L 500 KV	0.86	-1861	0.83	-924	0.81	-2042	0.81	-2042	0.93	-1335
N-1: GRIZZLY-PONDEROSA B-CAPT JACK 500 KV	0.85	-1905	0.83	-955	0.80	-2091	0.81	-2118	0.93	-1387
N-1: GRIZZLY-ROUND BU 500 KV	0.84	-1966	0.82	-1016	0.78	-2173	0.80	-2296	0.92	-1447
N-1: HANFORD-LOW MON 500 KV	0.84	-1938	0.82	-1012	0.78	-2088	0.80	-2292	0.92	-1427
N-1: HANFORD-VANTAGE 500 KV	0.85	-1917	0.82	-1011	0.79	-2097	0.80	-2292	0.92	-1405
N-1: HANFORD-WAUTOMA 500 KV	0.84	-1957	0.82	-1014	0.79	-2151	0.80	-2295	0.92	-1440
N-1: HATWAI 500/230 KV XFMR + RAS	0.84	-1957	0.82	-1019	0.76	-2079	0.80	-2302	0.92	-1441
N-1: HATWAI-LOLO 230 KV	0.84	-1952	0.82	-1023	0.78	-2146	0.80	-2302	0.92	-1438
N-1: HATWAI-LOW GRAN 500 KV + RAS	0.86	-1678	0.82	-982	0.77	-1074	0.81	-2346	0.93	-1290
N-1: HATWAI-N LEWISTON 230 KV	0.84	-1963	0.82	-1019	0.78	-2174	0.80	-2301	0.92	-1443
N-1: HELLS CANYON-BROWNLEE 230 KV	0.85	-1871	0.82	-833	0.80	-2073	0.82	-2057	0.93	-1368
N-1: HELLS CANYON-WALLA WALLA 230 KV	0.85	-1928	0.82	-1042	0.79	-2136	0.80	-2264	0.93	-1414
N-1: HEMINGWAY-GRASSLAND 500 KV	0.89	-1678	0.84	-730	0.85	-1814	0.83	-1519	0.95	-1158
N-1: HEMINGWAY-GRASSLAND 500 KV + PTSN SHUNT	0.88	-1722	0.83	-796	0.84	-1877	0.83	-1673	0.95	-1205
N-1: HEMINGWAY-SUMMER LAKE 500 KV	0.85	-1891	0.84	-880	0.80	-2097	0.82	-1534	0.93	-1379

Appendix C - 16hs2a_3400WoH_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Bell		Brownlee		Hatwai		Hemingway		Taft	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: HILL TOP 345/230 XFMR	0.84	-1941	0.82	-997	0.79	-2154	0.81	-2236	0.92	-1430
N-1: HORSE HV-MCNARY 230 KV	0.84	-1966	0.82	-1012	0.78	-2173	0.80	-2296	0.92	-1447
N-1: HOT SPRINGS-TAFT 500 KV	0.88	-1569	0.82	-1015	0.84	-1863	0.81	-2283	0.94	-1195
N-1: HUMBOLDT-COYOTE CK 345 KV	0.84	-1975	0.82	-1037	0.78	-2193	0.81	-2233	0.92	-1460
N-1: HUNTINGTON-PINTO-FOUR CORNERS 345 KV	0.84	-1981	0.82	-1026	0.78	-2196	0.80	-2328	0.92	-1465
N-1: ING500-CUSTERW 500 KV	0.84	-1891	0.82	-1017	0.79	-2130	0.80	-2299	0.92	-1407
N-1: JOHN DAY-MARION 500 KV	0.84	-1953	0.82	-1008	0.79	-2148	0.80	-2273	0.92	-1438
N-1: JOHN DAY-ROCK CK 500 KV	0.85	-1913	0.82	-994	0.80	-2083	0.81	-2260	0.93	-1393
N-1: JOHN DAY-SLATT 500 KV	0.84	-1963	0.82	-1007	0.78	-2168	0.80	-2262	0.92	-1446
N-1: KFALLS-MERIDIAN 500 KV	0.84	-1962	0.82	-1011	0.78	-2163	0.80	-2282	0.92	-1443
N-1: KNIGHT-WAUTOMA 500 KV	0.85	-1903	0.82	-994	0.80	-2069	0.81	-2255	0.93	-1387
N-1: LAGRANDE-NORTH POWDER 230 KV	0.85	-1932	0.82	-964	0.79	-2145	0.81	-2246	0.92	-1423
N-1: LANES-MARION 500 KV	0.84	-1950	0.82	-1009	0.79	-2149	0.80	-2277	0.92	-1436
N-1: LIT GOOSE-CENTRAL FERRY 500 KV	0.84	-1949	0.82	-1015	0.78	-2119	0.80	-2298	0.92	-1436
N-1: LIT GOOSE-LOW MON 500 KV	0.84	-1938	0.82	-1014	0.78	-2098	0.80	-2296	0.92	-1429
N-1: LOW GRAN-CENTRAL FERRY 500 KV	0.85	-1909	0.82	-1012	0.79	-2003	0.80	-2294	0.92	-1408
N-1: LOW MON-SAC TAP 500 KV	0.85	-1883	0.82	-1008	0.80	-1988	0.81	-2285	0.93	-1381
N-1: MALIN 500/230 XFMR	0.84	-1955	0.82	-1007	0.79	-2154	0.81	-2265	0.92	-1439
N-1: MALIN-HILLTOP 230 KV	0.84	-1933	0.82	-994	0.79	-2150	0.81	-2227	0.92	-1426
N-1: MALIN-ROUND MTN #1 500 KV	0.85	-1927	0.83	-992	0.79	-2144	0.81	-2211	0.92	-1415
N-1: MALIN-ROUND MTN #2 500 KV	0.85	-1927	0.83	-991	0.79	-2144	0.81	-2207	0.93	-1415
N-1: MALIN-SUMMER LAKE 500 KV	0.84	-1964	0.82	-1013	0.78	-2175	0.81	-2164	0.92	-1449
N-1: MAPLE VLY-ROCKY RH 345 KV	0.84	-1962	0.82	-1016	0.78	-2164	0.80	-2300	0.92	-1444
N-1: MARION-PEARL 500 KV	0.84	-1945	0.82	-1011	0.79	-2146	0.80	-2280	0.92	-1432
N-1: MARION-SANTIAM 500 KV	0.84	-1967	0.82	-1017	0.78	-2173	0.80	-2299	0.92	-1448
N-1: MCLOUGLIN-OSTRANDER 230 KV	0.84	-1968	0.82	-1017	0.78	-2177	0.80	-2301	0.92	-1449
N-1: MCNARY 500/230 KV XFMR	0.84	-1972	0.82	-966	0.78	-2178	0.80	-2297	0.92	-1453
N-1: MCNARY S2-MCNARY S3 230 KV	0.84	-1967	0.82	-1016	0.78	-2174	0.80	-2300	0.92	-1448
N-1: MCNARY-BOARD T1 230 KV	0.84	-1970	0.82	-1011	0.78	-2172	0.80	-2286	0.92	-1447
N-1: MCNARY-JOHN DAY 500 KV	0.84	-1944	0.82	-997	0.79	-2149	0.80	-2264	0.92	-1432
N-1: MCNARY-LONGHORN 500 KV	0.85	-1924	0.82	-987	0.79	-2141	0.81	-2295	0.93	-1416
N-1: MCNARY-ROSS 345 KV	0.84	-1967	0.82	-1009	0.78	-2175	0.80	-2291	0.92	-1449
N-1: MCNARY-ROUNDUP 230 KV	0.85	-1920	0.85	-853	0.79	-2125	0.81	-2155	0.93	-1406
N-1: MCNARY-SAC TAP-LOW MON 500 KV	0.85	-1880	0.82	-1006	0.80	-1983	0.81	-2280	0.93	-1380
N-1: MIDPOINT-HEMINGWAY 500 KV	0.87	-1826	0.84	-887	0.82	-2016	0.74	-1984	0.94	-1311
N-1: MIDPOINT-HEMINGWAY 500 KV + PTSN SHUNT	0.86	-1877	0.84	-892	0.81	-2065	0.73	-2001	0.94	-1343
N-1: MIDPOINT-HUMBOLDT 345 KV	0.84	-1976	0.82	-1038	0.78	-2193	0.81	-2254	0.92	-1462
N-1: NAPAVINE-PAUL 500 KV	0.84	-1951	0.82	-1015	0.79	-2149	0.80	-2295	0.92	-1436
N-1: OLYMPIA-PAUL 500 KV	0.84	-1972	0.82	-1019	0.78	-2186	0.80	-2305	0.92	-1453
N-1: ONTARIO-CALDWELL 230 KV	0.84	-1957	0.83	-979	0.79	-2159	0.81	-2190	0.92	-1440
N-1: OSTRANDER-KNIGHT 500 KV	0.84	-1959	0.82	-1012	0.78	-2158	0.80	-2287	0.92	-1442
N-1: OSTRANDER-PEARL 500 KV	0.84	-1967	0.82	-1016	0.78	-2175	0.80	-2298	0.92	-1448
N-1: OSTRANDER-TROUTDALE 500 KV	0.84	-1970	0.82	-1018	0.78	-2180	0.80	-2303	0.92	-1450
N-1: OXBOW-BROWNLEE #2 230 KV	0.84	-1968	0.82	-1003	0.78	-2174	0.80	-2288	0.92	-1448

Appendix C - 16hs2a_3400WoH_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Bell		Brownlee		Hatwai		Hemingway		Taft	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: OXBOW-LOLO 230 KV	0.85	-1922	0.82	-1003	0.80	-2088	0.80	-2248	0.93	-1405
N-1: PAUL-SATSOP 500 KV	0.84	-1964	0.82	-1017	0.78	-2169	0.80	-2300	0.92	-1445
N-1: PEARL-KEELER 500 KV + RAS	0.85	-1920	0.82	-1009	0.79	-2125	0.80	-2283	0.92	-1408
N-1: PINTO-FOUR CORNER 345 KV	0.84	-1969	0.82	-1019	0.78	-2180	0.80	-2303	0.92	-1451
N-1: PONDEROSA A 500/230 KV XFMR	0.84	-1967	0.82	-1018	0.78	-2176	0.80	-2301	0.92	-1448
N-1: PONDEROSA B 500/230 KV XFMR	0.84	-1966	0.82	-1016	0.78	-2174	0.80	-2298	0.92	-1447
N-1: RAVER-PAUL 500 KV	0.85	-1916	0.82	-1009	0.79	-2124	0.80	-2284	0.92	-1410
N-1: RAVER-TACOMA 500 KV	0.84	-1962	0.82	-1017	0.78	-2166	0.80	-2300	0.92	-1445
N-1: RED BUTTE-HARRY ALLEN 345 KV	0.84	-1973	0.82	-1026	0.78	-2190	0.80	-2332	0.92	-1461
N-1: ROBINSON-HARRY ALLEN 500 KV	0.84	-1962	0.82	-1009	0.78	-2164	0.81	-2263	0.92	-1443
N-1: ROCK CK-WAUTOMA 500 KV	0.85	-1891	0.82	-994	0.80	-2061	0.81	-2260	0.93	-1380
N-1: ROUNDUP-LAGRANDE 230 KV	0.85	-1926	0.83	-937	0.79	-2136	0.81	-2219	0.93	-1412
N-1: SCHULTZ-SICKLER 500 KV	0.84	-1924	0.82	-1015	0.79	-2132	0.80	-2297	0.92	-1421
N-1: SCHULTZ-VANTAGE 500 KV	0.84	-1944	0.82	-1017	0.79	-2139	0.80	-2299	0.92	-1432
N-1: SCHULTZ-WAUTOMA 500 KV	0.85	-1906	0.82	-1011	0.79	-2093	0.80	-2288	0.92	-1389
N-1: SIGURD-GLEN CANYON 230 KV	0.84	-1966	0.82	-1016	0.78	-2171	0.80	-2294	0.92	-1446
N-1: SLATT 500/230 KV XFMR	0.84	-1870	0.82	-1041	0.79	-2094	0.80	-2391	0.92	-1400
N-1: SLATT-LONGHORN 500 KV	0.84	-1964	0.82	-1014	0.78	-2168	0.80	-2293	0.92	-1445
N-1: SNOK TAP-SNOKING 500 KV	0.84	-1959	0.82	-1017	0.78	-2164	0.80	-2301	0.92	-1444
N-1: VANTAGE 500/230 KV XFMR #1	0.84	-1965	0.82	-1016	0.78	-2168	0.80	-2300	0.92	-1446
N-1: VANTAGE 500/230 KV XFMR #2	0.84	-1964	0.82	-1016	0.78	-2168	0.80	-2300	0.92	-1446
N-1: WALLA WALLA-TALBOT 230 KV	0.84	-1943	0.82	-1021	0.79	-2108	0.80	-2294	0.92	-1433
N-1: WALLA WALLA-WALLULA 230 KV	0.84	-1955	0.82	-1010	0.78	-2138	0.80	-2298	0.92	-1441
N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.87	-1764	0.82	-956	0.82	-1883	0.81	-2192	0.94	-1277
N-2: ASHE-MARION & BUCKLEY-MARION 500 KV	0.85	-1892	0.83	-979	0.79	-2060	0.81	-2196	0.93	-1386
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.86	-1835	0.83	-940	0.81	-2000	0.81	-2102	0.93	-1338
N-2: ASHE-MARION & SLATT-COYOTE TAP-LONGHORN 500 KV	0.85	-1893	0.82	-982	0.80	-2057	0.81	-2218	0.93	-1385
N-2: ASHE-MARION & SLATT-JOHN DAY 500 KV	0.85	-1890	0.83	-975	0.80	-2056	0.81	-2180	0.93	-1384
N-2: ASHE-SLATT & MCNARY-JOHN DAY 500 KV	0.85	-1854	0.82	-975	0.80	-2037	0.81	-2238	0.93	-1360
N-2: ASHE-SLATT & SLATT-COYOTE TAP-LONGHORN 500 KV	0.85	-1876	0.82	-991	0.80	-2046	0.81	-2265	0.93	-1372
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-CHEMAWA 230 KV	0.84	-1963	0.82	-1014	0.78	-2169	0.80	-2290	0.92	-1446
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-TROUTDALE 230 KV	0.84	-1968	0.82	-1015	0.78	-2178	0.80	-2294	0.92	-1450
N-2: BETHEL-CEDAR SP 500KV & BETHEL-ROUND BUTTE 230 KV	0.8405	-1967	0.825	-1010	0.78	-2175	0.81	-2263	0.92	-1451
N-2: BETHEL-CEDAR SP 500KV & BETHEL-SANTIAM 230KV	0.8405	-1966	0.824	-1009	0.78	-2175	0.81	-2262	0.92	-1450
N-2: BETHEL-CEDAR SP 500KV & SANTIAM-MIKKALO 500KV	0.8402	-1958	0.824	-1004	0.78	-2167	0.81	-2247	0.92	-1443
N-2: GRASSLAND-CEDAR SP 500KV & SLATT-BUCKLEY 500KV	0.8491	-1910	0.831	-959	0.79	-2117	0.81	-2127	0.9295	-1404
N-2: GRASSLAND-COYOTE 500KV & SLATT-LONGHORN 500KV	0.8405	-1934	0.824	-1003	0.78	-2148	0.81	-2280	0.92	-1424
N-2: BOISE BENCH-BROWNLEE #1 & #2 230 KV	0.85	-1935	0.8	-794	0.79	-2163	0.83	-1872	0.93	-1421
N-2: BOISE BENCH-BROWNLEE #3 & BOISE BENCH-HORSEFLAT#4 230 KV	0.85	-1936	0.8	-795	0.79	-2163	0.83	-1868	0.93	-1421
N-2: BRIDGER-POPULUS #1 & #2 345 KV + RAS	0.88	-1617	0.84	-805	0.84	-1777	0.84	-1451	0.95	-1146
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV + RAS	0.89	-1569	0.85	-761	0.85	-1746	0.86	-1193	0.95	-1122
N-2: BROADVIEW-GARRISONT #1 & #2 500 KV + RAS	0.81	-1896	0.82	-1071	0.71	-2417	0.78	-2513	0.82	-1660
N-2: BROWNLEE-HELLS CANYON & OXBOW-LOLO 230 KV	0.87	-1808	0.82	-840	0.82	-1989	0.82	-1902	0.94	-1302
N-2: BROWNLEE-OXBOW & BROWNLEE-HELLS CANYON 230 KV	0.85	-1870	0.82	-823	0.80	-2075	0.82	-2045	0.93	-1368

Appendix C - 16hs2a_3400WoH_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Bell		Brownlee		Hatwai		Hemingway		Taft	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: BUCKLEY-MARION & JOHN DAY-MARION 500 KV	0.84	-1949	0.82	-1001	0.78	-2141	0.80	-2244	0.92	-1436
N-2: CHIEF JO-MONROE & CHIEF JO-SICKLER 500 KV	0.84	-1910	0.82	-1013	0.79	-2122	0.80	-2292	0.92	-1415
N-2: CHIEF JO-MONROE 500 KV & CHIEF JO-SNOHOMS4 345 KV	0.84	-1943	0.82	-1014	0.79	-2137	0.80	-2293	0.92	-1432
N-2: CHIEF JO-MONROE 500 KV & MONROE-SAMMAMSH 230 KV	0.84	-1943	0.82	-1015	0.79	-2142	0.80	-2297	0.92	-1434
N-2: CHIEF JO-SICKLER 500 KV & CHIEF J3-SNOHOMS3 345 KV	0.84	-1926	0.82	-1015	0.79	-2134	0.80	-2295	0.92	-1424
N-2: COULEE-CHIEF JO 500 KV & CHIEF J4-SNOHOMS4 345 KV	0.84	-1905	0.82	-1015	0.79	-2131	0.80	-2296	0.92	-1419
N-2: COULEE-HANFORD & HANFORD-VANTAGE 500 KV	0.86	-1765	0.82	-998	0.81	-1884	0.81	-2274	0.93	-1271
N-2: COULEE-SCHULTZ #1 & #2 500 KV	0.86	-1769	0.82	-1001	0.81	-1922	0.81	-2265	0.93	-1287
N-2: CUSTERW-ING500 & CUSTERW-MONROE 500 KV	0.85	-1734	0.82	-1014	0.81	-1990	0.80	-2293	0.93	-1306
N-2: CUSTERW-MONROE #1 & #2 500 KV + RAS	0.82	-2001	0.81	-1078	0.76	-2299	0.80	-2478	0.91	-1552
N-2: DC-BIPOLE	0.86	-1803	0.83	-918	0.80	-2090	0.82	-1972	0.93	-1384
N-2: DOUBLE PALO VERDE	0.89	-1558	0.83	-565	0.84	-1734	0.83	-1966	0.94	-1142
N-2: ECHOLAKE-MAPLE VLY 500 KV & COVINGTON-MAPLE VLY 230 KV	0.84	-1966	0.82	-1018	0.78	-2180	0.80	-2303	0.92	-1454
N-2: ECHOLAKE-MAPLE VLY 500 KV & ROCKY RH-MAPLE VLY 345 KV	0.84	-1955	0.82	-1017	0.78	-2159	0.80	-2302	0.92	-1449
N-2: GARRISON-TAFT #1 & #2 500 KV + RAS	0.8	-1805	0.82	-1062	0.70	-2304	0.80	-2360	0.82	-1542
N-2: GRIZZLY-MALIN & GRIZZLY-CAPTAIN JACK 500 KV + RAS	0.85	-1774	0.83	-897	0.81	-2030	0.81	-1952	0.93	-1327
N-2: GRIZZLY-MALIN & GRIZZLY-SUMMER LAKE 500 KV + RAS	0.86	-1710	0.84	-857	0.82	-1960	0.82	-1892	0.94	-1262
N-2: GRIZZLY-MALIN & MALIN-SUMMER LAKE 500 KV + RAS	0.84	-1924	0.83	-990	0.78	-2188	0.81	-2062	0.92	-1442
N-2: HANFORD-ASHE & HANFORD-LOW MON 500 KV	0.85	-1920	0.82	-1010	0.78	-2002	0.80	-2285	0.92	-1412
N-2: HANFORD-WAUTOMA #1 & #2 500 KV	0.85	-1916	0.82	-996	0.79	-2103	0.81	-2265	0.93	-1411
N-2: JOHN DAY-BIG EDDY #1 & #2 500 KV	0.84	-1975	0.82	-1026	0.78	-2200	0.80	-2299	0.92	-1475
N-2: JOHN DAY-BIG EDDY & JOHN DAY-MARION 500 KV	0.84	-1956	0.82	-1009	0.78	-2155	0.80	-2270	0.92	-1441
N-2: JOHN DAY-GRIZZLY #1 & #2 500 KV + RAS	0.84	-1629	0.82	-964	0.81	-2023	0.81	-2205	0.92	-1325
N-2: JOHN DAY-GRIZZLY #2 & BUCKLEY-GRIZZLY 500 KV + RAS	0.84	-1807	0.82	-973	0.80	-2096	0.81	-2214	0.92	-1389
N-2: JOHN DAY-MARION & BUCKLEY-MARION 500 KV	0.84	-1949	0.82	-1001	0.78	-2141	0.80	-2244	0.92	-1436
N-2: JOHN DAY-MARION & MARION-PEARL 500 KV	0.85	-1919	0.82	-995	0.79	-2121	0.80	-2233	0.92	-1409
N-2: JOHN DAY-ROCK CREEK 500 KV & MCNARY-ROSS 345 KV	0.85	-1914	0.82	-986	0.80	-2084	0.81	-2250	0.93	-1394
N-2: KNIGHT-OSTRANDER & OSTRANDER-BIG EDDY 500 KV	0.84	-1964	0.82	-1011	0.78	-2168	0.80	-2279	0.92	-1447
N-2: KNIGHT-OSTRANDER 500 KV & MCNARY-ROSS 345 KV	0.84	-1959	0.82	-1004	0.78	-2158	0.80	-2276	0.92	-1442
N-2: KNIGHT-OSTRANDER 500 KV & MIDWAY-BONNEVILLE 230 KV	0.84	-1946	0.82	-1008	0.79	-2146	0.80	-2278	0.92	-1433
N-2: LOWER GRANITE-CENTRAL FERRY #1 & #2 500 KV + RAS OPEN 69 KV	0.86	-1704	0.82	-966	0.78	-1059	0.81	-2310	0.94	-1264
N-2: MALIN-ROUND MTN #1 & #2 500 KV	0.82	-1809	0.82	-1060	0.78	-2242	0.80	-2328	0.91	-1492
N-2: MCNARY-JOHN DAY & ROCK CREEK-JOHN DAY 500 KV	0.86	-1869	0.83	-967	0.80	-2064	0.81	-2211	0.93	-1367
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-HORSE HEAVEN 230 KV	0.84	-1941	0.82	-989	0.79	-2149	0.80	-2255	0.92	-1431
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-ROSS 345 KV	0.84	-1943	0.82	-987	0.79	-2148	0.80	-2251	0.92	-1432
N-2: MCNARY-ROSS 345 KV & MCNARY-HORSE HEAVEN 230 KV	0.84	-1966	0.82	-1003	0.78	-2173	0.80	-2285	0.92	-1448
N-2: MIDPOINT-HEMINGWAY 500 KV & MIDPOINT-KING 230 KV	0.87	-1816	0.84	-877	0.82	-2007	0.74	-1971	0.94	-1290
N-2: MONROE-CUSTERW & CHIEF JO-MONROE 500 KV	0.85	-1790	0.82	-1013	0.80	-2040	0.80	-2291	0.93	-1336
N-2: PAUL-RAVER & RAVER-COVINGT4 500 KV	0.85	-1921	0.82	-1010	0.79	-2127	0.80	-2285	0.92	-1414
N-2: PEARL-KEELER 500 KV & PEARL-SHERWOOD 230 KV + RAS	0.85	-1920	0.82	-1009	0.79	-2126	0.80	-2284	0.92	-1409
N-2: PEARL-OSTRANDER 500 KV & BIG EDDY-MCLOUGLN 230 KV	0.84	-1967	0.82	-1016	0.78	-2175	0.80	-2296	0.92	-1448
N-2: PEARL-OSTRANDER 500 KV & OSTRANDER-MCLOUGLN 230 KV	0.84	-1968	0.82	-1016	0.78	-2177	0.80	-2296	0.92	-1449
N-2: RAVER-COVINGTON #1 & #2 500 KV	0.84	-1983	0.82	-1019	0.78	-2198	0.80	-2305	0.92	-1461
N-2: RAVER-ECHO LAKE & RAVER-SCHULTZ 500 KV	0.84	-1925	0.82	-1014	0.79	-2137	0.80	-2295	0.92	-1424

Appendix C - 16hs2a_3400WoH_2250idnw_N Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency	Bell		Brownlee		Hatwai		Hemingway		Taft	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: RAVER-PAUL & NAPAVINE-PAUL 500 KV	0.85	-1914	0.82	-1009	0.79	-2120	0.80	-2282	0.92	-1406
N-2: RAVER-PAUL 500 KV & COULEE-OLYMPIA 300 KV	0.85	-1894	0.82	-1006	0.79	-2084	0.80	-2276	0.93	-1388
N-2: RAVER-PAUL 500 KV & TACOMA A-CHEHALIS 230 KV	0.85	-1912	0.82	-1007	0.79	-2116	0.80	-2278	0.92	-1402
N-2: RAVER-SCHULTZ #1 & #2 500 KV	0.84	-1941	0.82	-1011	0.79	-2127	0.80	-2288	0.92	-1434
N-2: RAVER-TACOMA & RAVER-COVINGT4 500 KV	0.84	-1967	0.82	-1017	0.78	-2175	0.80	-2301	0.92	-1450
N-2: RAVER-TACOMA 500 KV & TACOMA-CHRISTOP-COVINGTON 230 KV	0.84	-1962	0.82	-1017	0.78	-2167	0.80	-2301	0.92	-1446
N-2: SCHULTZ-WAUTOMA & VANTAGE-SCHULTZ 500 KV + RAS	0.86	-1843	0.82	-1009	0.80	-1999	0.81	-2282	0.93	-1348
N-2: SICKLER-SCHULTZ & SCHULTZ-VANTAGE 500 KV + RAS	0.85	-1909	0.82	-1014	0.79	-2116	0.80	-2295	0.92	-1411
N-2: TAFT-BELL & TAFT-DWORSKAK 500 KV + RAS	0.8	-1276	0.82	-1105	0.70	-1983	0.80	-2385	0.98	-471
N-2: TAFT-BELL 500 KV & BELL-LANCASTER 230 KV + RAS	0.8	-1303	0.82	-1021	0.88	-1315	0.81	-2305	0.94	-771
N-2: TAFT-BELL 500KV & BELL-BOUNDARY #3 230KV + RAS	0.8	-1575	0.82	-1043	0.85	-1643	0.80	-2366	0.93	-964
N-2: TAFT-BELL 500KV & BELL-TRENTWOOD #2 115KV	0.8	-1389	0.82	-1009	0.87	-1461	0.81	-2276	0.94	-855
N-2: TAFT-BELL 500KV & LANCASTER-NOXON 230KV	0.8	-1384	0.82	-1004	0.89	-1239	0.81	-2261	0.94	-734
N-2: TAFT-DWORSHAK & GARRISON-TAFT #1 500KV + RAS	0.93	-932	0.82	-1107	0.70	-2003	0.80	-2397	0.95	-643
N-2: WAUTOMA-ROCK CK 500 KV & MIDWAY-BIG EDDY 230 KV	0.85	-1867	0.82	-989	0.80	-2047	0.81	-2252	0.93	-1366
N-2: WAUTOMA-ROCK CK 500 KV & SPRINGCREEK-BIG EDDY 230 KV	0.85	-1867	0.82	-989	0.80	-2047	0.81	-2252	0.93	-1366
N-3: SCHULTZ-RAVER #1 & #2 & #3 500 KV	0.84	-1921	0.82	-1010	0.79	-2117	0.80	-2284	0.92	-1424

Appendix C – 16la1sa_3400idnw_nv Base Case Transient Stability Plots

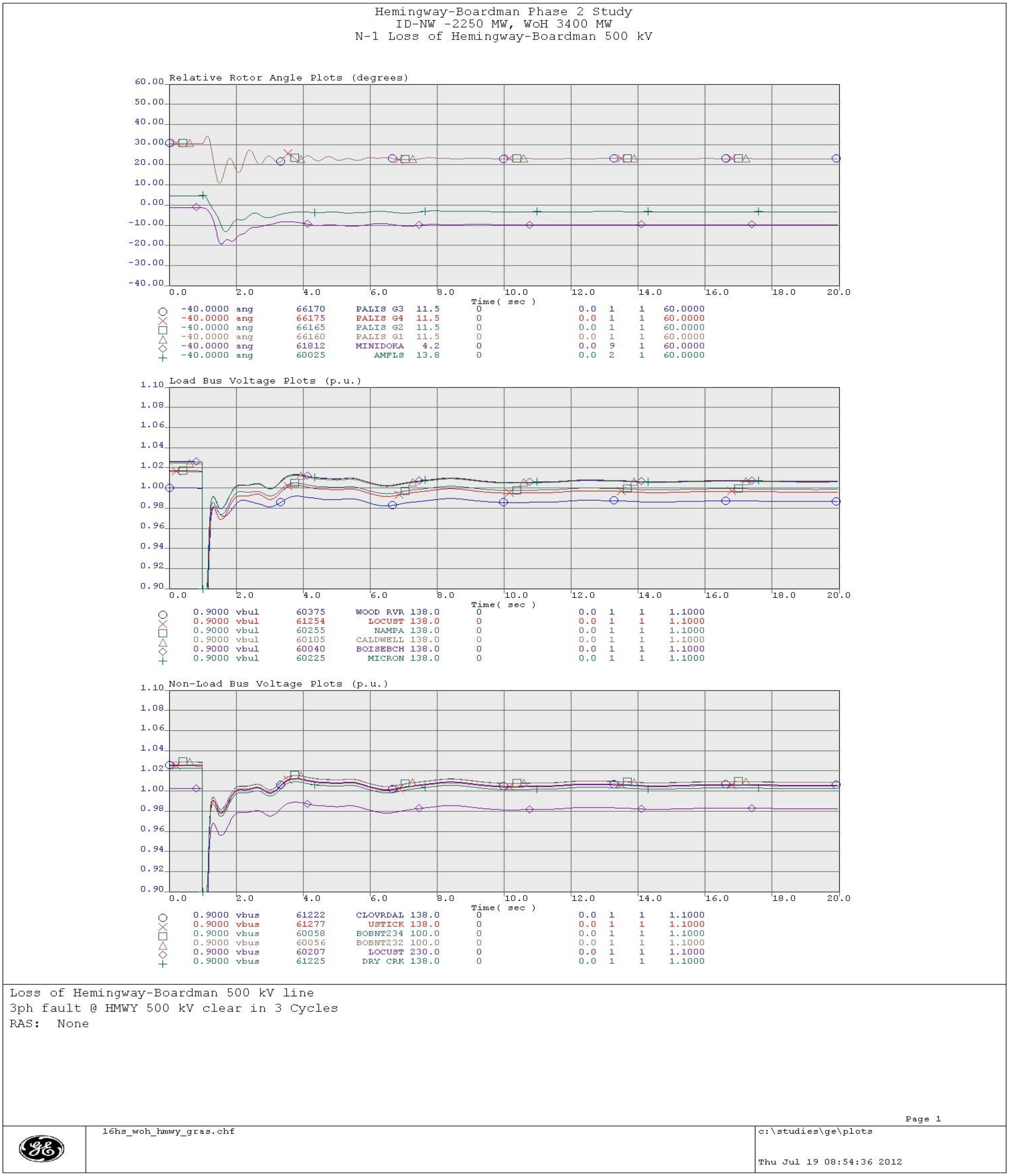


Figure C6: N-1 Loss of Hemingway-Boardman 500 kV Line (Angle & Voltage Plots)

Appendix C – 16la1sa_3400idnw_nv Base Case Transient Stability Plots

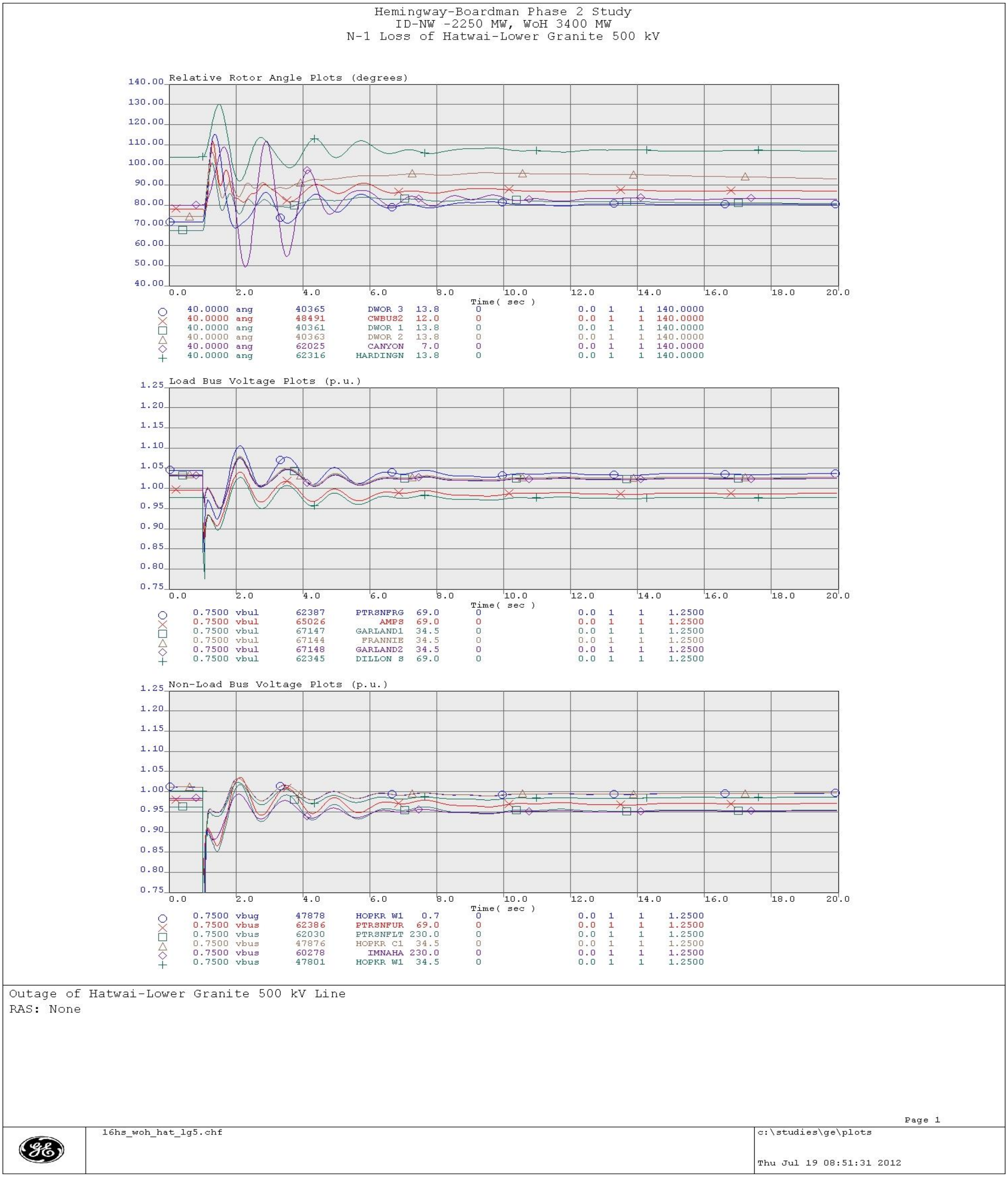


Figure C7: N-1 Loss of Hatwai-Lower Granite 500 kV Line (Angle & Voltage Plots)

Appendix C – 16la1sa_3400idnw_nv Base Case Transient Stability Plots

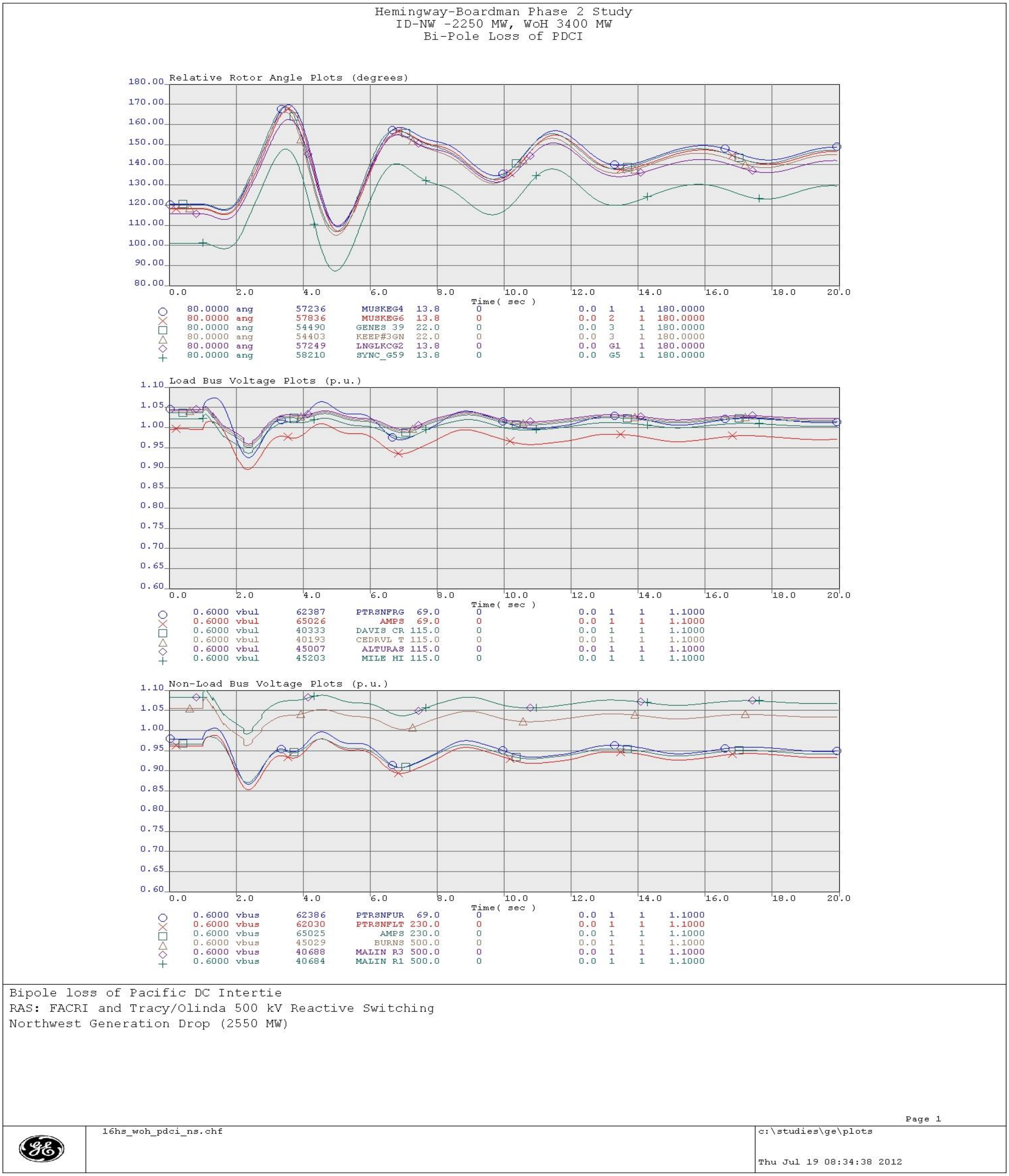


Figure C8: Bi-Pole Loss of Pacific DC Intertie (Angle & Voltage Plots)

Appendix C – 16la1sa_3400idnw_nv Base Case Transient Stability Plots

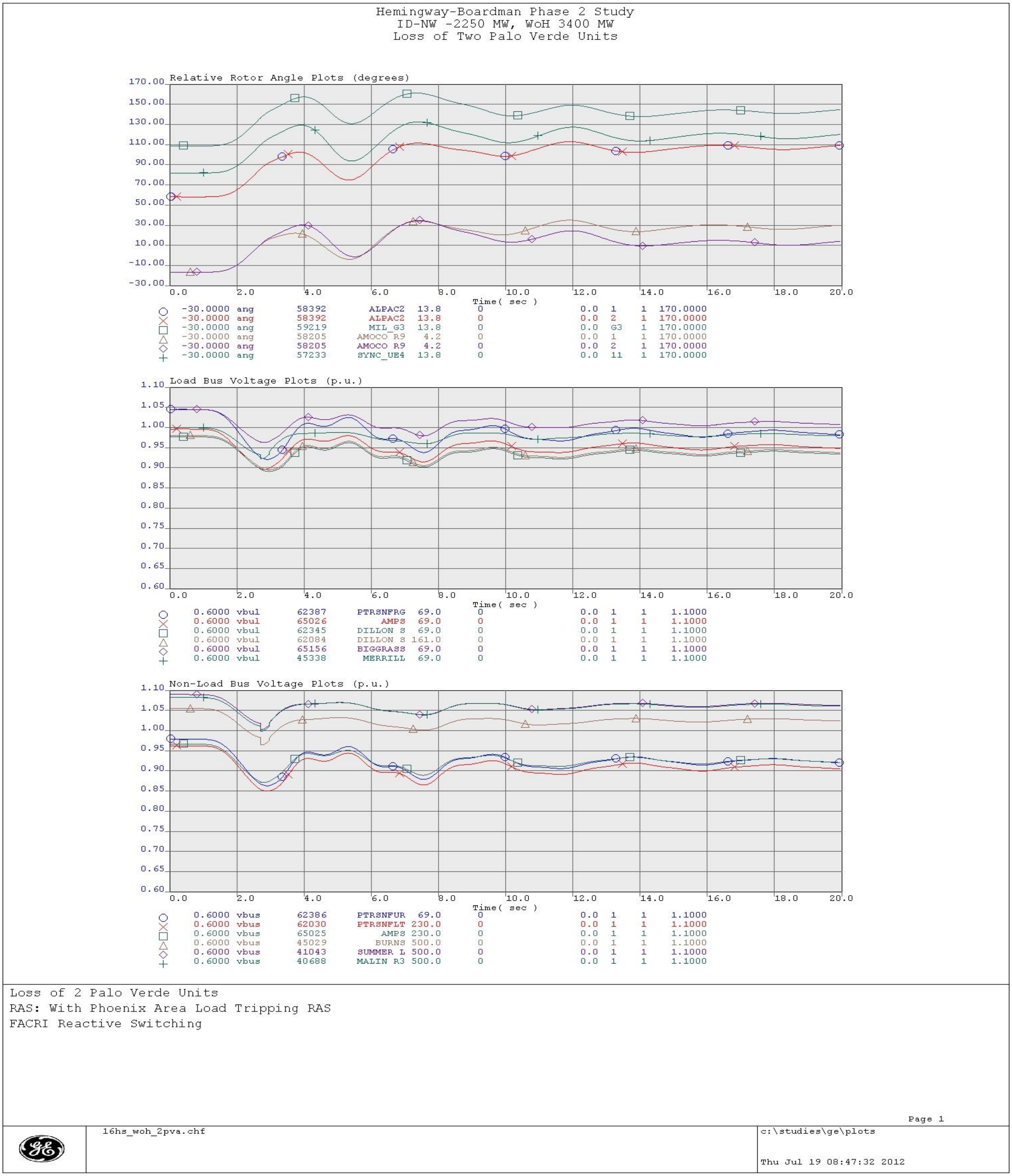
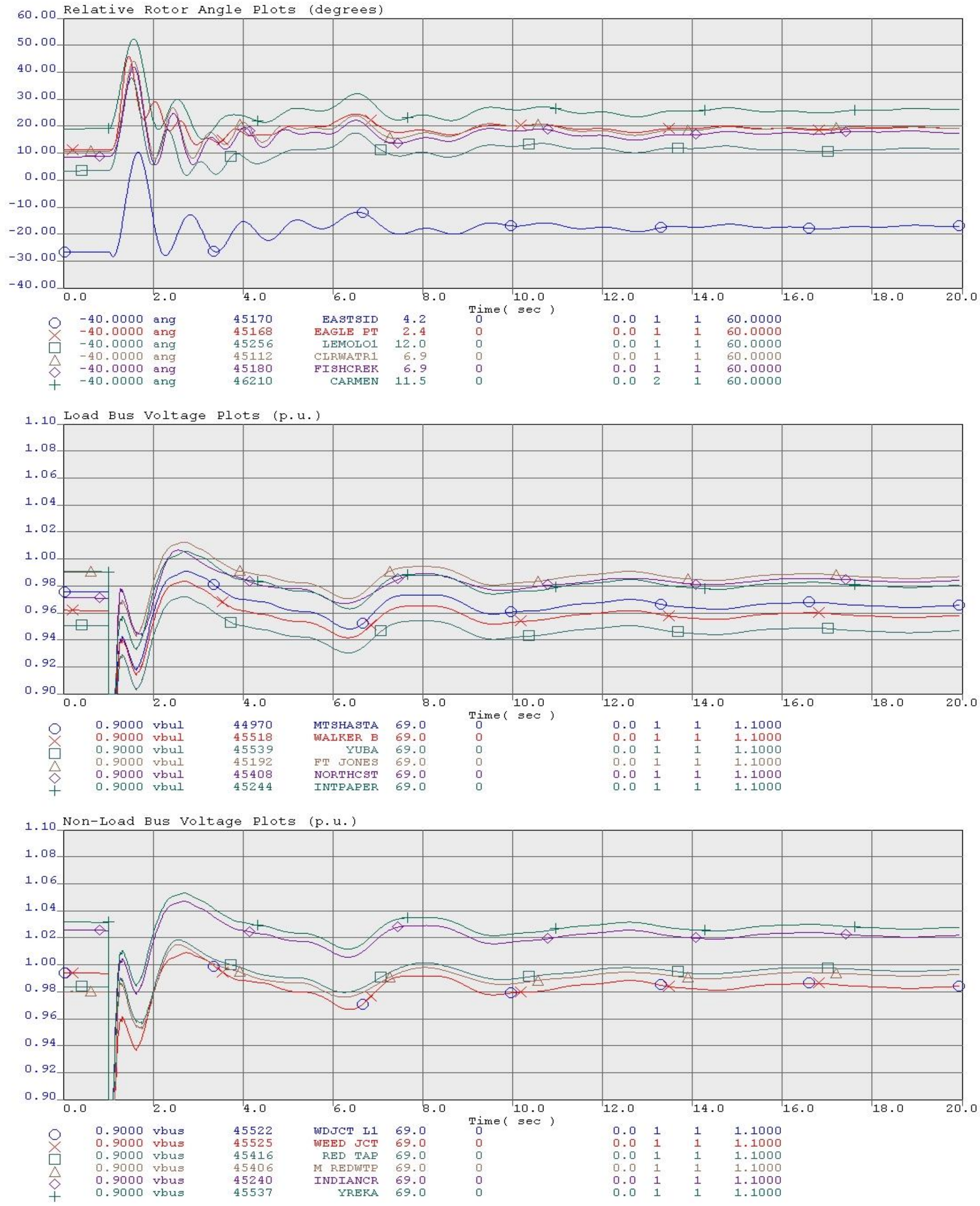


Figure C9: N-2 Loss of Two Palo Verde Units (Angle & Voltage Plots)

Appendix C – 16la1sa_3400idnw_nv Base Case Transient Stability Plots

Hemingway-Boardman Phase 2 Study
ID-NW -2250 MW, WoH 3400 MW
N-2 Loss of Malin-Round Mt #1 & #2 500 kV Lines



3-Phase Fault @ Malin 500 kV with 4 Cycle Clearing
Loss of Malin-Round Mtn #1 & #2 500 kV Lines
Opens Round Mtn-Table Mtn #2 500 kV Line
RAS: FACRI and Tracy/Olinda 500 kV Reactive Switching
NW Gen Drop 2400 MW

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Figure C10: N-2 Loss of Malin-Round Mt #1 & #2 500 kV Lines (Angle & Voltage Plots)

Appendix C - 16hs2a_3400WoH_2250idnw_N Base Case Transient Stability Results

Fault	Disturbance/Outage	RAS Actions		Largest Swing Voltage Bus	Lowest Swing Voltage Bus	Largest Swing Voltage Load Bus	Lowest Load Bus Frequency	Comments
		Cycles	Remedial Action	(% change)	(absolute value)	(% change)	(Hz)	
N-1 3 Cy 3PH Hemingway 500 kV	Hemingway-Grassland 500 kV	Var	None	Wood Rvr 138 15.9%	L Salm 3 13.8 0.829	Wood Rvr 138 15.9%	Palis g4 11.5 59.840	Stable & Damped
N-1 3 Cy 3PH Hatwai 500 kV	Hatwai-Lower Granite 500 kV	8 18	Libby 1-5 Generation Lancaster Generation	Ptrsnfrg 69 11.6%	Ptrsnflt 230 0.852	Ptrsnfrg 69 11.6%	Hardingn 13.8 59.764	Stable & Damped
Bi-pole Block	PDCI Bipole	Var	FACRI insertion of Ft Rock Series Caps, Malin C1, CaptJack C1 Tracy&Olinda React Switching NW 2550 MW Gen Drop	Ptrsnfrg 69 11.4%	Ptrsnflt 230 0.854	Ptrsnfrg 69 11.4%	Sync_g19 13.8 59.762	Stable & Damped
N-2	Loss of 2 Palo Verde units	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1	Ptrsnfrg 69 11.8%	Ptrsnflt 230 0.850	Ptrsnfrg 69 11.8%	Sync_g19 13.8 59.760	Stable & Damped
N-2 4 Cy 3PH Malin 500 kV	Malin-Round Mt #1 500 kV Malin-Round Mt #2 500 kV Round Mt-Table Mt #2 500 kV	Var	Chief Jo Braking Resistor Tracy&Olinda React Switching NW 2400 MW Gen Drop Flash Malin-Round Mt S-Caps	Mtshasta 69 16.0%	Yuba 69 0.799	Mtshasta 69 16.0%	Lakeview 69 59.738	Stable & Damped

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Shunt HANFORD_500.0 (40499) #s
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Bus MALIN R3_500.0 (40688)
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV + RAS	OPEN Shunt TAFT_500.0 (41057) #s
BF 4028 Taft-Dworshak & Taft Reactor 500kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4028 Taft-Dworshak & Taft Reactor 500kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	SET SWITCHED SHUNT AT BUS BENEWAH_230.0 (48037) TO 201.3 MVR
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN InjectionGroup RAS Libby Gen Drop
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500kV + RAS	OPEN Load MILCTYDC_230.0 (63010) #D1
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500kV + RAS	OPEN Bus MILCTYDC_230.0 (63010)
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500kV + RAS	SET SWITCHED SHUNT AT BUS ROSEBUD_230.0 (63012) TO -10 MVR
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500kV + RAS	SET SWITCHED SHUNT AT BUS CUSTER_230.0 (63003) TO -22 MVR
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500kV + RAS	OPEN Shunt CUSTER_230.0 (63003) #1

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	SET SWITCHED SHUNT AT BUS KLAFALLS_230.0 (45161) TO 91.4 MVR
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP S1_ 18.0 (47641)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G2_ 18.0 (47640)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G1_ 18.0 (47639)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 2
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN Bus ASHE R1_500.0 (40062)
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Bus SANTIAM_500.0 (40941)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Shunt OSTRNDER_500.0 (40809) #s
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOK TAP_500.0 (41001)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOKING_500.0 (41007)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt MONROE_500.0 (40749) #s
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR G2_ 20.0 (47744)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2AX_ 4.2 (47746)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2FG_ 13.8 (47747)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR G1_ 20.0 (47740)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1AX_ 4.2 (47742)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1FG_ 13.8 (47743)
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Transformer TONO_115.0 (42806) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Shunt OLY E_230.0 (40794) #s
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN Shunt MONROE_500.0 (40749) #s
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Transformer ALLSTON_500.0 (40045) TO ALLSTN E_230.0 (40043) CKT 2
BF 4708 Hatwai 500 kV Bus + RAS	OPEN Bus HATWAI_500.0 (40521)
BF 4708 Hatwai 500 kV Bus + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 201.3 MVR
BF 4708 Hatwai 500 kV Bus + RAS	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
BF 4708 Hatwai 500 kV Bus + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4708 Hatwai 500 kV Bus + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4708 Hatwai 500 kV Bus + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Transformer CHIEF JO_500.0 (40233) TO CHIEF J2_230.0 (40232) CKT 3

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV + RAS	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Transformer BIG EDDY_500.0 (40111) TO BIGEDDY1_230.0 (41341) CKT 2
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Bus CGS_ 25.0 (40063)
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN Bus BURNS_500.0 (45029)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R3_500.0 (40688)
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN Bus ROUND BU_500.0 (43485)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Bus MAPLE VL_500.0 (40693)
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M1_500.0 (43115)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G1_ 18.0 (47639) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G2_ 18.0 (47640) CKT 1

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP S1_ 18.0 (47641) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
BF 5266 Slatt-Buckly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	CLOSE Shunt QUARTZ_138.0 (60305) #c1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS N POWDER_ 34.5 (60313) TO 27 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Bus BURNS_500.0 (45029)
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 13 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	CLOSE Shunt QUARTZ_138.0 (60305) #c1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 200 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS N POWDER_ 34.5 (60313) TO 27 MVR
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF McNary 230 kV SECT 1	OPEN Bus HERM 1G_ 18.0 (45454)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1S_ 13.8 (45455)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2G_ 18.0 (45456)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2S_ 13.8 (45457)
BF McNary 230 kV SECT 1	OPEN Bus MCN 01_ 13.8 (44101)
BF McNary 230 kV SECT 1	OPEN Bus MCN 02_ 13.8 (44102)
BF McNary 230 kV SECT 1	OPEN Bus MCN 03_ 13.8 (44103)
BF McNary 230 kV SECT 1	OPEN Bus MCN 04_ 13.8 (44104)
BF McNary 230 kV SECT 1	OPEN Bus BOARD T1_230.0 (40121)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_230.0 (40129)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_115.0 (40127)
BF McNary 230 kV SECT 1	OPEN Bus MORROW 1_115.0 (47334)
BF McNary 230 kV SECT 1	OPEN Bus PORT MOR_115.0 (47335)
BF McNary 230 kV SECT 1	OPEN Bus MORRO G1_ 13.8 (47658)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN T_ 69.0 (40608)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN_ 69.0 (47332)
BF McNary 230 kV SECT 1	OPEN Bus KINZ WW_ 12.5 (47331)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_ 69.0 (40125)
BF McNary 230 kV SECT 1	OPEN Bus IONE_ 69.0 (40575)
BF McNary 230 kV SECT 1	OPEN Bus TOWER RD_115.0 (41324)
BF McNary 230 kV SECT 1	OPEN Bus ALKALI C_115.0 (41319)
BF McNary 230 kV SECT 1	OPEN Bus HERMISTN_230.0 (45137)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH1_230.0 (44122)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH2_230.0 (44123)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX1_100.0 (44115)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX2_100.0 (44116)
BF McNary 230 kV SECT 2	OPEN Bus MCNRY S2_230.0 (41352)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH34_230.0 (44125)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH3_230.0 (44124)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH4_230.0 (44126)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX3_100.0 (44117)
BF McNary 230 kV SECT 2	OPEN Bus MCN 05_ 13.8 (44105)
BF McNary 230 kV SECT 2	OPEN Bus MCN 06_ 13.8 (44106)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX4_100.0 (44118)
BF McNary 230 kV SECT 2	OPEN Bus MCN 07_ 13.8 (44107)

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Contingency Studied	Actions Taken in the Contingency
BF McNary 230 kV SECT 2	OPEN Bus MCN 08_ 13.8 (44108)
BF McNary 230 kV SECT 3	OPEN Bus MCNRY S3_230.0 (41353)
BF McNary 230 kV SECT 3	OPEN Bus MCN PH5_230.0 (44127)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX5_100.0 (44119)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX6_100.0 (44120)
BF McNary 230 kV SECT 3	OPEN Bus MCN 09_ 13.8 (44109)
BF McNary 230 kV SECT 3	OPEN Bus MCN 10_ 13.8 (44110)
BF McNary 230 kV SECT 3	OPEN Bus MCN 11_ 13.8 (44111)
BF McNary 230 kV SECT 3	OPEN Bus MCN 12_ 13.8 (44112)
BF McNary 230 kV SECT 3	OPEN Bus MCNARY_345.0 (40721)
Bus: Alvey 500 kV + RAS	OPEN Bus ALVEY_500.0 (40051)
Bus: Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
Bus: Bell BPA 500 kV	OPEN Bus BELL BPA_500.0 (40091)
Bus: Bell BPA 500 kV	OPEN Bus COULE R1_500.0 (40288)
Bus: Bell BPA 500 kV	OPEN Bus BELL SC_500.0 (40096)
Bus: Bell BPA 500 kV	OPEN InjectionGroup RAS Lancaster Gen Drop
Bus: Buckley 500 kV	OPEN Bus BUCKLEY_500.0 (40155)
Bus: Dixonville 500 kV	OPEN Bus DIXONVLE_500.0 (45095)
Bus: Dixonville 500 kV	SET SWITCHED SHUNT AT BUS GRANT PS_230.0 (45123) TO 147.4 MVR
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #2
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #3
Bus: Hot Springs 500 kV	OPEN Bus HOT SPR_500.0 (40553)
Bus: Keeler 500 kV + RAS	OPEN Bus KEELER_500.0 (40601)
Bus: Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
Bus: Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_500.0 (41401)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_230.0 (41402)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_230.0 (47386)
Bus: Rock Creek 500 kV	OPEN Bus ENRGZR T_230.0 (47823)
Bus: Rock Creek 500 kV	OPEN Bus WHITE CK_230.0 (47827)
Bus: Rock Creek 500 kV	OPEN Bus IMRIE_230.0 (47822)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_ 34.5 (47387)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC C1_ 34.5 (47388)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC W1_ 0.7 (47389)
Bus: Rock Creek 500 kV	OPEN Bus DOOLEY T_230.0 (47465)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 3_ 34.5 (47496)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 2_ 34.5 (47493)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C2_ 34.5 (47494)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W2_ 0.7 (47495)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C3_ 34.5 (47497)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W3_ 0.7 (47498)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE 1_ 34.5 (47829)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 1_ 34.5 (47825)
Bus: Rock Creek 500 kV	OPEN Bus WILLIS T_230.0 (47824)
Bus: Rock Creek 500 kV	OPEN Bus TULMN 1_ 34.5 (47826)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C1_ 34.5 (47936)
Bus: Rock Creek 500 kV	OPEN Bus TULMN C1_ 34.5 (47938)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 2_ 34.5 (47903)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 1_ 34.5 (47902)
Bus: Rock Creek 500 kV	OPEN Bus MILLRA S_230.0 (47857)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE C1_ 34.5 (47865)
Bus: Rock Creek 500 kV	OPEN Bus MILLR 1_ 34.5 (47966)
Bus: Rock Creek 500 kV	OPEN Bus HARVST W_230.0 (47858)
Bus: Rock Creek 500 kV	OPEN Bus HRVST 1_ 34.5 (47979)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE W1_ 0.6 (47866)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C1_ 34.5 (47904)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C2_ 34.5 (47905)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W1_ 0.7 (47906)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W2_ 0.7 (47907)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W1_ 0.7 (47937)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W2_ 0.6 (47940)

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Contingency Studied	Actions Taken in the Contingency
Bus: Rock Creek 500 kV	OPEN Bus TULMN W1_ 0.7 (47939)
Bus: Rock Creek 500 kV	OPEN Bus MILLR C1_ 34.5 (47967)
Bus: Rock Creek 500 kV	OPEN Bus MILLR W1_ 0.6 (47968)
Bus: Rock Creek 500 kV	OPEN Bus HRVST C1_ 34.5 (47980)
Bus: Rock Creek 500 kV	OPEN Bus HRVST W1_ 0.7 (47981)
Bus: Sickler 500 kV	OPEN Bus SICKLER_500.0 (40973)
Bus: Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
Bus: Summer Lake 500 kV	OPEN Bus SUMMER L_500.0 (41043)
Bus: Summer Lake 500 kV	OPEN Bus BURNS_500.0 (45029)
Bus: Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-1: Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
N-1: Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
N-1: Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
N-1: Allston-Napavine 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-1: Allston-Paul #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-1: Alvery-Dixonville 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO DIXONVLE_500.0 (45095) CKT 1
N-1: Alvey-Marion 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
N-1: Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-1: Ashe-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
N-1: Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-1: Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-1: Bell-Coulee 500 kV	OPEN Bus COULE R1_500.0 (40288)
N-1: Bell-Coulee 500 kV	OPEN InjectionGroup RAS Lancaster Gen Drop
N-1: Bell-Taft 500 kV	OPEN Bus BELL SC_500.0 (40096)
N-1: Big Eddy-Celilo 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO CELILO1_500.0 (41311) CKT 1
N-1: Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-1: Big Eddy-Knight 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO KNIGHT_500.0 (41450) CKT 1
N-1: Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-1: Boise Bench-Brownlee #3 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-1: Brady-Antelope 230 kV	OPEN Line BRADY_230.0 (60073) TO ANTLOPE_230.0 (65075) CKT 1
N-1: Broadview-Garrison #1 500 kV	OPEN Bus GAR1EAST_500.0 (40451)
N-1: Broadview-Garrison #1 500 kV	OPEN Bus TOWN1_500.0 (62013)
N-1: Brownlee-Ontario 230 kV	OPEN MultiSectionLine BROWNLEE_230.0 (60095) TO ONTARIO_230.0 (60265) CKT 1
N-1: Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-1: Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-1: Buckley-Slatt 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-1: Captain Jack-Olinda 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO OLINDA_500.0 (30020) CKT 1
N-1: Captain Jack-Olinda 500 kV	SET SWITCHED SHUNT AT BUS WEED JCT_115.0 (45335) TO 30.3 MVR
N-1: CaptJack-Kfalls 500 kV	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
N-1: Cascade Crossing 500 kV	OPEN Bus CDR SPRG_500.0 (43950)
N-1: Cascade Crossing 500 kV	OPEN Bus CDRSBET1_500.0 (43951)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHCRS1_500.0 (43491)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHEL5_500.0 (43041)
N-1: Chief Jo-Coulee 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-1: Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-1: Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-1: Coulee-Hanford 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-1: Coulee-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Covington4-Raver 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-1: Covington5-Raver 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
N-1: CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-1: Dixonville-Meridian 500 kV	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
N-1: Drycreek-Lolo 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO LOLO_230.0 (48197) CKT 1
N-1: Drycreek-N Lewiston 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO N LEWIST_230.0 (48255) CKT 1
N-1: Drycreek-Wala Ava 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO WALA AVA_230.0 (48451) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-1: Dworshak-Taft 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-1: Dworshak-Taft 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
N-1: Dworshak-Taft 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-1: Echo Lake-Maple Valley 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO MAPLE VL_500.0 (40693) CKT 1
N-1: Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Echo Lake-Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
N-1: Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-1: Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSHE1_115.0 (32229)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSESHE_115.0 (32230)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTL1_115.0 (32233)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_115.0 (32234)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_ 13.2 (32460)
N-1: Goldhill-Placer 115 kV	OPEN Bus FLINT1_115.0 (32236)
N-1: Grassland-Coyote 500 kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-1: Grassland-Slatt 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
N-1: Grizzly-John Day #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-1: Grizzly-Malin 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN MultiSectionLine PONDROSA_500.0 (40837) TO SUMMER L_500.0 (41043) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZ R3_500.0 (40488) TO PONDROSA_500.0 (40837) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO GRIZZ R3_500.0 (40488) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Grizzly-Round Bu 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO ROUND BU_500.0 (43485) CKT 1
N-1: Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-1: Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-1: Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Transformer HATWAI_500.0 (40521) TO HATWAI_230.0 (40519) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 67.1 MVR
N-1: Hatwai-Lolo 230 kV	OPEN Line HATWAI_230.0 (40519) TO LOLO_230.0 (48197) CKT 1
N-1: Hatwai-Low Gran 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
N-1: Hatwai-Low Gran 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-1: Hatwai-N Lewiston 230 kV	OPEN Line HATWAI_230.0 (40519) TO N LEWIST_230.0 (48255) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO HURICANE_230.0 (45103) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN MultiSectionLine HURICANE_230.0 (45103) TO WALAWALA_230.0 (45327) CKT 1
N-1: Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
N-1: Hemingway-Grassland 500 kV	CLOSE Shunt OREBASIN_ 34.5 (66146) #1
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	CLOSE Shunt OREBASIN_ 34.5 (66146) #1
N-1: Hemingway-Summer Lake 500 kV	OPEN Line HEMINWAY_500.0 (60155) TO BURNS_500.0 (45029) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN MultiSectionLine BURNS_500.0 (45029) TO SUMMER L_500.0 (41043) CKT 1
N-1: Hill Top 345/230 Xfmr	OPEN Transformer HIL TOP_230.0 (40537) TO HIL TOP_345.0 (64058) CKT 1
N-1: Horse Hv-McNary 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-1: Hot Springs-Taft 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line COYOTECR_345.0 (64032) TO HUMBOLDT_345.0 (64059) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line MAGGIECR_120.0 (64070) TO CARLIN_120.0 (64169) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt EIGHTMFK_120.0 (64457) #b
N-1: Humboldt-Coyote Ck 345 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 10.8 MVR
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt MIDPOINT_345.0 (60235) #2
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO &1_345.0 (67582)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO_345.0 (66225)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #2_ 99.0 (65014)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #3_ 99.0 (65017)
N-1: Ing500-CusterW 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-1: John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-1: John Day-Rock Ck 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: John Day-Slatt 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-1: Kfalls-Meridian 500 kV	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
N-1: Knight-Wautoma 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
N-1: LaGrande-North Powder 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO N POWDER_230.0 (60312) CKT 1
N-1: Lanes-Marion 500 kV	OPEN Line LANE_500.0 (40629) TO MARION_500.0 (40699) CKT 1
N-1: Lit Goose-Central Ferry 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
N-1: Lit Goose-Low Mon 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
N-1: Low Gran-Central Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Low Mon-Sac Tap 500 kV	OPEN Line LOW MON_500.0 (40683) TO SACJWA T_500.0 (40917) CKT 1
N-1: Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
N-1: Malin-Hilltop 230 kV	OPEN Line CANBYTAP_230.0 (40171) TO HIL TOP_230.0 (40537) CKT 1
N-1: Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-1: Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-1: Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-1: Maple Vly-Rocky RH 345 kV	OPEN MultiSectionLine MAPLE VL_345.0 (40691) TO ROCKY RH_345.0 (40891) CKT 1
N-1: Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Line MARION_500.0 (40699) TO SANTIAM_500.0 (40941) CKT 1
N-1: McLouglin-Ostrander 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-1: McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary S2-McNary S3 230 kV	OPEN Line MCNRY S2_230.0 (41352) TO MCNRY S3_230.0 (41353) CKT 1
N-1: McNary-Board T1 230 kV	OPEN Line BOARD T1_230.0 (40121) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-1: McNary-Longhorn 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
N-1: McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-1: McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-1: McNary-Roundup 230 kV	OPEN Line MCNRY S1_230.0 (41351) TO ROUNDUP_230.0 (40905) CKT 1
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJWA T_500.0 (40917)
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
N-1: McNary-Sac Tap-Low Mon 500 kV	CLOSE Gen ICE H1-2_ 13.8 (40559) #1
N-1: Midpoint-Hemingway 500 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Midpoint-Humboldt 345 kV	OPEN Bus IDAHO-NV_345.0 (64061)
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS HIL TOP_230.0 (40537) TO 52.2 MVR
N-1: Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
N-1: Ontario-Caldwell 230 kV	OPEN MultiSectionLine CALDWELL_230.0 (60110) TO LANGLEY_230.0 (60266) CKT 1
N-1: Ostrander-Knight 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-1: Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-1: Ostrander-Troutdale 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO TROUTDAL_500.0 (41095) CKT 1
N-1: Oxbow-Brownlee #2 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 2
N-1: Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-1: Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-1: Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO SATSOP_500.0 (40949) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-1: Pinto-Four Corner 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Ponderosa A 500/230 kV Xfmr	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Ponderosa B 500/230 kV Xfmr	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Raver-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-1: Raver-Tacoma 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus H ALLEN_345.0 (18001)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus HA PS_345.0 (18002)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus UTAH-NEV_345.0 (67657)
N-1: Robinson-Harry Allen 500 kV	OPEN Line ROBINSON_500.0 (64895) TO H ALLEN_500.0 (18450) CKT 1
N-1: Rock Ck-Wautoma 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Roundup-Lagrande 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO ROUNDUP_230.0 (40905) CKT 1
N-1: Schultz-Sickler 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-1: Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Schultz-Wautoma 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Sigurd-Glen Canyon 230 kV	OPEN Bus SIGURDPS_230.0 (66355)
N-1: Slatt 500/230 kV Xfmr	OPEN Transformer SLATT_500.0 (40989) TO SLATT_230.0 (40986) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-1: Snok Tap-Snoking 500 kV	OPEN Line SNOK TAP_500.0 (41001) TO SNOKING_500.0 (41007) CKT 1
N-1: Vantage 500/230 kV Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
N-1: Vantage 500/230 kV Xfmr #2	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 2
N-1: Walla Walla-Talbot 230 kV	OPEN Line TALBOT_230.0 (44912) TO WALAWALA_230.0 (45327) CKT 1
N-1: Walla Walla-Wallula 230 kV	OPEN Line WALAWALA_230.0 (45327) TO WALLULA_230.0 (45331) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	OPEN Load MILCTYDC_230.0 (63010) #D1
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	OPEN Bus MILCTYDC_230.0 (63010)
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	SET SWITCHED SHUNT AT BUS ROSEBUD_230.0 (63012) TO -10 MVR
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	SET SWITCHED SHUNT AT BUS CUSTER_230.0 (63003) TO -22 MVR
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Taft-Bell & Taft-Dworskak 500 kV + RAS	SET SWITCHED SHUNT AT BUS GARRISON_500.0 (40459) TO -558 MVR
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN MultiSectionLine BIGEDDY2_230.0 (41342) TO CHEMAWA_230.0 (40213) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Bus PARKDALE_230.0 (40813)
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 2
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIHOR41_230.0 (61995) CKT 4 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO HORSEFLT_230.0 (60102) CKT 4
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO11_230.0 (61998) CKT 1 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO21_230.0 (61997) CKT 2 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV + RAS	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 1
N-2: Bridger-Populus #1 & #2 345 kV + RAS	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #1 & #2 345 kV + RAS	OPEN Gen BRIDGER1_ 22.0 (60086) #1
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET LOAD AT BUS BRIDGER1_ 22.0 (60086) TO 60 % of present MW (cnst pf)
N-2: Bridger-Populus #1 & #2 345 kV + RAS	OPEN Gen BRIDGER2_ 22.0 (60087) #1
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET LOAD AT BUS BRIDGER2_ 22.0 (60087) TO 60 % of present MW (cnst pf)
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET SERIES CAP REACTANCE AT POPULUS_345.0 (67790) TO POPBRI21_345.0 (61967) CKT 2 TO -0.017307 pu
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET SERIES CAP REACTANCE AT POPULUS_345.0 (67790) TO POPBRI11_345.0 (61968) CKT 1 TO -0.017307 pu
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET SERIES CAP REACTANCE AT BRI3MI11_345.0 (61999) TO 3MIKNOLL_345.0 (60084) CKT 1 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV + RAS	CLOSE Shunt BORAH_345.0 (60060) #1
N-2: Bridger-Populus #1 & #2 345 kV + RAS	BYPASS SeriesCap BURNS_500.0 (45029) TO BURSUM11_500.0 (90132) CKT 1
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	OPEN MultiSectionLine BRIDGER_345.0 (60085) TO 3MIKNOLL_345.0 (60084) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	OPEN Gen BRIDGER1_ 22.0 (60086) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET LOAD AT BUS BRIDGER1_ 22.0 (60086) TO 60 % of present MW (cnst pf)
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	OPEN Gen BRIDGER2_ 22.0 (60087) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET LOAD AT BUS BRIDGER2_ 22.0 (60087) TO 60 % of present MW (cnst pf)
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET SERIES CAP REACTANCE AT POPULUS_345.0 (67790) TO POPBRI21_345.0 (61967) CKT 2 TO -0.017307 pu
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET SERIES CAP REACTANCE AT POPULUS_345.0 (67790) TO POPBRI11_345.0 (61968) CKT 1 TO -0.017307 pu
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET SERIES CAP REACTANCE AT BRI3MI11_345.0 (61999) TO 3MIKNOLL_345.0 (60084) CKT 1 TO 50 % of present
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	CLOSE Shunt BORAH_345.0 (60060) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	BYPASS SeriesCap BURNS_500.0 (45029) TO BURSUM11_500.0 (90132) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	CLOSE Shunt GARRISON_500.0 (40459) #r
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Series Cap GAR1EAST_500.0 (40451) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Line GAR1EAST_500.0 (40451) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Series Cap GAR2EAST_500.0 (40453) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Line GAR2EAST_500.0 (40453) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 2_ 22.0 (62049) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt PTRSNFLT_230.0 (62030) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt OREBASIN_230.0 (66145) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt FRANNIE2_ 34.5 (67145) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS ROSEBUD_230.0 (63012) TO -10 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt GARLAND1_ 34.5 (67147) #1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Transformer HELLSCYN_230.0 (60150) TO HELSCYN1_ 14.4 (60151) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN Line MONROE_230.0 (40747) TO NOVELTY_230.0 (42304) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus CHIEF J3_345.0 (40223)
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus SNOHOMS3_345.0 (40993)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
N-2: DC-BIPOLE	OPEN Shunt MALIN_500.0 (40687) #s
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: DC-BIPOLE	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: DC-BIPOLE	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: DC-BIPOLE	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: DC-BIPOLE	CHANGE INJECTION GROUP RAS PDCI Gen Drop Units BY 'PDCI_gen_drop_value_less300' MW in generator merit order by opening
N-2: DC-BIPOLE	OPEN Bus SYLMAR1_230.0 (26097)
N-2: DC-BIPOLE	OPEN Bus SYLMAR2_230.0 (26099)
N-2: DC-BIPOLE	OPEN Shunt SYLMAR S_230.0 (24147) #b
N-2: DC-BIPOLE	OPEN Shunt SYLMARLA_230.0 (26094) #b
N-2: DC-BIPOLE	OPEN Shunt BIGEDDY2_230.0 (41342) #s
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #b
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS ANTELOPE_230.0 (24401) TO 158.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt BARRE_230.0 (24016) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS BARRE_230.0 (24016) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt CHINO_230.0 (24025) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS CHINO_230.0 (24025) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt DEVERS_230.0 (24804) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS DEVERS_230.0 (24804) TO 316.8 MVR
N-2: DC-BIPOLE	CLOSE Shunt EL NIDO_230.0 (24040) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS EL NIDO_230.0 (24040) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt GOULD_230.0 (24059) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS GOULD_230.0 (24059) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LCIENEGA_230.0 (24082) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LCIENEGA_230.0 (24082) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LAGUBELL_230.0 (24076) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LAGUBELL_230.0 (24076) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOMW_230.0 (24093) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOMW_230.0 (24093) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOME_230.0 (25656) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOME_230.0 (25656) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRAGE_230.0 (24806) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRAGE_230.0 (24806) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MOORPARK_230.0 (24099) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MOORPARK_230.0 (24099) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_230.0 (24100) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS OLINDA_230.0 (24100) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt PADUA_230.0 (24112) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PADUA_230.0 (24112) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt PARDEE_230.0 (24114) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PARDEE_230.0 (24114) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt RIOHONDO_230.0 (24126) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS RIOHONDO_230.0 (24126) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt SANBRDNO_230.0 (24132) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS SANBRDNO_230.0 (24132) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt S.CLARA_230.0 (24128) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS S.CLARA_230.0 (24128) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #b
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #2
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VALLEYSC_115.0 (24160) TO 187.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt VILLA PK_230.0 (24154) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VILLA PK_230.0 (24154) TO 158.4 MVR

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: DC-BIPOLE	CLOSE Shunt VINCENT_230.0 (24155) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VINCENT_230.0 (24155) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VSTA_230.0 (24901) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VSTA_230.0 (24901) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt WALNUT_230.0 (24158) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS WALNUT_230.0 (24158) TO 79.2 MVR
N-2: DC-BIPOLE	OPEN Bus CELILO4_230.0 (41314)
N-2: DC-BIPOLE	OPEN Bus CELILO3_230.0 (41313)
N-2: DC-BIPOLE	OPEN Bus CELILO2_500.0 (41312)
N-2: DC-BIPOLE	OPEN Bus CELILO1_500.0 (41311)
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS COLV BPA_115.0 (40263) TO 39.3 MVR
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS BELL S2_230.0 (40088) TO 407.5 MVR
N-2: Double Palo Verde	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-2: Double Palo Verde	OPEN Shunt MALIN_500.0 (40687) #s
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: Double Palo Verde	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: Double Palo Verde	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: Double Palo Verde	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: Double Palo Verde	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: Double Palo Verde	OPEN Gen PALOVRD2_ 24.0 (14932) #1
N-2: Double Palo Verde	OPEN Gen PALOVRD1_ 24.0 (14931) #1
N-2: Double Palo Verde	CHANGE LOAD AT BUS AGUAFAPS_ 69.0 (14400) BY -120 MW (cnst pf)
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS COLV BPA_115.0 (40263) TO 39.3 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS BELL S2_230.0 (40088) TO 407.5 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Line COVINGTN_230.0 (40303) TO MAPLEV12_230.0 (40692) CKT 2
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_345.0 (40691)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus ROCKY RH_345.0 (40891)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN Bus PONDROSB_500.0 (40834)
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus PONDROSA_500.0 (40837)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus GRIZZ R3_500.0 (40488)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
	order by opening
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus ALFALFA_230.0 (40039)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus OUTLOOK_230.0 (45229)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV + RAS Open 69 kV	OPEN InjectionGroup RAS Lower Granite Gen Drop
N-2: Lower Granite-Central Ferry #1 & #2 500 kV + RAS Open 69 kV	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Lower Granite-Central Ferry #1 & #2 500 kV + RAS Open 69 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV + RAS Open 69 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
N-2: Lower Granite-Central Ferry #1 & #2 500 kV + RAS Open 69 kV	OPEN Line MILL CRK_ 69.0 (45205) TO WAITBURG_ 69.0 (45323) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #6
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG2_ 13.2 (38755) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #10
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #11
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine MCNARY_345.0 (40721) TO ROSS_345.0 (40901) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	OPEN Line KING_230.0 (60177) TO MIDPOINT_230.0 (60232) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line PEARL #_230.0 (43773) TO SHERWOOD_230.0 (43527) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN MultiSectionLine BIGEDDY3_230.0 (41343) TO MCLOUGLN_230.0 (43313) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT5_500.0 (40306)
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus COULEE_300.0 (40285)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus OLYMPIA_300.0 (40795)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Bus CENTR SS_230.0 (47748)
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN Bus CHRISTOP_230.0 (42505)
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_DLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_SLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV + RAS	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV + RAS	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV + RAS	OPEN Bus ADDY N_230.0 (40021)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV + RAS	SET INJECTION GROUP RAS Boundary Gen Drop TO 400 MW in generator merit order by opening
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV + RAS	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV + RAS	SET SWITCHED SHUNT AT BUS COLV BPA_115.0 (40263) TO 39.3 MVR
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine LANCASTR_230.0 (40624) TO NOXONBPA_230.0 (40787) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	OPEN Load MILCTYDC_230.0 (63010) #D1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	OPEN Bus MILCTYDC_230.0 (63010)
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	SET SWITCHED SHUNT AT BUS ROSEBUD_230.0 (63012) TO -10 MVR
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	SET SWITCHED SHUNT AT BUS CUSTER_230.0 (63003) TO -22 MVR
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	OPEN Shunt CUSTER_230.0 (63003) #1
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	CLOSE Shunt BETHEL5_500.0 (43041) #1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	CLOSE Shunt BETHEL5_500.0 (43041) #1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	CLOSE Shunt QUARTZ_138.0 (60305) #c1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	CLOSE Shunt QUARTZ_138.0 (60305) #c1
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500kV + RAS	OPEN Bus HOT SPR_500.0 (40553)
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4708 Hatwai 500 kV Bus + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF Lolo 230kV	OPEN Bus LOLO_230.0 (48197)
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Hatwai-Low Gran 500 kV + RAS	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #I
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO3_ 13.8 (41216) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO4_ 13.8 (41217) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO5_ 13.8 (41218) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO6_ 13.8 (41219) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO7_ 13.8 (41220) #F
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Line BELL BPA_115.0 (40087) TO BIGELOW_115.0 (40113) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap MIKKALO_500.0 (43970) TO MKLOSNT2_500.0 (43971) CKT 2
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap SANTIAM_500.0 (40941) TO SANTMKO2_500.0 (43492) CKT 2
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN MultiSectionLine BETHEL_230.0 (43039) TO SANTIAM_230.0 (40939) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Line BETHEL_230.0 (43039) TO ROUNDB N_230.0 (43483) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
BF PGE Grassland-Slatt 500kV & Boardman Plant	OPEN Transformer BOARD F_ 24.0 (43047) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Slatt 500kV & Boardman Plant	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Gen BOARD CT_ 18.5 (43044) #1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Transformer BOARD ST_ 16.0 (43045) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Transformer BOARD CT_ 18.5 (43044) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Gen BOARD ST_ 16.0 (43045) #1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1

Appendix C - 16hs2a_3400WoH_2250idnw_N Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1

Appendix D

16hs2a_2250idnw_ms Base Case (MSTI & SWIP, SWIP South 1500 MW)

Appendix D– 16hs2sa_2250idnw_N_ms Case Post-Transient Contingency Results

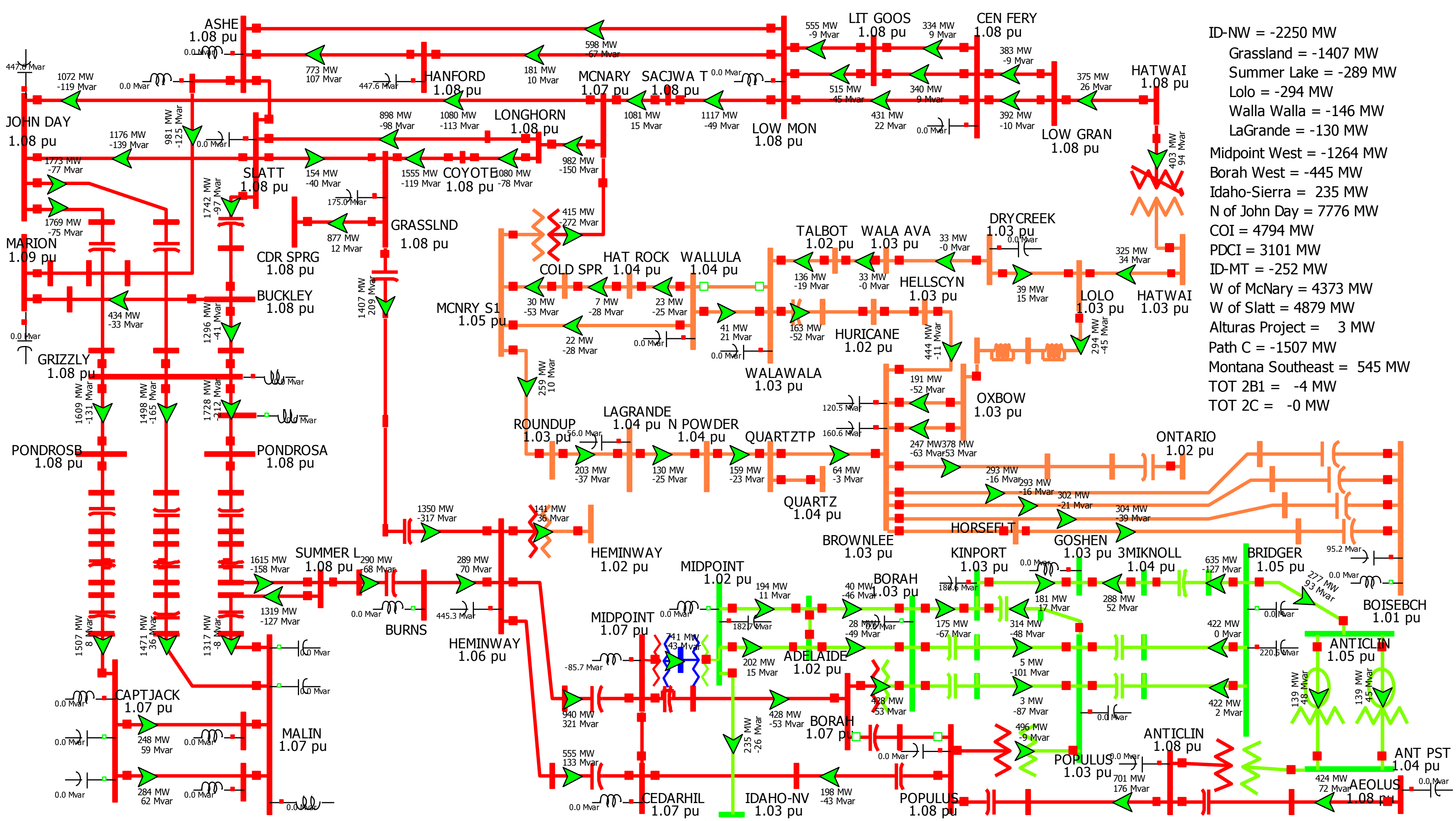

Figure D1: 16hs2sa_2250idnw_N_ms Case **Pre-Contingency**

Appendix D– 16hs2sa_2250idnw_N_ms Case Post-Transient Contingency Results

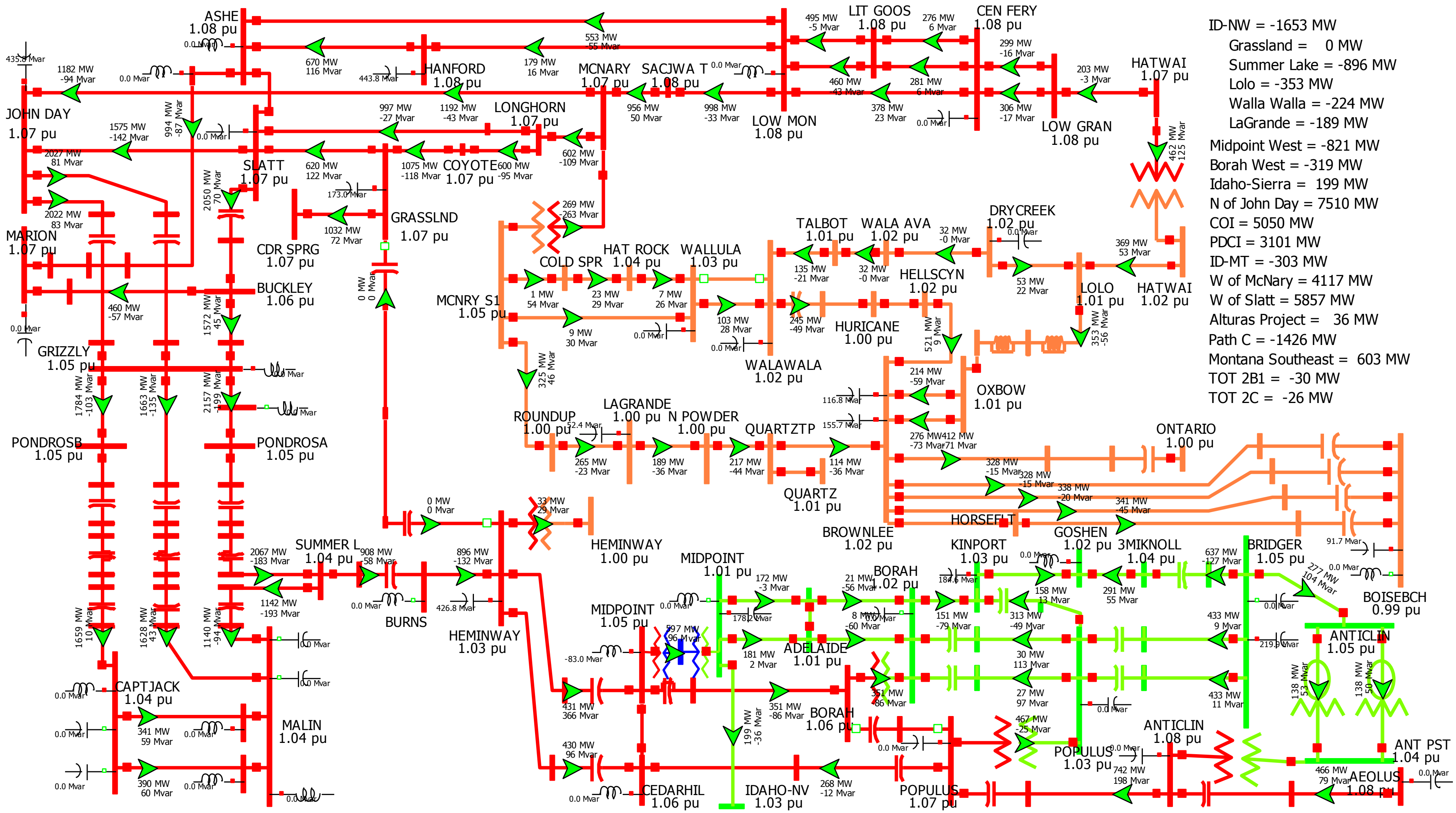

Figure D2: 16hs2sa_2250idnw_N_ms Case **N-1: Hemingway-Grassland 500 kV + PTSN Shunt**

Appendix D– 16hs2sa_2250idnw_N_ms Case Post-Transient Contingency Results

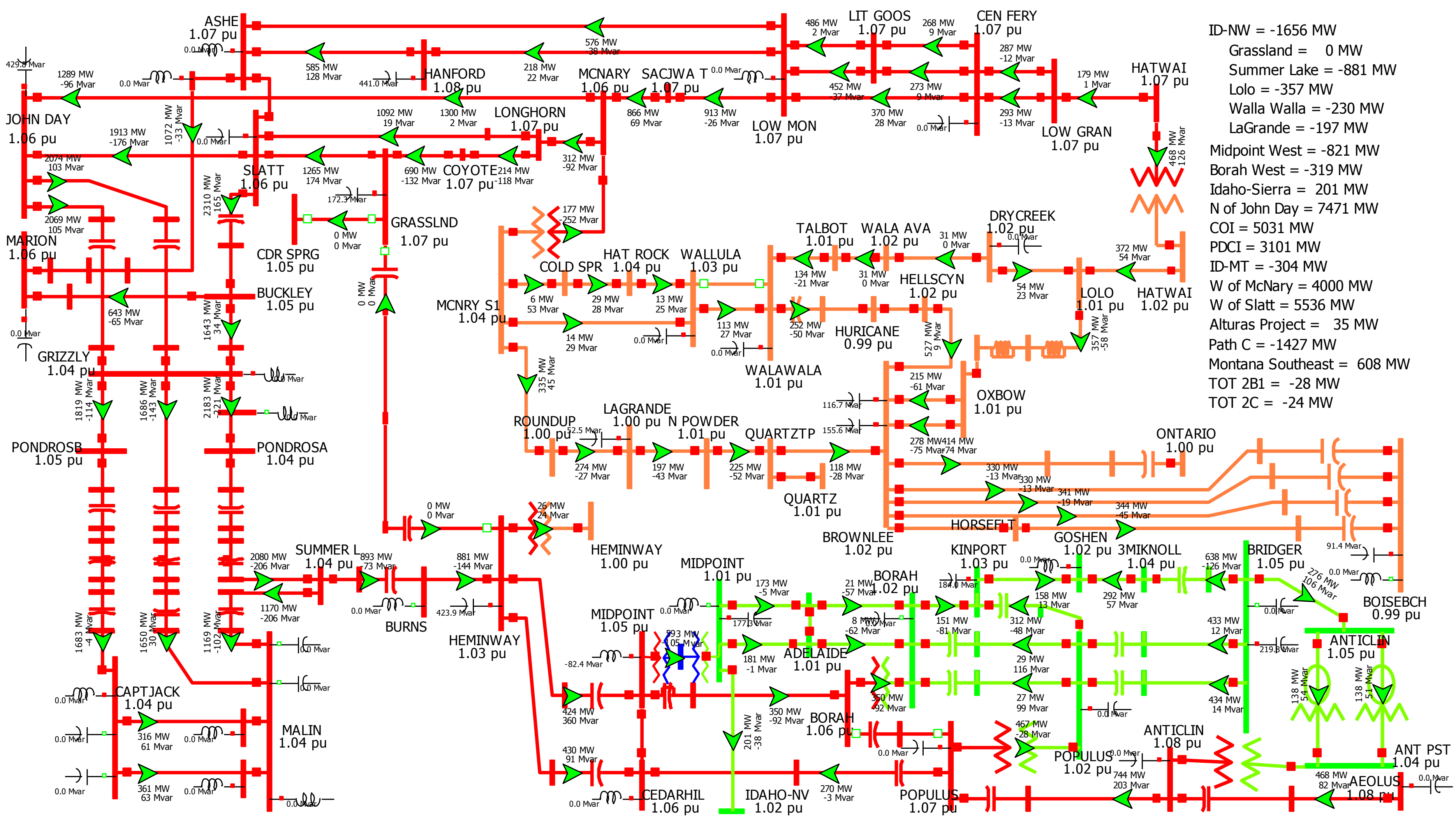

Figure D3: 16hs2sa_2250idnw_N_ms Case **BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN**

Appendix D– 16hs2sa_2250idnw_N_ms Case Post-Transient Contingency Results

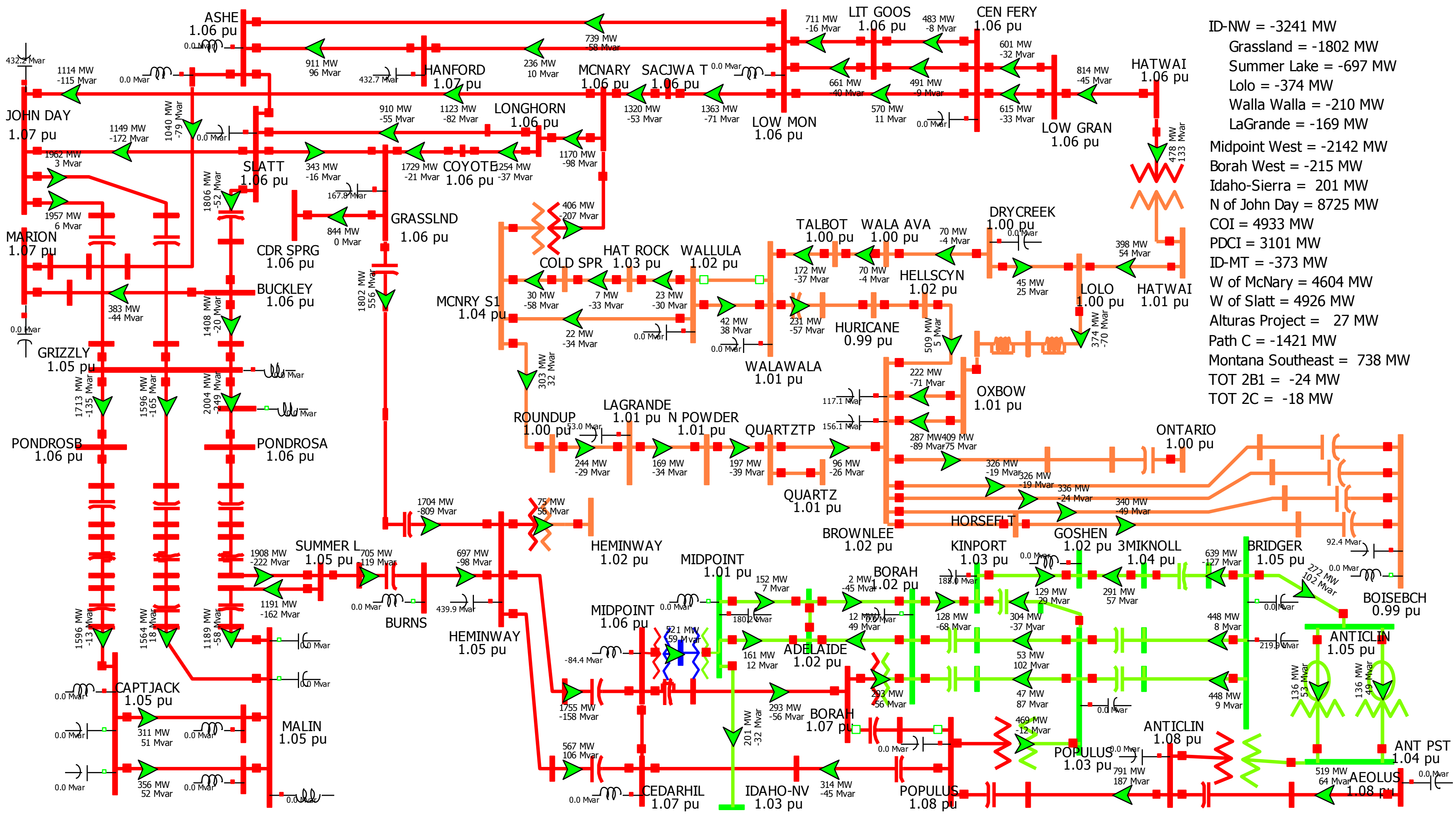

Figure D4: 16hs2sa_2250idnw_N_ms Case **N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt**

Appendix D– 16hs2sa_2250idnw_N_ms Case Post-Transient Contingency Results

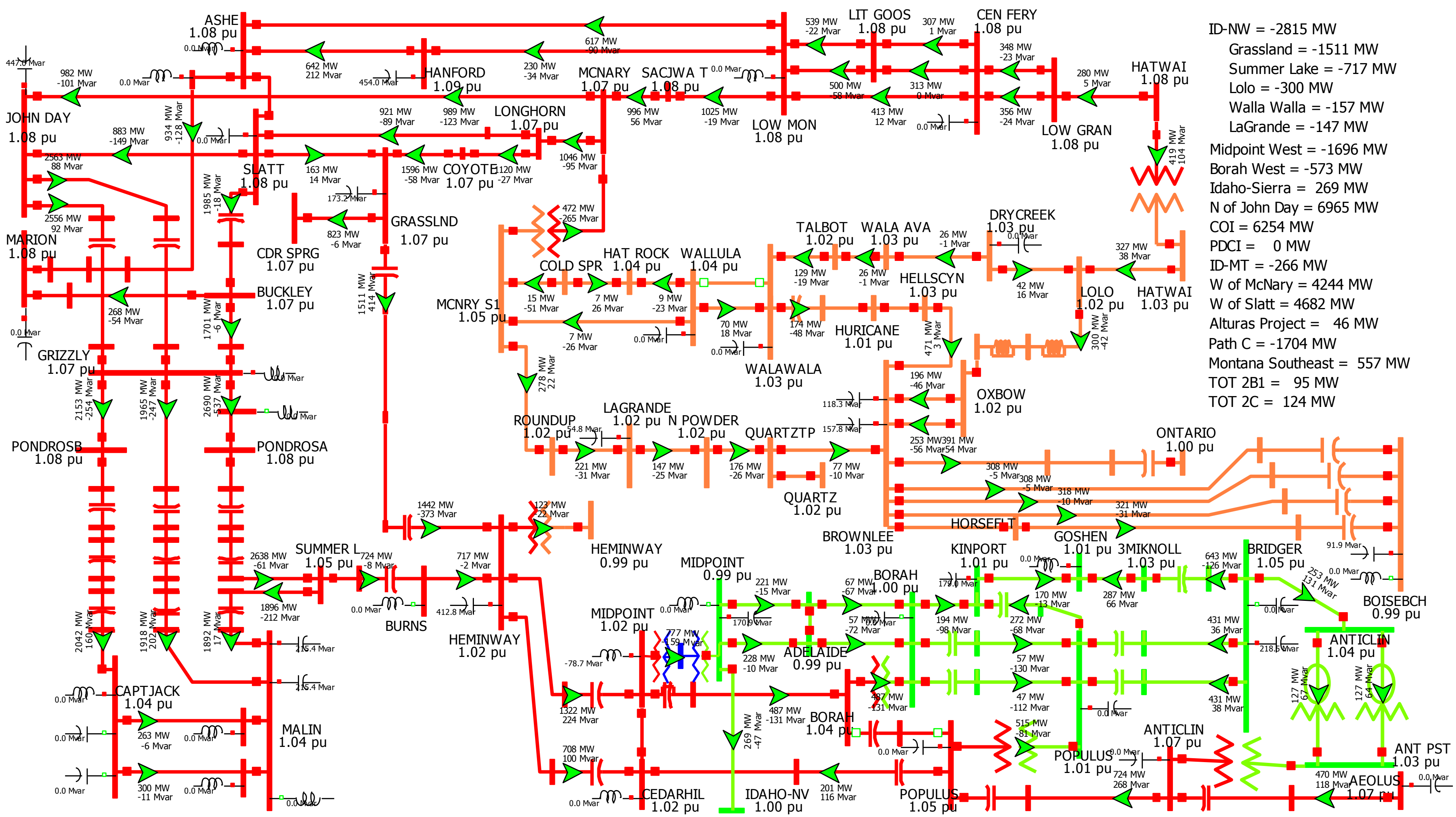

Figure D5: 16hs2sa_2250idnw_N_ms Case **N-2: DC-BIPOLE**

Appendix D– 16hs2sa_2250idnw_N_ms Case Post-Transient Contingency Results

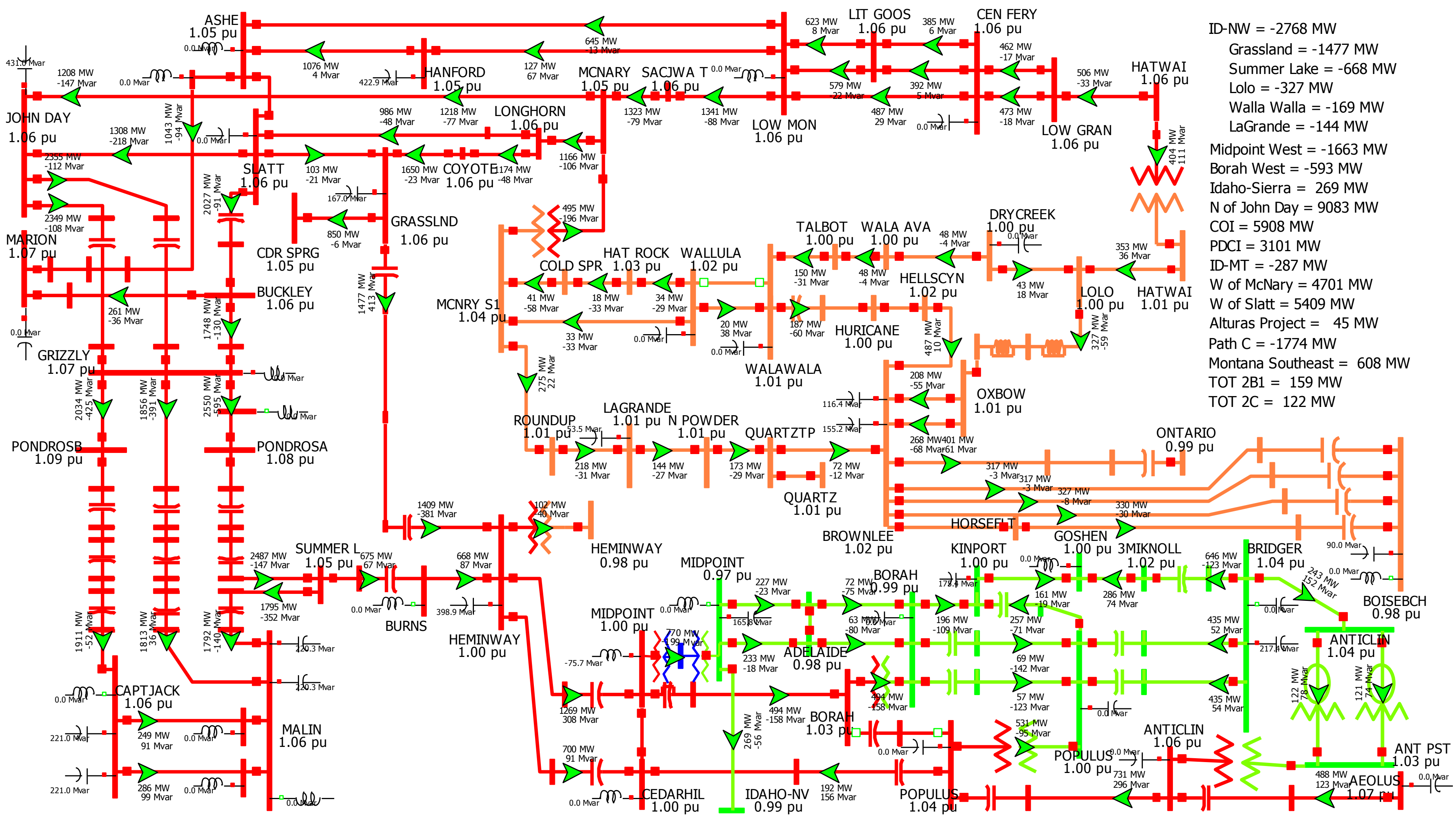

Figure D6: 16hs2sa_2250idnw_N_ms Case **N-2: Double Palo Verde**

Appendix D– 16hs2sa_2250idnw_N_ms Case Post-Transient Contingency Results

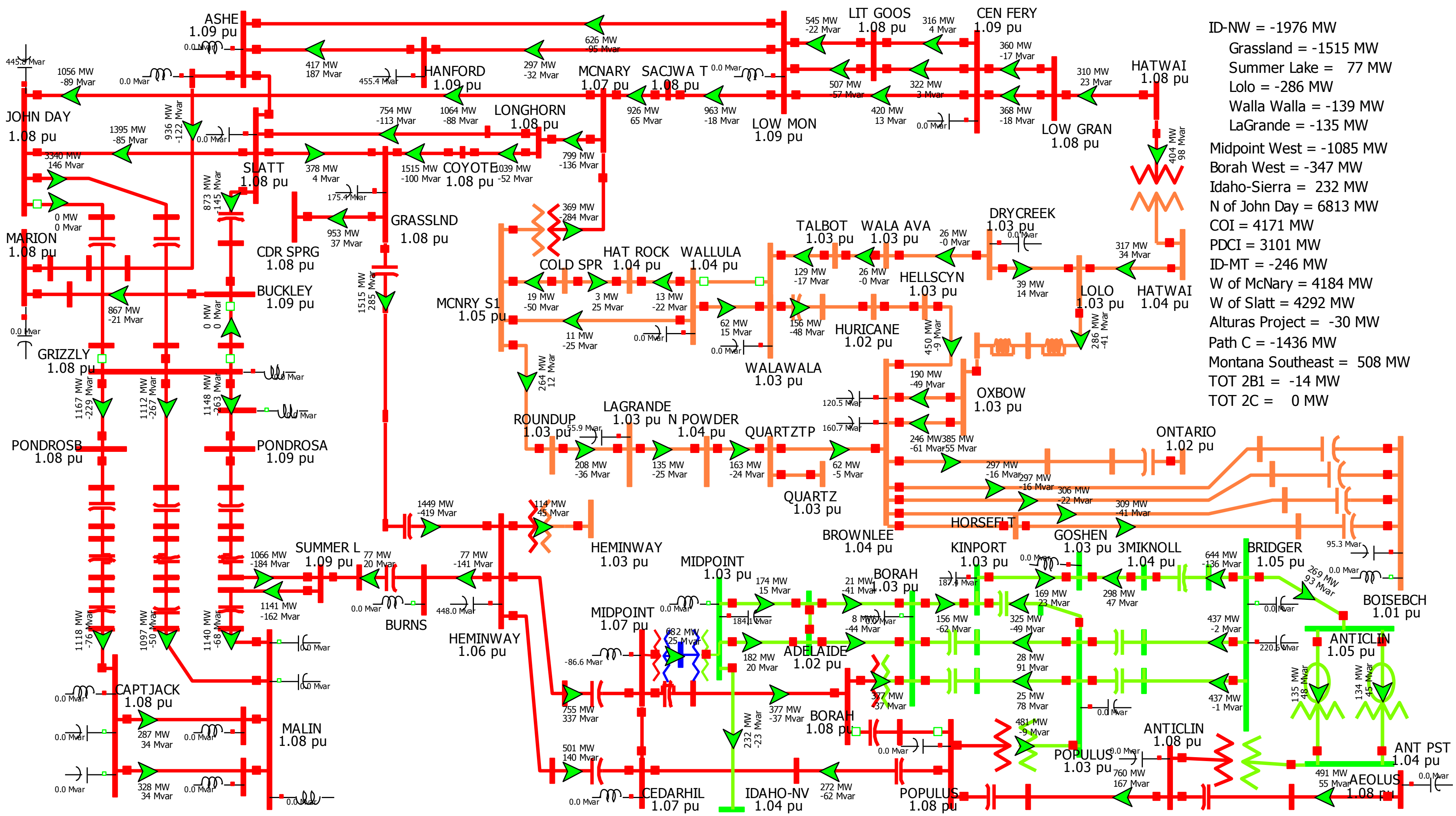

Figure D7: 16hs2sa_2250idnw_N_ms Case **N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS**

Appendix D - 16hs2a_2250idnw_ms Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1550.96	1550	100.1%	1782.5	87.0%
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	MERIDINP (45197) -> MERIDINP (45195) CKT 2 at MERIDINP	Branch MVA	362.71	676.03	650	104.0%	780.0	86.7%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1552.06	1550	100.1%	1782.5	87.1%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	636.27	1204.25	978.99	123.0%	1287.7	93.5%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	GLENDL (45113) -> GRANT PS (45123) CKT 1 at GLENDL	Branch Amp	306.62	777.51	722.94	107.5%	1265.2	61.5%
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4028 Taft-Dworshak & Taft Reactor 500kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1595.95	1550	103.0%	1782.5	89.5%
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1584.96	1550	102.3%	1782.5	88.9%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1708.65	2936.12	2441.96	120.2%	3235.5	90.7%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1708.65	2936.12	2199.94	133.5%	3279.9	89.5%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1707.51	2929.07	2666.9	109.8%	4000.0	73.2%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at ROUND MT	Branch Amp	1698.77	2918.34	2667.01	109.4%	4000.0	73.0%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1560.59	1550	100.7%	1782.5	87.6%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1662.21	2840.25	2699.69	105.2%	4000.0	71.0%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1654.87	2824.6	2699.69	104.6%	4000.0	70.6%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1607.22	1550	103.7%	1782.5	90.2%
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	No Violations							
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	No Violations							
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1560.85	1550	100.7%	1782.5	87.6%
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1567.85	1550	101.2%	1782.5	88.0%
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1708.65	2970.18	2441.96	121.6%	3235.5	91.8%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1708.65	2970.18	2199.94	135.0%	3279.9	90.6%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1707.51	2962.82	2666.9	111.1%	4000.0	74.1%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1698.77	2952.35	2667.01	110.7%	4000.0	73.8%
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1572.08	1550	101.4%	1782.5	88.2%
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	No Violations							
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1580.09	1550	101.9%	1782.5	88.6%
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.18	326.36	320	102.0%	370.0	88.2%
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	682.79	1039.75	950	109.4%	1286.0	80.9%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.18	333.11	320	104.1%	370.0	90.0%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	682.79	1051.56	950	110.7%	1286.0	81.8%
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							

Appendix D - 16hs2a_2250idnw_ms Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations							
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	919.13	1051.11	1009.11	104.2%	1285.2	81.8%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	No Violations							
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations							
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations							
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	No Violations							
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1553.51	1550	100.2%	1782.5	87.2%
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	No Violations							
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations							
BF 4542 Paul-Allston 500 kV & Center G2	No Violations							
BF 4542 Paul-Napavine 500 kV & Center G1	No Violations							
BF 4550 Olympia-Paul & Paul-Allston 500 kV	No Violations							
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	No Violations							
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1584.42	1550	102.2%	1782.5	88.9%
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	No Violations							
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations							
BF 4700 Hatwai 500kV & 230 kV + RAS	DWOR 2 (40363)	% Δ Volts	1.010	1.070				5.94%
BF 4708 Hatwai 500 kV Bus	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1642.28	1550	106.0%	1782.5	92.1%
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1622.33	1550	104.7%	1782.5	91.0%
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1574.89	1550	101.6%	1782.5	88.4%
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1553.04	1550	100.2%	1782.5	87.1%
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1581.28	1550	102.0%	1782.5	88.7%
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1579.72	1550	101.9%	1782.5	88.6%
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1561.55	1550	100.7%	1782.5	87.6%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1580.51	1550	102.0%	1782.5	88.7%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1590.19	1550	102.6%	1782.5	89.2%
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1555.09	1550	100.3%	1782.5	87.2%
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	No Violations							
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1587.51	1550	102.4%	1782.5	89.1%
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1573.59	1550	101.5%	1782.5	88.3%
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1611.9	1550	104.0%	1782.5	90.4%
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1565.36	1550	101.0%	1782.5	87.8%
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations							
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations							
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations							
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1551.49	1550	100.1%	1782.5	87.0%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1584.42	1550	102.2%	1782.5	88.9%
BF 5214 Low Mon-McNary & Calpine PH 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1581.77	1550	102.0%	1782.5	88.7%
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1568.24	1550	101.2%	1782.5	88.0%
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1574.76	1550	101.6%	1782.5	88.3%
BF 5266 Slatt-Buckly 500 kV	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1724.95	1550	111.3%	1782.5	96.8%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1082.18	1295.85	1237.04	104.8%	1395.9	92.8%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	741.86	929.19	919.99	101.0%	1046.8	88.8%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1555.42	1550	100.3%	1782.5	87.3%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1599.51	1550	103.2%	1782.5	89.7%
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	No Violations							
BF Lolo 230kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1568.69	1550	101.2%	1782.5	88.0%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1734.93	1550	111.9%	1782.5	97.3%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1082.18	1306.2	1237.04	105.6%	1395.9	93.6%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	741.86	936.15	919.99	101.8%	1046.8	89.4%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	919.13	1023.5	1009.11	101.4%	1285.2	79.6%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	PTRSNFLT (62030)	% Δ Volts	1.000	0.950				5.00%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1733.4	1550	111.8%	1782.5	97.2%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1082.18	1302.84	1237.04	105.3%	1395.9	93.3%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	741.86	932.23	919.99	101.3%	1046.8	89.1%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	919.13	1022.88	1009.11	101.4%	1285.2	79.6%
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1551.88	1550	100.1%	1782.5	87.1%
BF PGE Grassland-Slatt 500kV & Boardman Plant	No Violations							
Bus: Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	919.13	1030.57	1009.11	102.1%	1285.2	80.2%
Bus: Bell BPA 500 kV	No Violations							
Bus: Buckley 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1553.61	1550	100.2%	1782.5	87.2%
Bus: Dixonville 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1557.75	1550	100.5%	1782.5	87.4%
Bus: Hot Springs 500 kV	No Violations							
Bus: Keeler 500 kV + RAS	No Violations							
Bus: Rock Creek 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1574.43	1550	101.6%	1782.5	88.3%
Bus: Sickler 500 kV	No Violations							
Bus: Summer Lake 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1584.77	1550	102.2%	1782.5	88.9%
N-1: Allston-Keeler 500 kV + RAS	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Allston-Napavine 500 kV	No Violations							
N-1: Allston-Paul #2 500 kV	No Violations							
N-1: Alvery-Dixonville 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1557.03	1550	100.5%	1782.5	87.4%
N-1: Alvey-Marion 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1551.92	1550	100.1%	1782.5	87.1%
N-1: Alvey-Marion 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	919.13	1095.53	1009.11	108.6%	1285.2	85.2%
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1555.01	1550	100.3%	1782.5	87.2%
N-1: Ashe-Slatt 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1579.29	1550	101.9%	1782.5	88.6%
N-1: Bell-Coulee 500 kV	No Violations							
N-1: Bell-Taft 500 kV	No Violations							
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV	No Violations							
N-1: Broadview-Garrison #1 500 kV	No Violations							
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1551.44	1550	100.1%	1782.5	87.0%
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Captain Jack-Olinda 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1552.21	1550	100.1%	1782.5	87.1%
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 1 at COTWDWAP	Branch Amp	249.76	822.5	785.7	104.7%	926.3	88.8%
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 2 at COTWDWAP	Branch Amp	249.76	822.5	785.7	104.7%	926.3	88.8%
N-1: Captain Jack-Olinda 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1708.65	2569.7	2441.96	105.2%	3235.5	79.4%
N-1: Captain Jack-Olinda 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1708.65	2569.7	2199.94	116.8%	3279.9	78.3%
N-1: Captain Jack-Olinda 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1819.11	2428.57	2199.94	110.4%	3280.5	74.0%
N-1: Captain Jack-Olinda 500 kV	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1803.72	2408.03	2199.94	109.5%	3280.5	73.4%
N-1: Captain Jack-Olinda 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2004.23	2641.4	2477.87	106.6%	4000.0	66.0%
N-1: CaptJack-Kfalls 500 kV	No Violations							
N-1: Cascade Crossing 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	919.13	1034.04	1009.11	102.5%	1285.2	80.5%
N-1: Cedar Hill-Robinson 500 kV (SWIP)	No Violations							
N-1: Chief Jo-Coulee 500 kV	No Violations							
N-1: Chief Jo-Monroe 500 kV	No Violations							
N-1: Chief Jo-Sickler 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1560.19	1550	100.7%	1782.5	87.5%
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Covington4-Raver 500 kV	No Violations							
N-1: Covington5-Raver 500 kV	No Violations							
N-1: Coyote-Longhorn 500 kV	No Violations							
N-1: CusterW-Monroe 500 kV	No Violations							
N-1: Dixonville-Meridian 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1552.57	1550	100.2%	1782.5	87.1%
N-1: Dixonville-Meridian 500 kV	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	636.27	1162.18	978.99	118.7%	1287.7	90.3%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Dixonville-Meridian 500 kV	GLENDL (45113) -> GRANT PS (45123) CKT 1 at GLENDL	Branch Amp	306.62	727.89	722.94	100.7%	1265.2	57.5%
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV + RAS	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1649.26	1550	106.4%	1782.5	92.5%
N-1: Dworshak-Taft 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1595.95	1550	103.0%	1782.5	89.5%
N-1: Echo Lake-Maple Valley 500 kV	No Violations							
N-1: Echo Lake-Raver 500 kV	No Violations							
N-1: Echo Lake-Schultz 500 kV	No Violations							
N-1: Echo Lake-Snok Tap 500 kV	No Violations							
N-1: Garrison-Taft #2 500 kV	No Violations							
N-1: Goldhill-Placer 115 kV	No Violations							
N-1: Grassland-Coyote 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1551.88	1550	100.1%	1782.5	87.1%
N-1: Grassland-Slatt 500 kV	No Violations							
N-1: Grizzly-John Day #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1564.14	1550	100.9%	1782.5	87.7%
N-1: Grizzly-Malin 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1554.02	1550	100.3%	1782.5	87.2%
N-1: Grizzly-Malin 500 kV	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1749.71	2408.31	2400.04	100.3%	3799.0	63.4%
N-1: Grizzly-Ponderosa A-Summer L 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1594.92	1550	102.9%	1782.5	89.5%
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1554.4	1550	100.3%	1782.5	87.2%
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1749.71	2407.12	2400.04	100.3%	3799.0	63.4%
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Hatwai 500/230 kV Xfmr + RAS	No Violations							
N-1: Hatwai-Lolo 230 kV	No Violations							
N-1: Hatwai-Low Gran 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1574.72	1550	101.6%	1782.5	88.3%
N-1: Hatwai-N Lewiston 230 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1563.47	1550	100.9%	1782.5	87.7%
N-1: Hells Canyon-Brownlee 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	741.86	933.91	919.99	101.5%	1046.8	89.2%
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Grassland 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1717.09	1550	110.8%	1782.5	96.3%
N-1: Hemingway-Grassland 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1082.18	1290.98	1237.04	104.4%	1395.9	92.5%
N-1: Hemingway-Grassland 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	741.86	924.24	919.99	100.5%	1046.8	88.3%
N-1: Hemingway-Grassland 500 kV + FACRI	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1618.46	1550	104.4%	1782.5	90.8%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1749.71	2843.6	2400.04	118.5%	3799.0	74.9%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1743.73	2826.45	2400.04	117.8%	3799.0	74.4%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1723.86	1550	111.2%	1782.5	96.7%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1082.18	1284.96	1237.04	103.9%	1395.9	92.1%
N-1: Hemingway-Summer Lake 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1560.7	1550	100.7%	1782.5	87.6%
N-1: Hill Top 345/230 Xfmr	No Violations							
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: Hot Springs-Taft 500 kV	No Violations							
N-1: Humboldt-Coyote Ck 345 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Huntington-Pinto-Four Corners 345 kV	No Violations							
N-1: Ing500-CusterW 500 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1573.68	1550	101.5%	1782.5	88.3%
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Kfalls-Meridian 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1566.61	1550	101.1%	1782.5	87.9%
N-1: LaGrande-North Powder 230 kV	No Violations							
N-1: Lanes-Marion 500 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-Sac Tap 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1574.07	1550	101.6%	1782.5	88.3%
N-1: Malin 500/230 Xfmr	No Violations							
N-1: Malin-Hilltop 230 kV	No Violations							
N-1: Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1708.65	2938.03	2441.96	120.3%	3235.5	90.8%
N-1: Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1708.65	2938.03	2199.94	133.6%	3279.9	89.6%
N-1: Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALROU21	Branch Amp	1707.51	2930.7	2666.9	109.9%	4000.0	73.3%
N-1: Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1698.77	2920.51	2667.01	109.5%	4000.0	73.0%
N-1: Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALROU11	Branch Amp	1662.21	2909.68	2699.69	107.8%	4000.0	72.7%
N-1: Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1654.87	2896.78	2699.69	107.3%	4000.0	72.4%
N-1: Malin-Summer Lake 500 kV	No Violations							
N-1: Maple Vly-Rocky RH 345 kV	No Violations							
N-1: Marion-Pearl 500 kV	No Violations							
N-1: Marion-Santiam 500 kV	No Violations							
N-1: McLouglin-Ostrander 230 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary S2-McNary S3 230 kV	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Longhorn 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1551.39	1550	100.1%	1782.5	87.0%
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	No Violations							
N-1: McNary-Sac Tap-Low Mon 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1575.93	1550	101.7%	1782.5	88.4%
N-1: Midpoint-Hemingway 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1591.37	1550	102.7%	1782.5	89.3%
N-1: Midpoint-Humboldt 345 kV	No Violations							
N-1: Midpoint-Townsend 500 kV (MSTI)	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	741.86	992.01	919.99	107.8%	1046.8	94.8%
N-1: Midpoint-Townsend 500 kV (MSTI)	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1082.18	1256.17	1237.04	101.5%	1395.9	90.0%
N-1: Midpoint-Townsend 500 kV (MSTI)	MIDHEM11 (61988) -> MIDPOINT (60240) CKT 1 at MIDPOINT	Branch Amp	1182.83	1883.33	1732.05	108.7%	2338.3	80.5%
N-1: Midpoint-Townsend 500 kV (MSTI)	PTRSNFLT (62030)	% Δ Volts	1.000	0.930				7.00%
N-1: Midpoint-Townsend 500 kV (MSTI)	AMPS (65025)	% Δ Volts	1.000	0.940				6.00%
N-1: Midpoint-Townsend 500 kV (MSTI)	PTRSNFUR (62386)	% Δ Volts	1.010	0.950				5.94%
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	741.86	989.82	919.99	107.6%	1046.8	94.6%
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1082.18	1254.45	1237.04	101.4%	1395.9	89.9%

Appendix D - 16hs2a_2250idnw_ms Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	MIDHEM11 (61988) -> MIDPOINT (60240) CKT 1 at MIDPOINT	Branch Amp	1182.83	1877.64	1732.05	108.4%	2338.3	80.3%
N-1: Napavine-Paul 500 kV	No Violations							
N-1: Olympia-Paul 500 kV	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1568.04	1550	101.2%	1782.5	88.0%
N-1: Paul-Satsop 500 kV	No Violations							
N-1: Pearl-Keeler 500 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.18	349.07	320	109.1%	370.0	94.3%
N-1: Pearl-Keeler 500 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	682.79	1177.33	950	123.9%	1286.0	91.5%
N-1: Pearl-Keeler 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.18	324.84	320	101.5%	370.0	87.8%
N-1: Pearl-Keeler 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	682.79	1034.73	950	108.9%	1286.0	80.5%
N-1: Pinto-Four Corner 345 kV	No Violations							
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Raver-Paul 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1551.99	1550	100.1%	1782.5	87.1%
N-1: Raver-Tacoma 500 kV	No Violations							
N-1: Red Butte-Harry Allen 345 kV	No Violations							
N-1: Robinson-Harry Allen 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	91.85	161	150	107.3%	180.0	89.4%
N-1: Robinson-Harry Allen 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	296.31	429.81	415.69	103.4%	483.5	88.9%
N-1: Robinson-Harry Allen 500 kV	CHCGO PK (32224) -> HIGGINS (32232) CKT 1 at CHCGO PK	Branch Amp	533.36	662.04	652.66	101.4%	893.6	74.1%
N-1: Rock Ck-Wautoma 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1573.55	1550	101.5%	1782.5	88.3%
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1819.11	3259.15	2199.94	148.1%	3280.5	99.3%
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB22 (30019) -> TABLE MT (30015) CKT 2 at ROUTAB22	Branch Amp	1808.64	3244.97	2667.01	121.7%	3280.5	98.9%
N-1: Round Mtn-Table Mtn 500 kV	ROUND MT (30005) -> ROUTAB21 (30018) CKT 2 at ROUND MT	Branch Amp	1819.11	3259.15	2667.01	122.2%	4000.0	81.5%
N-1: Roundup-Lagrande 230 kV	No Violations							
N-1: Schultz-Sickler 500 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Sigurd-Glen Canyon 230 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Slatt-Longhorn 500 kV	No Violations							
N-1: Snok Tap-Snoking 500 kV	No Violations							
N-1: Table Mtn-Tesla 500 kV	TABLE MT (30015) -> TABVAC11 (30031) CKT 1 at TABLE MT	Branch Amp	2004.23	2971.66	2667.01	111.4%	4000.0	74.3%
N-1: Table Mtn-Tesla 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2004.23	2971.66	2477.87	119.9%	4000.0	74.3%
N-1: Table Mtn-Tesla 500 kV	TABVAC12 (30032) -> VACA-DIX (30030) CKT 1 at VACA-DIX	Branch Amp	1977.58	2950.84	2667.01	110.6%	4000.0	73.8%
N-1: Table Mtn-Vaca Dixon 500 kV	TABTES11 (30041) -> TABTES12 (30043) CKT 1 at TABTES11	Branch Amp	1501.76	2665.77	2229.96	119.5%	3555.9	75.0%
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1624.35	1550	104.8%	1782.5	91.1%

Appendix D - 16hs2a_2250idnw_ms Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Ashe-Marion & Buckley-Marion 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1553.65	1550	100.2%	1782.5	87.2%
N-2: Ashe-Marion & Slatt-Buckley 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1580.25	1550	102.0%	1782.5	88.7%
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1557.29	1550	100.5%	1782.5	87.4%
N-2: Ashe-Marion & Slatt-John Day 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1554.43	1550	100.3%	1782.5	87.2%
N-2: Ashe-Slatt & McNary-John Day 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1589.15	1550	102.5%	1782.5	89.2%
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1586.02	1550	102.3%	1782.5	89.0%
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	No Violations							
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	No Violations							
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	919.13	1046.61	1009.11	103.7%	1285.2	81.4%
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	919.13	1033.79	1009.11	102.4%	1285.2	80.4%
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1555	1550	100.3%	1782.5	87.2%
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1555.62	1550	100.4%	1782.5	87.3%
N-2: Bridger-Populus #1 & #2 345 kV	No Violations							
N-2: Broadview-Townsend #1 & #2 500 kV + RAS	No Violations							
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1621	1550	104.6%	1782.5	90.9%
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1565.16	1550	101.0%	1782.5	87.8%
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations							
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations							
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1587.43	1550	102.4%	1782.5	89.1%
N-2: Coulee-Schultz #1 & #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1580	1550	101.9%	1782.5	88.6%
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations							
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	No Violations							
N-2: DC-BIPOLE	SCATERGD (26066) -> OLYMPC (26087) CKT 2 at OLYMPC	Branch Amp	811.04	910.52	876.07	103.9%	1001.6	90.9%
N-2: DC-BIPOLE	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1749.71	2926.47	2400.04	121.9%	3799.0	77.0%
N-2: DC-BIPOLE	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1743.73	2913.84	2400.04	121.4%	3799.0	76.7%
N-2: DC-BIPOLE	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1819.11	2362.56	2199.94	107.4%	3280.5	72.0%
N-2: DC-BIPOLE	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1803.72	2342.59	2199.94	106.5%	3280.5	71.4%
N-2: DC-BIPOLE	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1708.65	2296.77	2199.94	104.4%	3279.9	70.0%
N-2: DC-BIPOLE	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2004.23	2540.07	2477.87	102.5%	4000.0	63.5%
N-2: DC-BIPOLE	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1531.36	2159.92	2134	101.2%	3499.9	61.7%
N-2: DC-BIPOLE	MIDWAY (30060) -> MIDVIN11 (30061) CKT 1 at MIDWAY	Branch Amp	1514.76	2136.61	2134	100.1%	3499.9	61.0%
N-2: DC-BIPOLE	ROBINSON (64895)	% Δ Volts	1.080	1.020				5.56%
N-2: DC-BIPOLE	YORKCANY (12091)	% Δ Volts	1.000	0.950				5.00%
N-2: Double Palo Verde	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1629.76	1550	105.1%	1782.5	91.4%
N-2: Double Palo Verde	HESPERUS (79071) -> COYOTE G (79191) CKT 1 at HESPERUS	Branch Amp	353.74	434.36	431.76	100.6%	441.8	98.3%
N-2: Double Palo Verde	GLCRWND2 (62397) -> SHELBY T (62128) CKT 1 at GLCRWND2	Branch Amp	398.83	401.75	401.63	100.0%	530.2	75.8%
N-2: Double Palo Verde	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1749.71	2767.78	2400.04	115.3%	3799.0	72.9%
N-2: Double Palo Verde	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1743.73	2752.74	2400.04	114.7%	3799.0	72.5%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Double Palo Verde	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1819.11	2227.13	2199.94	101.2%	3280.5	67.9%
N-2: Double Palo Verde	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1803.72	2208.32	2199.94	100.4%	3280.5	67.3%
N-2: Double Palo Verde	SHELBY T (62128) -> SHELBY 2 (62027) CKT 1 at SHELBY T	Branch Amp	398.43	401.67	401.63	100.0%	1001.6	40.1%
N-2: Double Palo Verde	YORKCANY (12091)	% Δ Volts	1.000	0.920				8.00%
N-2: Double Palo Verde	ROBINSON (64895)	% Δ Volts	1.080	1.000				7.41%
N-2: Double Palo Verde	CIMARRON (12148)	% Δ Volts	1.000	0.930				7.00%
N-2: Double Palo Verde	MONTROSE (79049)	% Δ Volts	1.000	0.930				7.00%
N-2: Double Palo Verde	PTRSNFLT (62030)	% Δ Volts	1.000	0.930				7.00%
N-2: Double Palo Verde	RAINVL_T (12130)	% Δ Volts	1.000	0.930				7.00%
N-2: Double Palo Verde	RAINVL1 (12129)	% Δ Volts	1.000	0.930				7.00%
N-2: Double Palo Verde	SPRINGER (12077)	% Δ Volts	1.000	0.930				7.00%
N-2: Double Palo Verde	PTRSNFUR (62386)	% Δ Volts	1.010	0.940				6.93%
N-2: Double Palo Verde	ROBINSON (64885)	% Δ Volts	1.030	0.960				6.80%
N-2: Double Palo Verde	CEDARHIL (60159)	% Δ Volts	1.070	1.000				6.54%
N-2: Double Palo Verde	MIDPOINT (60240)	% Δ Volts	1.070	1.000				6.54%
N-2: Double Palo Verde	BACA (10026)	% Δ Volts	0.990	0.930				6.06%
N-2: Double Palo Verde	BULLOCK (79079)	% Δ Volts	0.990	0.930				6.06%
N-2: Double Palo Verde	DOUGHSPN (79182)	% Δ Volts	0.990	0.930				6.06%
N-2: Double Palo Verde	GUNVAL (79184)	% Δ Volts	0.990	0.930				6.06%
N-2: Double Palo Verde	HAPPYCAN (79082)	% Δ Volts	0.990	0.930				6.06%
N-2: Double Palo Verde	LOSTCANY (79045)	% Δ Volts	0.990	0.930				6.06%
N-2: Double Palo Verde	NORTHMSA (79085)	% Δ Volts	0.990	0.930				6.06%
N-2: Double Palo Verde	PEACHVLY (72801)	% Δ Volts	0.990	0.930				6.06%
N-2: Double Palo Verde	SPRCKTAP (79115)	% Δ Volts	0.990	0.930				6.06%
N-2: Double Palo Verde	AMPS (65025)	% Δ Volts	1.000	0.940				6.00%
N-2: Double Palo Verde	BIGGRASS (65155)	% Δ Volts	1.000	0.940				6.00%
N-2: Double Palo Verde	DILLON S (62084)	% Δ Volts	1.000	0.940				6.00%
N-2: Double Palo Verde	EMPIRETS (79075)	% Δ Volts	1.000	0.940				6.00%
N-2: Double Palo Verde	TOWAOC (79122)	% Δ Volts	1.000	0.940				6.00%
N-2: Double Palo Verde	ARRIBA (10016)	% Δ Volts	1.010	0.950				5.94%
N-2: Double Palo Verde	ARRIBA_T (10018)	% Δ Volts	1.010	0.950				5.94%
N-2: Double Palo Verde	CLIFTON (70113)	% Δ Volts	1.010	0.950				5.94%
N-2: Double Palo Verde	GALLINAT (10484)	% Δ Volts	1.010	0.950				5.94%
N-2: Double Palo Verde	GRANDJCT (79036)	% Δ Volts	1.010	0.950				5.94%
N-2: Double Palo Verde	STORRIE (12079)	% Δ Volts	1.010	0.950				5.94%
N-2: Double Palo Verde	HORIZON (70233)	% Δ Volts	1.020	0.960				5.88%
N-2: Double Palo Verde	VALENCIA (10357)	% Δ Volts	1.020	0.960				5.88%
N-2: Double Palo Verde	WBK 25 (50742)	% Δ Volts	1.020	0.960				5.88%
N-2: Double Palo Verde	HEMINWAY (60155)	% Δ Volts	1.060	1.000				5.66%
N-2: Double Palo Verde	BLUEDOOR (79073)	% Δ Volts	0.990	0.940				5.05%
N-2: Double Palo Verde	CORTEZ (79012)	% Δ Volts	0.990	0.940				5.05%
N-2: Double Palo Verde	E.CORTEZ (79074)	% Δ Volts	0.990	0.940				5.05%
N-2: Double Palo Verde	GARNET M (79103)	% Δ Volts	0.990	0.940				5.05%
N-2: Double Palo Verde	GARNETAP (79104)	% Δ Volts	0.990	0.940				5.05%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Double Palo Verde	GRANDJCT (79034)	% Δ Volts	0.990	0.940				5.05%
N-2: Double Palo Verde	GRANDJCT (79035)	% Δ Volts	0.990	0.940				5.05%
N-2: Double Palo Verde	LOSTCANY (79044)	% Δ Volts	0.990	0.940				5.05%
N-2: Double Palo Verde	MCKENZIX (79193)	% Δ Volts	0.990	0.940				5.05%
N-2: Double Palo Verde	MONTROSE (79048)	% Δ Volts	0.990	0.940				5.05%
N-2: Double Palo Verde	SOCANAL (79192)	% Δ Volts	0.990	0.940				5.05%
N-2: Double Palo Verde	STRNELSN (79183)	% Δ Volts	0.990	0.940				5.05%
N-2: Double Palo Verde	VALENCIA (10356)	% Δ Volts	0.990	0.940				5.05%
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations							
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations							
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	No Violations							
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1593.07	1550	102.8%	1782.5	89.4%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1749.71	3391.49	2400.04	141.3%	3799.0	89.3%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM11	Branch Amp	1418.46	3235.36	2700.04	119.8%	4000.0	80.9%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1558.8	1550	100.6%	1782.5	87.5%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON16	Branch Amp	1639.66	3210.84	2400.04	133.8%	4099.2	78.3%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1625.28	3197.94	2400.04	133.2%	4099.2	78.0%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON16	Branch Amp	1639.66	3168.64	2400.04	132.0%	4099.2	77.3%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON12	Branch Amp	1625.28	3157.73	2400.04	131.6%	4099.2	77.0%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations							
N-2: Hanford-Wautoma #1 & #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1557.04	1550	100.5%	1782.5	87.4%
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1579	1550	101.9%	1782.5	88.6%
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	1865.91	3190.86	2900.03	110.0%	4350.0	73.4%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	JOHN DAY (40585) -> GRIJOH12 (90065) CKT 1 at JOHN DAY	Branch Amp	1890.75	3568.7	3500.01	102.0%	3500.01	102.0%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH11 (90064) -> GRIZZLY (40489) CKT 1 at GRIJOH11	Branch Amp	1882.74	3561.71	3500.01	101.8%	3500.0	101.8%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH12	Branch Amp	1882.74	3561.71	3000.03	118.7%	4050.0	87.9%
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1573.47	1550	101.5%	1782.5	88.3%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.18	345.57	320	108.0%	370.0	93.4%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	682.79	1177.49	950	123.9%	1286.0	91.6%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	79.27	95.94	94	102.1%	139.0	69.0%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	CARLTON (40181)	% Δ Volts	1.03	0.97				5.83%
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1622.33	1550	104.7%	1782.5	91.0%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	91.85	165.78	150	110.5%	180.0	92.1%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1855.4	3801.86	2667.36	142.5%	4099.2	92.7%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI11	Branch Amp	1820.99	3691.81	2667.36	138.4%	4099.2	90.1%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPOLI11	Branch Amp	1820.99	3691.81	2667.36	138.4%	4099.2	90.1%
N-2: Malin-Round Mtn #1 & #2 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	296.31	416.03	415.69	100.1%	483.5	86.1%

Appendix D - 16hs2a_2250idnw_ms Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	1980.24	3222.95	2992.98	107.7%	4514.9	71.4%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	1980.24	3222.95	2992.98	107.7%	4514.9	71.4%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at OLIMAX12	Branch Amp	1949.99	3189.36	2992.98	106.6%	4514.9	70.6%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	1949.99	3189.36	2992.98	106.6%	4514.9	70.6%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	1928.22	3151.51	2992.98	105.3%	4514.9	69.8%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXWELL (30025)	% Δ Volts	1.04	0.98				5.77%
N-2: Malin-Round Mtn #1 & #2 500 kV	MTSHASTA (44970)	% Δ Volts	0.99	0.94				5.05%
N-2: Malin-Round Mtn #1 & #2 500 kV	WEED (45524)	% Δ Volts	1.00	0.95				5.00%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1590.49	1550	102.6%	1782.5	89.2%
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1591.85	1550	102.7%	1782.5	89.3%
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations							
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1566.06	1550	101.0%	1782.5	87.9%
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1566.3	1550	101.1%	1782.5	87.9%
N-2: Paul-Raver & Raver-Covingt4 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1552.53	1550	100.2%	1782.5	87.1%
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.18	326.78	320	102.1%	370.0	88.3%
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	682.79	1040.29	950	109.5%	1286.0	80.9%
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	No Violations							
N-2: Raver-Covington #1 & #2 500 kV	No Violations							
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations							
N-2: Raver-Paul & Napavine-Paul 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1553.87	1550	100.2%	1782.5	87.2%
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations							
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations							
N-2: Raver-Schultz #1 & #2 500 kV	No Violations							
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations							
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations							
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	91.85	170.98	150	114.0%	180.0	95.0%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	DELEVN (30114) -> CORTINA (30450) CKT 1 at CORTINA	Branch Amp	691.14	896.89	830.88	107.9%	953.9	94.0%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1855.4	3515.22	2667.36	131.8%	3800.0	92.5%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI12	Branch Amp	1820.99	3419.85	2667.36	128.2%	4099.2	83.4%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPOLI11	Branch Amp	1820.99	3408.07	2667.36	127.8%	4099.2	83.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	1980.24	3481.61	2992.98	116.3%	4514.9	77.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	1980.24	3481.61	2992.98	116.3%	4514.9	77.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at MAXWELL	Branch Amp	1949.99	3462.02	2992.98	115.7%	4514.9	76.7%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	1949.99	3462.02	2992.98	115.7%	4514.9	76.7%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	1928.22	3429.28	2992.98	114.6%	4514.9	76.0%
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	No Violations							
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	No Violations							
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHE (30790) -> MCMULLN1 (30825) CKT 1 at MCMULLN1	Branch Amp	285.71	921.33	825.86	111.6%	976.5	94.4%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	MCMULLN1 (30825) -> KEARNEY (30830) CKT 1 at MCMULLN1	Branch Amp	232.64	862.79	825.11	104.6%	975.0	88.5%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHEJ (34159) -> HAMMONDS (34160) CKT 1 at HAMMONDS	Branch Amp	391.77	468.23	462.88	101.2%	579.9	80.7%

Appendix D - 16hs2a_2250idnw_ms Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2004.23	2598.05	2477.87	104.9%	4000.0	65.0%
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	No Violations							
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	No Violations							
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	No Violations							
N-2: Townsend-Garrison #1 & #2 500 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1581.12	1550	102.0%	1782.5	88.7%
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1527.99	1581.12	1550	102.0%	1782.5	88.7%
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations							

Appendix D - 16hs2a_2250idnw_N_ms Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Midpoint		Townsend		Robinson		Malin		John Day		Hanford		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 11L12 MERIDIAN-KLAM FALLS 500 KV+KFGEN2+ST	0.75	-2840	0.77	-2770	0.93	-987	0.70	-2306	0.79	-3282	0.97	-2984	0.88	-4292	0.74	-394
BF 11L22 CAPT JACK-KLAM FALLS 500 KV+KFGEN2+ST	0.75	-2775	0.77	-2713	0.93	-963	0.70	-2288	0.75	-3303	0.97	-3042	0.87	-4435	0.74	-390
BF 11R1 MERIDIAN-KLAM FALLS 500 KV & MERIDIAN 500/230 KV XFMR	0.74	-2895	0.77	-2823	0.93	-1020	0.70	-2312	0.80	-3408	0.97	-3156	0.87	-4551	0.74	-396
BF 11R6 MERIDIAN-DIXONVILLE 500 KV & MERIDIAN 500/230 KV XFMR	0.76	-2736	0.77	-2672	0.93	-960	0.70	-2272	0.86	-2535	0.97	-3004	0.87	-4500	0.74	-386
BF 4003 HANFORD-VANTAGE & HANFORD CAPS	0.74	-2905	0.77	-2828	0.93	-981	0.70	-2321	0.82	-3366	0.97	-3029	0.83	-4109	0.74	-392
BF 4019 CAPTJACK-MALIN #2 & MALIN 500/230 XFMR	0.74	-2928	0.77	-2849	0.93	-1033	0.70	-2317	0.80	-3488	0.97	-3286	0.86	-4726	0.74	-399
BF 4028 TAFT-DWORSHAK & TAFT REACTOR 500KV	0.75	-2898	0.77	-2806	0.95	-788	0.70	-2315	0.81	-3552	0.97	-3322	0.85	-4640	0.74	-374
BF 4046 JOHN DAY-GRIZZLY #2 & GRIZZLY-MALIN #2 500 KV	0.76	-2459	0.78	-2414	0.93	-852	0.70	-2211	0.83	-2566	0.97	-2508	0.89	-3969	0.75	-365
BF 4064 CAPTJACK-MALIN & MALIN-ROUND MTN #1 500 KV	0.76	-2759	0.77	-2694	0.93	-986	0.70	-2257	0.80	-2921	0.97	-3086	0.87	-4551	0.74	-390
BF 4072 GRIZZLY-MALIN #2 & MALIN-ROUND MTN #2 500 KV	0.77	-2506	0.78	-2454	0.93	-899	0.70	-2188	0.81	-2457	0.98	-2702	0.88	-4221	0.74	-373
BF 4095 LOW MON-HANFORD & HANFORD-WAUTOMA 500 KV	0.74	-2939	0.77	-2862	0.93	-1025	0.70	-2324	0.81	-3484	0.97	-3229	0.84	-4302	0.74	-397
BF 4104 ASHE-HANFORD & HANFORD-WAUTOMA 500 KV	0.74	-2937	0.77	-2861	0.93	-1006	0.70	-2326	0.82	-3469	0.97	-3216	0.81	-4142	0.74	-395
BF 4111 HOT SPRINGS-TAFT & TAFT-DWORSHAK 500 KV	0.75	-2928	0.77	-2835	0.96	-883	0.70	-2319	0.81	-3570	0.97	-3341	0.85	-4668	0.74	-386
BF 4114 GARRISON-TAFT #1 +TAFT REACTOR 500KV	0.77	-2803	0.79	-2728	0.94	-632	0.70	-2322	0.81	-3472	0.97	-3255	0.86	-4636	0.75	-371
BF 4119 GARRISON-TAFT #1 & TAFT-BELL 500 KV	0.78	-2844	0.79	-2766	0.95	-625	0.70	-2334	0.82	-3424	0.97	-3192	0.86	-4355	0.74	-394
BF 4131 SLATT-JOHN DAY & JOHN DAY-GRIZZLY #2 500 KV	0.76	-2640	0.78	-2586	0.93	-931	0.70	-2262	0.83	-2915	0.98	-2447	0.88	-4198	0.74	-381
BF 4143 (OR 4134) JOHN DAY-GRIZZLY #1 & JOHN DAY CAPS 500 KV	0.76	-2642	0.78	-2589	0.94	-915	0.70	-2264	0.84	-2759	0.97	-2390	0.90	-3943	0.74	-378
BF 4148 HOT SPRINGS-TAFT & GARRISON-TAFT #2 500 KV	0.79	-2688	0.81	-2636	0.94	-571	0.70	-2320	0.81	-3471	0.97	-3252	0.86	-4585	0.76	-352
BF 4170 JOHN DAY-MARION & JOHN DAY CAPS 500 KV	0.75	-2860	0.76	-2787	0.93	-1009	0.70	-2308	0.83	-3105	0.97	-2712	0.88	-4245	0.74	-395
BF 4186 (OR 4582) MALIN-ROUND MTN 500 KV & MALIN 500/230 XFMR	0.76	-2724	0.77	-2659	0.93	-978	0.70	-2245	0.81	-2880	0.97	-3061	0.87	-4526	0.74	-388
BF 4194 ROCK CK-JOHN DAY & BIG EDDY-JOHN DAY 500 KV	0.75	-2842	0.77	-2764	0.93	-939	0.70	-2306	0.83	-3268	0.97	-2793	0.86	-4196	0.74	-382
BF 4197 JOHN DAY-BIG EDDY #1 & JOHN DAY CAPS 500 KV	0.74	-2903	0.77	-2830	0.93	-1026	0.70	-2317	0.82	-3271	0.96	-2932	0.87	-4445	0.74	-398
BF 4202 JOHN DAY-BIG EDDY#2 & BIG EDDY-OSTRANDER 500 KV	0.74	-2952	0.77	-2874	0.93	-1046	0.70	-2327	0.82	-3432	0.96	-3192	0.86	-4639	0.74	-401
BF 4231 MCNARY-LONGHORN 500 KV & MCNARY 500/230 KV XFMR	0.75	-2935	0.77	-2864	0.93	-1016	0.70	-2335	0.80	-3497	0.97	-3279	0.86	-4642	0.74	-395
BF 4234 MCNARY-LONGHORN & MCNARY-HERMCALP 500 KV	0.75	-3034	0.77	-2956	0.93	-1016	0.70	-2365	0.80	-3619	0.97	-3250	0.86	-4407	0.73	-401
BF 4247 LIT GOOS-LOW MON #2 & LOW MON-MCNARY 500 KV	0.75	-2892	0.77	-2812	0.93	-940	0.70	-2318	0.82	-3404	0.97	-3107	0.86	-4262	0.74	-381
BF 4259 LIT GOOS-LOW MON #2 & LOW MON-HANFORD 500 KV	0.74	-2945	0.77	-2867	0.93	-1024	0.70	-2325	0.81	-3499	0.97	-3258	0.84	-4372	0.74	-397
BF 4268 MONROE-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.74	-2961	0.77	-2878	0.93	-1005	0.70	-2328	0.81	-3551	0.97	-3315	0.86	-4578	0.74	-396
BF 4276 ING500-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.75	-2964	0.77	-2881	0.93	-1027	0.70	-2328	0.81	-3544	0.97	-3314	0.86	-4690	0.74	-399
BF 4280 KEELER-PEARL & PEARL-MARION 500 KV + RAS	0.75	-3043	0.76	-2967	0.93	-1045	0.70	-2368	0.84	-3370	0.97	-3123	0.87	-4273	0.73	-410
BF 4280 KEELER-PEARL & PEARL-OSTRANDER 500 KV + RAS	0.74	-3067	0.77	-2986	0.93	-1045	0.70	-2370	0.82	-3632	0.98	-3052	0.87	-4328	0.73	-410
BF 4287 PEARL-OSTRANDER 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.74	-2932	0.77	-2854	0.93	-1031	0.70	-2323	0.82	-3363	0.98	-2968	0.87	-4529	0.74	-399
BF 4293 SCHULTZ-RAVER & RAVER COVINGTON5 500 KV	0.74	-2963	0.77	-2881	0.93	-1039	0.70	-2328	0.81	-3534	0.97	-3289	0.86	-4605	0.74	-400
BF 4336 CHIEF JO-SICKLER 500 KV & SICKLER 500/230 XFMR	0.74	-2962	0.77	-2879	0.93	-1023	0.70	-2328	0.81	-3546	0.97	-3300	0.87	-4432	0.74	-398
BF 4336 SICKLER-SCHULTZ 500 KV & SICKLER 500/230 XFMR	0.74	-2960	0.77	-2878	0.93	-1022	0.70	-2328	0.81	-3542	0.97	-3292	0.87	-4430	0.74	-398
BF 4377 ASHE-MARION & MARION-ALVEY 500 KV + RAS	0.75	-2952	0.77	-2879	0.93	-1040	0.70	-2347	0.86	-2939	0.98	-2850	0.87	-4321	0.73	-411
BF 4386 BUCKLEY-MARION & MARION-SANTIAM 500 KV	0.74	-2914	0.77	-2838	0.93	-1033	0.70	-2320	0.82	-3354	0.97	-3104	0.87	-4549	0.74	-399
BF 4432 OSTRANDER-TROUTDALE & SPLIT OSTRANDER 500 KV	0.74	-2935	0.77	-2857	0.93	-1034	0.70	-2323	0.82	-3400	0.98	-2910	0.87	-4541	0.74	-399
BF 4439 BIG EDDY-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.74	-2956	0.77	-2877	0.93	-1043	0.70	-2328	0.81	-3465	0.98	-3059	0.86	-4663	0.74	-400
BF 4442 BIG EDDY-OSTRANDER 500 KV & OSTRANDER-MCLOUGHLIN 230 KV	0.74	-2953	0.77	-2875	0.93	-1041	0.70	-2327	0.81	-3467	0.97	-3176	0.86	-4683	0.74	-400
BF 4448 KNIGHT-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.74	-2940	0.77	-2861	0.93	-1034	0.70	-2324	0.82	-3404	0.98	-3013	0.87	-4569	0.74	-399
BF 4450 KNIGHT-OSTRANDER & OSTRANDER-PEARL 500 KV	0.74	-2936	0.77	-2857	0.93	-1032	0.70	-2323	0.82	-3423	0.98	-2937	0.87	-4585	0.74	-399
BF 4502 PAUL-ALLSTON & ALLSTON-KEELER 500 KV + RAS	0.73	-3280	0.76	-3189	0.93	-1108	0.70	-2439	0.82	-4049	0.97	-3425	0.89	-3961	0.73	-431
BF 4510 PEARL-MARION 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.75	-2880	0.77	-2810	0.93	-1016	0.70	-2316	0.84	-3064	0.97	-2964	0.87	-4419	0.74	-396
BF 4526 CUSTERW-MONROE & MONROE-ECHO LAKE 500 KV + RAS	0.73	-3316	0.76	-3223	0.92	-1227	0.70	-2439	0.79	-4126	0.97	-3515	0.86	-4642	0.73	-444

Appendix D - 16hs2a_2250idnw_N_ms Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Midpoint		Townsend		Robinson		Malin		John Day		Hanford		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV	0.75	-2875	0.77	-2797	0.93	-965	0.70	-2313	0.83	-3343	0.98	-2888	0.88	-4117	0.74	-388
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV + RAS	0.75	-3003	0.76	-2923	0.93	-1018	0.70	-2350	0.81	-3608	0.97	-3174	0.88	-4033	0.73	-402
BF 4540 PAUL-NAPAVINE & PAUL-SATSOP 500 KV	0.74	-2942	0.77	-2864	0.93	-1023	0.70	-2325	0.81	-3475	0.97	-3227	0.86	-4608	0.74	-397
BF 4542 PAUL-ALLSTON 500 KV & CENTER G2	0.74	-3026	0.76	-2946	0.93	-1036	0.70	-2354	0.81	-3610	0.97	-3255	0.87	-4410	0.73	-405
BF 4542 PAUL-NAPAVINE 500 KV & CENTER G1	0.74	-3045	0.76	-2962	0.93	-1048	0.70	-2356	0.80	-3680	0.97	-3341	0.87	-4488	0.73	-407
BF 4550 OLYMPIA-PAUL & PAUL-ALLSTON 500 KV	0.74	-2933	0.77	-2857	0.93	-1016	0.70	-2323	0.81	-3440	0.97	-3167	0.86	-4582	0.74	-396
BF 4554 OLYMPIA-PAUL 500 KV & TONO 500/115 XFMR	0.75	-2976	0.76	-2893	0.93	-1048	0.70	-2330	0.81	-3565	0.97	-3349	0.85	-4812	0.74	-401
BF 4572 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.75	-2881	0.78	-2802	0.93	-940	0.70	-2322	0.82	-3453	0.98	-3052	0.86	-4286	0.74	-381
BF 4630 CEN FERRY-LIT GOOS #1 & LIT GOOS-LOW MON #1 500 KV	0.74	-2956	0.77	-2875	0.93	-1028	0.70	-2327	0.81	-3531	0.97	-3291	0.86	-4677	0.74	-398
BF 4652 TAFT-DWORSHAK & TAFT-HATWAI 500 KV + RAS	0.74	-3191	0.76	-3093	0.94	-990	0.70	-2395	0.79	-3959	0.97	-3643	0.85	-4843	0.74	-422
BF 4672 MONROE-CHIEF JO 500 KV & MONROE CAPS	0.74	-2942	0.77	-2865	0.93	-1018	0.70	-2326	0.82	-3471	0.97	-3198	0.87	-4169	0.74	-397
BF 4676 LIT GOOS-LOW MON & LOW MON-ASHE 500 KV	0.75	-2935	0.77	-2857	0.93	-1014	0.70	-2323	0.81	-3492	0.97	-3239	0.86	-4405	0.74	-395
BF 4690 PAUL-ALLSTON 500 KV & ALLSTON 500/230 XFMR	0.74	-2927	0.77	-2851	0.93	-1012	0.70	-2322	0.82	-3413	0.97	-3135	0.86	-4517	0.74	-396
BF 4700 HATWAI 500KV & 230 KV + RAS	0.74	-3206	0.75	-3103	0.94	-991	0.70	-2398	0.80	-3900	0.97	-3577	0.85	-4802	0.74	-422
BF 4708 HATWAI 500 KV BUS	0.75	-2870	0.76	-2767	0.94	-800	0.70	-2308	0.81	-3536	0.97	-3302	0.86	-4520	0.75	-360
BF 4728 COULEE-CHIEF JO 500 KV & CHEIF JO 500/230 XFMR	0.75	-2966	0.76	-2883	0.93	-1034	0.70	-2329	0.81	-3543	0.97	-3313	0.86	-4592	0.74	-399
BF 4775 CEN FERRY-LOW GRAN #1 & #2 500 KV	0.76	-2849	0.77	-2760	0.94	-839	0.70	-2307	0.81	-3596	0.97	-3361	0.86	-4420	0.75	-365
BF 4776 HATWAI-LOW GRAN & LOW GRAN-CEN FERRY 500 KV	0.75	-2911	0.77	-2823	0.95	-909	0.70	-2318	0.81	-3559	0.97	-3323	0.85	-4624	0.74	-384
BF 4870 JOHN DAY-BIG EDDY 500 KV & BIG EDDY 500/230 KV	0.75	-2965	0.76	-2884	0.93	-1048	0.70	-2330	0.81	-3496	0.95	-3394	0.86	-4706	0.74	-401
BF 4888 ASHE-SLATT & CGS 500 KV	0.74	-3114	0.77	-3022	0.93	-1004	0.70	-2387	0.81	-3842	0.97	-3417	0.86	-4272	0.73	-404
BF 4891 LOW MON-ASHE & ASHE-SLATT 500 KV	0.75	-2871	0.77	-2791	0.93	-929	0.70	-2317	0.83	-3308	0.98	-2881	0.86	-3803	0.74	-380
BF 4901 LOW MON-ASHE & ASHE-HANFORD 500 KV	0.75	-2902	0.77	-2821	0.93	-936	0.70	-2318	0.82	-3429	0.97	-3145	0.83	-4054	0.74	-381
BF 4940 LOW MON-ASHE & ASHE-MARION 500 KV	0.76	-2794	0.77	-2725	0.93	-950	0.70	-2296	0.84	-3032	0.97	-2643	0.87	-3850	0.74	-385
BF 4957 SUMMER L-MALIN & SUMMER L-HEMINGWAY 500 KV	0.76	-2102	0.79	-2124	0.93	-861	0.70	-2229	0.80	-2725	0.97	-2933	0.87	-4414	0.75	-370
BF 4959 GRIZZLY-SUMMER L & SUMMER L-MALIN 500 KV	0.76	-2144	0.79	-2169	0.93	-866	0.70	-2243	0.81	-2579	0.98	-2708	0.88	-4258	0.75	-370
BF 4996 CAPTJACK-MALIN #1 & #2 500 KV	0.74	-2909	0.77	-2833	0.93	-1024	0.70	-2319	0.75	-3256	0.97	-3289	0.86	-4746	0.74	-397
BF 5003 SLATT-BUCKLEY & SLATT-BOARDMAN 500 KV	0.76	-2740	0.77	-2679	0.93	-960	0.70	-2285	0.84	-3086	0.97	-2712	0.88	-4207	0.74	-386
BF 5006 SLATT-LONGHORN & SLATT-GRASSLAND 500 KV	0.75	-2846	0.77	-2783	0.93	-1037	0.70	-2307	0.81	-3446	0.97	-3090	0.86	-4532	0.74	-400
BF 5015 ASHE-SLATT & SLATT-BUCKLEY 500 KV	0.76	-2709	0.77	-2645	0.93	-889	0.70	-2278	0.84	-2952	0.98	-2472	0.87	-3854	0.74	-372
BF 5018 ASHE-SLATT & SLATT-JOHN DAY 500 KV	0.75	-2828	0.77	-2755	0.93	-939	0.70	-2307	0.83	-3287	0.97	-2750	0.86	-4089	0.74	-382
BF 5021 SLATT-JOHN DAY & SLATT-LONGHORN 500 KV	0.75	-2862	0.76	-2793	0.93	-1024	0.70	-2306	0.82	-3398	0.97	-2894	0.86	-4478	0.74	-397
BF 5028 BUCKLEY-GRIZZLY & GRIZZLY-SUMMER LAKE 500 KV	0.77	-2404	0.79	-2369	0.94	-804	0.70	-2241	0.84	-2588	0.98	-2396	0.90	-3947	0.75	-358
BF 5040 GRIZZLY-JOHN DAY & GRIZZLY-ROUND BU 500 KV	0.75	-2685	0.78	-2624	0.93	-931	0.70	-2272	0.82	-2944	0.97	-2700	0.88	-4275	0.74	-381
BF 5114 ECHO LAKE-RAVER & ECHO LAKE- SNOK TAP 500 KV	0.74	-2953	0.77	-2871	0.93	-1002	0.70	-2327	0.81	-3536	0.97	-3275	0.87	-4434	0.74	-395
BF 5117 ECHO LAKE-MAPLE VALLEY & ECHO LAKE-RAVER 500 KV	0.74	-2949	0.77	-2871	0.93	-1019	0.70	-2327	0.81	-3506	0.97	-3242	0.87	-4426	0.74	-397
BF 5148 COULEE-SCHULTZ & ECHO LAKE-SCHULTZ 500 KV	0.74	-2928	0.77	-2851	0.93	-991	0.70	-2322	0.82	-3478	0.97	-3197	0.87	-4235	0.74	-393
BF 5170 WAUTOMA-SCHULTZ & SCHULTZ-RAVER 500 KV	0.74	-2920	0.77	-2844	0.93	-973	0.70	-2322	0.82	-3454	0.97	-3148	0.85	-4228	0.74	-390
BF 5179 VANTAGE-SCHULTZ & SCHULTZ-RAVER #4	0.74	-2955	0.77	-2873	0.93	-1016	0.70	-2327	0.81	-3507	0.97	-3269	0.85	-4422	0.74	-397
BF 5187 MCNARY-LONGHORN & LONGHORN-SLATT 500 KV	0.75	-2915	0.77	-2845	0.93	-1008	0.70	-2328	0.81	-3428	0.97	-3146	0.86	-4565	0.74	-394
BF 5193 GRASSLAND-COYOTE & COYOTE-LONGHORN 500 KV	0.75	-2993	0.76	-2920	0.93	-1007	0.70	-2361	0.82	-3517	0.97	-3175	0.86	-4412	0.74	-399
BF 5211 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.75	-2881	0.78	-2802	0.93	-940	0.70	-2322	0.82	-3453	0.98	-3052	0.86	-4286	0.74	-381
BF 5214 LOW MON-MCNARY & CALPINE PH 500 KV	0.75	-2964	0.77	-2883	0.93	-940	0.70	-2350	0.82	-3484	0.97	-3037	0.86	-4011	0.74	-387
BF 5250 HANFORD-WAUTOMA#1 & WAUTOMA-KNIGHT 500 KV	0.75	-2830	0.77	-2754	0.93	-941	0.70	-2304	0.84	-3227	0.98	-2773	0.86	-4123	0.74	-383
BF 5259 HANFORD-WAUTOMA#2 & WAUTOMA-ROCK CK 500 KV	0.75	-2837	0.77	-2758	0.93	-929	0.70	-2305	0.83	-3297	0.98	-2778	0.85	-4098	0.74	-381
BF 5266 SLATT-BUCKLY 500 KV	0.75	-2771	0.77	-2703	0.93	-974	0.70	-2282	0.84	-3125	0.97	-2759	0.88	-4268	0.74	-389

Appendix D - 16hs2a_2250idnw_N_ms Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Midpoint		Townsend		Robinson		Malin		John Day		Hanford		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 5339 VANTAGE-SCHULTZ 500 KV & VANTAGE 500/230 XFMR #1	0.74	-2960	0.77	-2877	0.93	-1019	0.70	-2328	0.81	-3532	0.97	-3293	0.84	-4515	0.74	-397
BF 5345 VANTAGE-HANFORD 500 KV & VANTAGE 500/230 XFMR #1	0.75	-2947	0.77	-2870	0.93	-1004	0.70	-2327	0.81	-3500	0.97	-3242	0.83	-4365	0.74	-395
BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.77	-1990	0.80	-2019	0.95	-594	0.70	-2309	0.84	-2438	0.98	-2432	0.90	-3952	0.77	-312
BF IPC HEMINGWAY-SUMMER L 500 KV & HEMINGWAY 500/230 XFMR	0.72	-2176	0.75	-2215	0.93	-949	0.70	-2271	0.81	-3237	0.97	-3265	0.86	-4731	0.74	-388
BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.70	-2094	0.73	-2074	0.93	-842	0.70	-2293	0.81	-3382	0.97	-3388	0.85	-4830	0.74	-373
BF IPC POPULUS-CHILL-HEMINGWAY 500 KV & HEM 500/230 XFMR	0.70	-2276	0.71	-2256	0.93	-1084	0.70	-1784	0.84	-2179	0.97	-2514	0.89	-3962	0.74	-386
BF LOLO 230KV	0.74	-2916	0.75	-2830	0.93	-971	0.70	-2324	0.82	-3356	0.97	-3157	0.86	-4552	0.74	-386
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.81	-1940	0.83	-1960	0.94	-551	0.70	-2317	0.87	-2129	0.98	-2025	0.93	-3385	0.77	-296
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV+PTSN	0.79	-2019	0.82	-2045	0.95	-599	0.70	-2323	0.87	-2159	0.98	-2048	0.92	-3457	0.76	-311
BF PGE GRASSLAND-COYOTE SP 500KV & CARTY GAS PLANT	0.75	-2913	0.77	-2843	0.93	-1004	0.70	-2333	0.82	-3370	0.97	-3116	0.86	-4550	0.74	-394
BF PGE GRASSLAND-SLATT 500KV & BOARDMAN PLANT	0.74	-3001	0.76	-2923	0.93	-1015	0.70	-2360	0.81	-3588	0.97	-3227	0.86	-4458	0.73	-402
BUS: ALVEY 500 KV + RAS	0.75	-2981	0.76	-2907	0.93	-1071	0.70	-2347	0.87	-2706	0.97	-3275	0.87	-4768	0.74	-416
BUS: BELL BPA 500 KV	0.75	-3000	0.76	-2923	0.95	-964	0.70	-2342	0.81	-3480	0.97	-3258	0.86	-4439	0.74	-420
BUS: BUCKLEY 500 KV	0.75	-2675	0.78	-2615	0.93	-942	0.70	-2263	0.84	-2858	0.98	-2465	0.90	-3954	0.74	-383
BUS: DIXONVILLE 500 KV	0.75	-2695	0.78	-2634	0.93	-942	0.70	-2261	0.85	-2536	0.97	-2987	0.87	-4499	0.74	-383
BUS: HOT SPRINGS 500 KV	0.74	-2954	0.77	-2872	0.93	-981	0.70	-2327	0.81	-3539	0.97	-3310	0.86	-4708	0.74	-395
BUS: KEELER 500 KV + RAS	0.74	-3276	0.76	-3188	0.93	-1116	0.70	-2440	0.83	-3811	0.98	-3102	0.91	-3780	0.73	-432
BUS: ROCK CREEK 500 KV	0.75	-2833	0.77	-2755	0.93	-927	0.70	-2305	0.84	-3250	0.98	-2726	0.86	-4106	0.74	-381
BUS: SICKLER 500 KV	0.74	-2959	0.77	-2877	0.93	-1020	0.70	-2328	0.81	-3539	0.97	-3287	0.87	-4383	0.74	-398
BUS: SUMMER LAKE 500 KV	0.76	-2059	0.79	-2082	0.93	-840	0.70	-2215	0.82	-2541	0.97	-2670	0.88	-4202	0.75	-366
N-1: ALLSTON-KEELER 500 KV + RAS	0.73	-3293	0.76	-3200	0.93	-1118	0.70	-2441	0.81	-4096	0.97	-3482	0.89	-4028	0.73	-432
N-1: ALLSTON-NAPAVINE 500 KV	0.74	-2928	0.77	-2852	0.93	-1013	0.70	-2322	0.82	-3415	0.97	-3139	0.86	-4517	0.74	-396
N-1: ALLSTON-PAUL #2 500 KV	0.74	-2927	0.77	-2851	0.93	-1012	0.70	-2322	0.82	-3414	0.97	-3139	0.86	-4526	0.74	-396
N-1: ALVERY-DIXONVILLE 500 KV	0.75	-2687	0.78	-2625	0.93	-942	0.70	-2260	0.87	-2399	0.97	-2946	0.87	-4467	0.74	-383
N-1: ALVEY-MARION 500 KV	0.76	-2734	0.77	-2670	0.93	-959	0.70	-2275	0.85	-2632	0.98	-2801	0.87	-4338	0.74	-386
N-1: ASHE-HANFORD 500 KV	0.75	-2953	0.77	-2875	0.93	-1019	0.70	-2329	0.81	-3494	0.97	-3275	0.82	-4292	0.74	-397
N-1: ASHE-LOW MON 500 KV	0.74	-2946	0.77	-2866	0.93	-1024	0.70	-2325	0.81	-3503	0.97	-3258	0.86	-4454	0.74	-397
N-1: ASHE-MARION 500 KV	0.75	-2815	0.77	-2741	0.93	-963	0.70	-2299	0.84	-3083	0.97	-2697	0.88	-4142	0.74	-387
N-1: ASHE-SLATT 500 KV	0.75	-2881	0.77	-2802	0.93	-937	0.70	-2319	0.83	-3329	0.97	-3005	0.86	-4177	0.74	-381
N-1: BELL-COULEE 500 KV	0.75	-2967	0.76	-2883	0.94	-956	0.70	-2331	0.81	-3515	0.97	-3281	0.86	-4587	0.73	-403
N-1: BELL-TAFT 500 KV	0.75	-3007	0.76	-2928	0.95	-980	0.70	-2343	0.81	-3483	0.97	-3263	0.86	-4534	0.74	-421
N-1: BIG EDDY-CELILO 500 KV	0.75	-2966	0.76	-2883	0.93	-1041	0.70	-2328	0.81	-3540	0.97	-3312	0.85	-4762	0.74	-400
N-1: BIG EDDY-JOHN DAY 500 KV	0.75	-2962	0.76	-2883	0.93	-1045	0.70	-2329	0.81	-3505	0.96	-3329	0.86	-4728	0.74	-401
N-1: BIG EDDY-KNIGHT 500 KV	0.74	-2921	0.77	-2845	0.93	-1006	0.70	-2320	0.82	-3438	0.98	-2950	0.85	-4562	0.74	-394
N-1: BIG EDDY-OSTRANDER 500 KV	0.74	-2954	0.77	-2876	0.93	-1041	0.70	-2327	0.81	-3480	0.97	-3184	0.86	-4699	0.74	-400
N-1: BOISE BENCH-BROWNLEE #3 230 KV	0.75	-2857	0.77	-2783	0.93	-1024	0.70	-2323	0.81	-3504	0.97	-3280	0.86	-4722	0.74	-397
N-1: BRADY-ANTELOPE 230 KV	0.74	-2948	0.77	-2864	0.93	-1016	0.70	-2327	0.81	-3538	0.97	-3312	0.85	-4757	0.74	-399
N-1: BROADVIEW-GARRISON #1 500 KV	0.75	-2998	0.76	-2916	0.93	-1140	0.70	-2333	0.81	-3568	0.97	-3346	0.85	-4834	0.74	-413
N-1: BROWNLEE-ONTARIO 230 KV	0.76	-2769	0.77	-2709	0.93	-1015	0.70	-2320	0.81	-3470	0.97	-3256	0.86	-4693	0.74	-396
N-1: BUCKLEY-GRIZZLY 500 KV	0.75	-2787	0.77	-2718	0.93	-971	0.70	-2287	0.81	-3186	0.98	-2845	0.87	-4433	0.74	-388
N-1: BUCKLEY-MARION 500 KV	0.74	-2923	0.77	-2848	0.93	-1036	0.70	-2320	0.82	-3387	0.97	-3142	0.86	-4580	0.74	-399
N-1: BUCKLEY-SLATT 500 KV	0.75	-2771	0.77	-2703	0.93	-974	0.70	-2282	0.84	-3125	0.97	-2759	0.88	-4268	0.74	-389
N-1: CAPTAIN JACK-OLINDA 500 KV	0.77	-2512	0.78	-2457	0.94	-909	0.70	-2166	0.82	-2392	0.98	-2787	0.88	-4308	0.74	-374
N-1: CAPTJACK-KFALLS 500 KV	0.76	-2743	0.77	-2681	0.93	-968	0.70	-2273	0.75	-3303	0.97	-3114	0.86	-4679	0.74	-387
N-1: CASCADE CROSSING 500 KV	0.75	-2861	0.76	-2789	0.93	-1027	0.70	-2303	0.83	-3176	0.98	-2849	0.88	-4333	0.74	-398

Appendix D - 16hs2a_2250idnw_N_ms Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Midpoint		Townsend		Robinson		Malin		John Day		Hanford		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: CEDAR HILL-ROBINSON 500 KV (SWIP)	0.76	-2686	0.78	-2577	0.93	-1141	0.70	-1784	0.84	-2371	0.97	-2641	0.89	-4116	0.73	-406
N-1: CHIEF JO-COULEE 500 KV	0.75	-2969	0.76	-2886	0.93	-1042	0.70	-2329	0.81	-3542	0.97	-3316	0.86	-4650	0.74	-401
N-1: CHIEF JO-MONROE 500 KV	0.74	-2958	0.77	-2876	0.93	-1032	0.70	-2327	0.81	-3528	0.97	-3279	0.86	-4533	0.74	-399
N-1: CHIEF JO-SICKLER 500 KV	0.74	-2957	0.77	-2875	0.93	-1021	0.70	-2327	0.81	-3537	0.97	-3301	0.86	-4566	0.74	-397
N-1: COULEE-HANFORD 500 KV	0.75	-2928	0.77	-2847	0.93	-944	0.70	-2323	0.81	-3507	0.97	-3243	0.85	-4180	0.74	-386
N-1: COULEE-SCHULTZ 500 KV	0.75	-2938	0.77	-2859	0.93	-996	0.70	-2324	0.81	-3510	0.97	-3259	0.86	-4409	0.74	-393
N-1: COVINGTON4-RAVER 500 KV	0.75	-2968	0.76	-2885	0.93	-1043	0.70	-2329	0.81	-3546	0.97	-3320	0.85	-4738	0.74	-400
N-1: COVINGTON5-RAVER 500 KV	0.75	-2968	0.76	-2885	0.93	-1043	0.70	-2329	0.81	-3545	0.97	-3320	0.85	-4736	0.74	-400
N-1: COYOTE-LONGHORN 500 KV	0.75	-2949	0.77	-2874	0.93	-1019	0.70	-2334	0.81	-3476	0.97	-3239	0.86	-4680	0.74	-396
N-1: CUSTERW-MONROE 500 KV	0.74	-2961	0.77	-2878	0.93	-1008	0.70	-2329	0.81	-3549	0.97	-3315	0.86	-4589	0.74	-397
N-1: DIXONVILLE-MERIDIAN 500 KV	0.76	-2739	0.77	-2674	0.93	-959	0.70	-2272	0.84	-2728	0.97	-3028	0.87	-4520	0.74	-386
N-1: DRYCREEK-LOLO 230 KV	0.75	-2966	0.76	-2883	0.93	-1040	0.70	-2328	0.81	-3541	0.97	-3315	0.85	-4764	0.74	-400
N-1: DRYCREEK-N LEWISTON 230 KV	0.75	-2966	0.76	-2883	0.93	-1039	0.70	-2328	0.81	-3539	0.97	-3312	0.85	-4758	0.74	-399
N-1: DRYCREEK-WALA AVA 230 KV	0.75	-2965	0.76	-2882	0.93	-1037	0.70	-2328	0.81	-3540	0.97	-3312	0.85	-4755	0.74	-399
N-1: DWORSHAK-HATWAI 500 KV + RAS	0.76	-2855	0.76	-2756	0.94	-793	0.70	-2305	0.81	-3566	0.97	-3331	0.86	-4515	0.75	-358
N-1: DWORSHAK-TAFT 500 KV	0.75	-2898	0.77	-2806	0.95	-788	0.70	-2315	0.81	-3552	0.97	-3322	0.85	-4640	0.74	-374
N-1: ECHO LAKE-MAPLE VALLEY 500 KV	0.75	-2968	0.76	-2885	0.93	-1043	0.70	-2329	0.81	-3538	0.97	-3302	0.86	-4641	0.74	-400
N-1: ECHO LAKE-RAVER 500 KV	0.74	-2960	0.77	-2878	0.93	-1030	0.70	-2327	0.81	-3539	0.97	-3298	0.86	-4669	0.74	-399
N-1: ECHO LAKE-SCHULTZ 500 KV	0.74	-2960	0.77	-2878	0.93	-1037	0.70	-2328	0.81	-3510	0.97	-3273	0.86	-4580	0.74	-400
N-1: ECHO LAKE-SNOK TAP 500 KV	0.74	-2954	0.77	-2872	0.93	-1004	0.70	-2327	0.81	-3540	0.97	-3287	0.86	-4470	0.74	-396
N-1: GARRISON-TAFT #2 500 KV	0.77	-2803	0.79	-2728	0.94	-632	0.70	-2322	0.81	-3472	0.97	-3255	0.86	-4636	0.75	-371
N-1: GOLDHILL-PLACER 115 KV	0.75	-2977	0.76	-2894	0.93	-1047	0.70	-2331	0.81	-3579	0.97	-3344	0.85	-4808	0.74	-400
N-1: GRASSLAND-COYOTE 500 KV	0.75	-2913	0.77	-2843	0.93	-1004	0.70	-2333	0.82	-3370	0.97	-3116	0.86	-4550	0.74	-394
N-1: GRASSLAND-SLATT 500 KV	0.75	-2933	0.77	-2858	0.93	-1037	0.70	-2328	0.81	-3520	0.97	-3260	0.86	-4724	0.74	-399
N-1: GRIZZLY-JOHN DAY #2 500 KV	0.76	-2709	0.77	-2645	0.93	-937	0.70	-2276	0.82	-2971	0.98	-2739	0.88	-4328	0.74	-382
N-1: GRIZZLY-MALIN 500 KV	0.76	-2633	0.77	-2574	0.93	-932	0.70	-2239	0.81	-2811	0.97	-2738	0.88	-4256	0.74	-381
N-1: GRIZZLY-PONDEROSA A-SUMMER L 500 KV	0.76	-2576	0.78	-2529	0.93	-871	0.70	-2279	0.82	-2898	0.98	-2779	0.88	-4322	0.75	-369
N-1: GRIZZLY-PONDEROSA B-CAPT JACK 500 KV	0.76	-2619	0.77	-2561	0.93	-929	0.70	-2235	0.82	-2772	0.97	-2716	0.88	-4233	0.74	-380
N-1: GRIZZLY-ROUND BU 500 KV	0.74	-2956	0.77	-2875	0.93	-1040	0.70	-2327	0.81	-3525	0.97	-3269	0.86	-4733	0.74	-400
N-1: HANFORD-LOW MON 500 KV	0.74	-2955	0.77	-2874	0.93	-1034	0.70	-2327	0.81	-3521	0.97	-3275	0.84	-4420	0.74	-399
N-1: HANFORD-VANTAGE 500 KV	0.75	-2947	0.77	-2870	0.93	-1004	0.70	-2327	0.81	-3500	0.97	-3242	0.83	-4366	0.74	-395
N-1: HANFORD-WAUTOMA 500 KV	0.74	-2954	0.77	-2873	0.93	-1033	0.70	-2326	0.82	-3513	0.97	-3271	0.85	-4663	0.74	-398
N-1: HATWAI 500/230 KV XFMR + RAS	0.74	-2968	0.76	-2885	0.93	-1029	0.70	-2329	0.82	-3481	0.97	-3267	0.86	-4697	0.74	-396
N-1: HATWAI-LOLO 230 KV	0.74	-2963	0.76	-2881	0.93	-1031	0.70	-2328	0.81	-3524	0.97	-3296	0.86	-4723	0.74	-398
N-1: HATWAI-LOW GRAN 500 KV	0.75	-2914	0.77	-2825	0.95	-910	0.70	-2318	0.81	-3567	0.97	-3337	0.85	-4654	0.74	-384
N-1: HATWAI-N LEWISTON 230 KV	0.75	-2966	0.76	-2883	0.93	-1039	0.70	-2328	0.81	-3539	0.97	-3312	0.85	-4757	0.74	-400
N-1: HELLS CANYON-BROWNLEE 230 KV	0.75	-2835	0.76	-2769	0.93	-953	0.70	-2330	0.83	-3299	0.97	-3096	0.87	-4481	0.74	-386
N-1: HELLS CANYON-WALLA WALLA 230 KV	0.74	-2947	0.76	-2867	0.93	-1011	0.70	-2326	0.82	-3423	0.97	-3218	0.86	-4640	0.74	-395
N-1: HEMINGWAY-GRASSLAND 500 KV	0.79	-1973	0.81	-2000	0.95	-598	0.70	-2299	0.85	-2407	0.98	-2400	0.90	-3882	0.76	-310
N-1: HEMINGWAY-GRASSLAND 500 KV + FACRI	0.74	-2572	0.77	-2555	0.93	-871	0.70	-2394	0.83	-4094	0.97	-3723	0.84	-4962	0.74	-374
N-1: HEMINGWAY-GRASSLAND 500 KV + PTSN SHUNT	0.78	-2128	0.80	-2152	0.95	-649	0.70	-2338	0.84	-2496	0.97	-2525	0.89	-3989	0.75	-325
N-1: HEMINGWAY-SUMMER LAKE 500 KV	0.75	-2275	0.78	-2300	0.93	-943	0.70	-2296	0.81	-3229	0.97	-3253	0.86	-4725	0.74	-386
N-1: HILL TOP 345/230 XFMR	0.74	-2936	0.77	-2857	0.93	-1039	0.70	-2321	0.81	-3422	0.97	-3298	0.86	-4743	0.74	-400
N-1: HORSE HV-MCNARY 230 KV	0.74	-2954	0.77	-2873	0.93	-1039	0.70	-2326	0.81	-3525	0.97	-3284	0.86	-4708	0.74	-400
N-1: HOT SPRINGS-TAFT 500 KV	0.74	-2954	0.77	-2872	0.93	-981	0.70	-2327	0.81	-3540	0.97	-3310	0.86	-4708	0.74	-395

Appendix D - 16hs2a_2250idnw_N_ms Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Midpoint		Townsend		Robinson		Malin		John Day		Hanford		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: HUMBOLDT-COYOTE CK 345 KV	0.76	-2744	0.77	-2650	0.93	-1027	0.70	-2236	0.82	-3404	0.97	-3232	0.86	-4683	0.74	-398
N-1: HUNTINGTON-PINTO-FOUR CORNERS 345 KV	0.75	-2997	0.76	-2916	0.93	-1056	0.70	-2326	0.81	-3559	0.97	-3340	0.85	-4812	0.73	-403
N-1: ING500-CUSTERW 500 KV	0.75	-2964	0.77	-2881	0.93	-1029	0.70	-2328	0.81	-3545	0.97	-3315	0.86	-4697	0.74	-399
N-1: JOHN DAY-MARION 500 KV	0.74	-2918	0.77	-2844	0.93	-1029	0.70	-2319	0.82	-3343	0.97	-3064	0.87	-4551	0.74	-398
N-1: JOHN DAY-ROCK CK 500 KV	0.75	-2843	0.77	-2764	0.93	-936	0.70	-2306	0.83	-3304	0.97	-2863	0.86	-4233	0.74	-382
N-1: JOHN DAY-SLATT 500 KV	0.75	-2887	0.77	-2814	0.93	-1030	0.70	-2309	0.82	-3461	0.97	-2950	0.86	-4568	0.74	-398
N-1: KFALLS-MERIDIAN 500 KV	0.75	-2913	0.77	-2837	0.93	-1025	0.70	-2315	0.78	-3548	0.97	-3208	0.86	-4613	0.74	-397
N-1: KNIGHT-WAUTOMA 500 KV	0.75	-2837	0.77	-2760	0.93	-945	0.70	-2305	0.84	-3240	0.98	-2794	0.86	-4185	0.74	-384
N-1: LAGRANDE-NORTH POWDER 230 KV	0.75	-2942	0.76	-2864	0.93	-1021	0.70	-2328	0.81	-3463	0.97	-3264	0.86	-4720	0.74	-397
N-1: LANES-MARION 500 KV	0.74	-2920	0.77	-2846	0.93	-1028	0.70	-2320	0.83	-3307	0.97	-3151	0.86	-4590	0.74	-398
N-1: LIT GOOSE-CENTRAL FERRY 500 KV	0.75	-2963	0.77	-2881	0.93	-1037	0.70	-2328	0.81	-3539	0.97	-3308	0.85	-4743	0.74	-399
N-1: LIT GOOSE-LOW MON 500 KV	0.74	-2959	0.77	-2877	0.93	-1032	0.70	-2327	0.81	-3535	0.97	-3298	0.86	-4693	0.74	-398
N-1: LOW GRAN-CENTRAL FERRY 500 KV	0.74	-2960	0.77	-2877	0.93	-1029	0.70	-2327	0.81	-3539	0.97	-3307	0.85	-4725	0.74	-398
N-1: LOW MON-SAC TAP 500 KV	0.75	-2918	0.77	-2839	0.93	-957	0.70	-2322	0.81	-3479	0.97	-3214	0.85	-4365	0.74	-384
N-1: MALIN 500/230 XFMR	0.74	-2934	0.77	-2854	0.93	-1034	0.70	-2318	0.81	-3510	0.97	-3294	0.86	-4731	0.74	-399
N-1: MALIN-HILLTOP 230 KV	0.74	-2914	0.77	-2835	0.93	-1031	0.70	-2312	0.81	-3463	0.97	-3296	0.86	-4738	0.74	-398
N-1: MALIN-ROUND MTN #1 500 KV	0.76	-2764	0.77	-2699	0.93	-988	0.70	-2258	0.82	-2923	0.97	-3094	0.87	-4557	0.74	-390
N-1: MALIN-ROUND MTN #2 500 KV	0.76	-2755	0.77	-2690	0.93	-985	0.70	-2255	0.81	-2899	0.97	-3082	0.87	-4550	0.74	-390
N-1: MALIN-SUMMER LAKE 500 KV	0.75	-2738	0.77	-2678	0.93	-1034	0.70	-2239	0.80	-3008	0.97	-3051	0.87	-4516	0.74	-398
N-1: MAPLE VLY-ROCKY RH 345 KV	0.75	-2964	0.77	-2882	0.93	-1039	0.70	-2328	0.81	-3537	0.97	-3299	0.86	-4629	0.74	-400
N-1: MARION-PEARL 500 KV	0.74	-2902	0.77	-2833	0.93	-1025	0.70	-2320	0.83	-3140	0.97	-3103	0.86	-4624	0.74	-397
N-1: MARION-SANTIAM 500 KV	0.75	-2987	0.76	-2903	0.93	-1047	0.70	-2334	0.80	-3620	0.97	-3402	0.85	-4848	0.74	-401
N-1: MCLOUGLIN-OSTRANDER 230 KV	0.75	-2967	0.76	-2884	0.93	-1042	0.70	-2329	0.81	-3530	0.97	-3315	0.86	-4743	0.74	-400
N-1: MCNARY 500/230 KV XFMR	0.75	-2969	0.77	-2885	0.93	-1047	0.70	-2333	0.80	-3580	0.97	-3367	0.85	-4766	0.74	-401
N-1: MCNARY S2-MCNARY S3 230 KV	0.75	-2967	0.76	-2884	0.93	-1043	0.70	-2328	0.81	-3543	0.97	-3314	0.85	-4738	0.74	-400
N-1: MCNARY-BOARD T1 230 KV	0.74	-2943	0.77	-2863	0.93	-1037	0.70	-2321	0.81	-3502	0.97	-3288	0.86	-4759	0.74	-398
N-1: MCNARY-JOHN DAY 500 KV	0.75	-2876	0.77	-2800	0.93	-1012	0.70	-2310	0.83	-3354	0.97	-2935	0.87	-4449	0.74	-395
N-1: MCNARY-LONGHORN 500 KV	0.75	-2940	0.77	-2866	0.93	-1008	0.70	-2333	0.81	-3470	0.97	-3225	0.86	-4632	0.74	-394
N-1: MCNARY-ROSS 345 KV	0.74	-2944	0.77	-2868	0.93	-1040	0.70	-2325	0.81	-3477	0.97	-3231	0.86	-4665	0.74	-400
N-1: MCNARY-ROUNDUP 230 KV	0.75	-2891	0.77	-2822	0.93	-999	0.70	-2327	0.82	-3404	0.97	-3203	0.86	-4668	0.74	-393
N-1: MCNARY-SAC TAP-LOW MON 500 KV	0.75	-2902	0.77	-2823	0.93	-951	0.70	-2319	0.82	-3416	0.97	-3129	0.85	-4334	0.74	-383
N-1: MIDPOINT-HEMINGWAY 500 KV	0.70	-2416	0.72	-2111	0.93	-872	0.70	-2299	0.81	-3419	0.97	-3348	0.85	-4805	0.74	-377
N-1: MIDPOINT-HUMBOLDT 345 KV	0.75	-2850	0.77	-2758	0.93	-1046	0.70	-2233	0.81	-3441	0.97	-3268	0.86	-4713	0.74	-400
N-1: MIDPOINT-TOWNSEND 500 KV (MSTI)	0.79	-2416	0.80	-2404	0.99	-770	0.70	-2366	0.88	-2364	0.97	-2108	0.91	-3062	0.77	-230
N-1: MIDPOINT-TOWNSEND 500 KV (MSTI)+PTSN SHUNT	0.79	-2437	0.79	-2424	0.99	-792	0.70	-2369	0.87	-2379	0.98	-2126	0.91	-3090	0.77	-234
N-1: NAPAVINE-PAUL 500 KV	0.74	-2945	0.77	-2867	0.93	-1025	0.70	-2325	0.81	-3491	0.97	-3245	0.86	-4666	0.74	-398
N-1: OLYMPIA-PAUL 500 KV	0.75	-2973	0.76	-2890	0.93	-1045	0.70	-2330	0.81	-3560	0.97	-3339	0.85	-4811	0.74	-401
N-1: ONTARIO-CALDWELL 230 KV	0.75	-2859	0.77	-2781	0.93	-1026	0.70	-2321	0.81	-3505	0.97	-3283	0.86	-4724	0.74	-398
N-1: OSTRANDER-KNIGHT 500 KV	0.74	-2938	0.77	-2861	0.93	-1033	0.70	-2323	0.82	-3417	0.97	-3138	0.86	-4600	0.74	-399
N-1: OSTRANDER-PEARL 500 KV	0.74	-2960	0.77	-2881	0.93	-1041	0.70	-2328	0.80	-3533	0.97	-3221	0.86	-4749	0.74	-400
N-1: OSTRANDER-TROUTDALE 500 KV	0.75	-2970	0.76	-2887	0.93	-1044	0.70	-2330	0.81	-3530	0.97	-3307	0.86	-4729	0.74	-400
N-1: OXBOW-BROWNLEE #2 230 KV	0.74	-2956	0.77	-2876	0.93	-1038	0.70	-2328	0.81	-3536	0.97	-3309	0.85	-4758	0.74	-399
N-1: OXBOW-LOLO 230 KV	0.74	-2911	0.75	-2828	0.93	-972	0.70	-2324	0.82	-3356	0.97	-3158	0.86	-4559	0.74	-386
N-1: PAUL-SATSOP 500 KV	0.74	-2964	0.77	-2881	0.93	-1039	0.70	-2328	0.81	-3527	0.97	-3298	0.86	-4707	0.74	-400
N-1: PEARL-KEELER 500 KV	0.74	-2912	0.77	-2839	0.93	-1004	0.70	-2321	0.83	-3325	0.97	-3041	0.87	-4461	0.74	-394

Appendix D - 16hs2a_2250idnw_N_ms Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Midpoint		Townsend		Robinson		Malin		John Day		Hanford		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: PEARL-KEELER 500 KV + RAS	0.74	-3079	0.77	-2994	0.93	-1049	0.70	-2371	0.82	-3651	0.97	-3233	0.87	-4363	0.73	-411
N-1: PINTO-FOUR CORNER 345 KV	0.75	-2965	0.77	-2882	0.93	-1041	0.70	-2324	0.81	-3537	0.97	-3316	0.85	-4766	0.74	-400
N-1: PONDEROSA A 500/230 KV XFMR	0.75	-2966	0.76	-2884	0.93	-1042	0.70	-2328	0.81	-3537	0.97	-3314	0.85	-4764	0.74	-400
N-1: PONDEROSA B 500/230 KV XFMR	0.75	-2965	0.76	-2883	0.93	-1041	0.70	-2329	0.81	-3541	0.97	-3316	0.85	-4766	0.74	-400
N-1: RAVER-PAUL 500 KV	0.75	-2882	0.77	-2804	0.93	-970	0.70	-2314	0.82	-3386	0.98	-2911	0.87	-4158	0.74	-389
N-1: RAVER-TACOMA 500 KV	0.75	-2965	0.76	-2883	0.93	-1040	0.70	-2328	0.81	-3539	0.97	-3303	0.86	-4671	0.74	-400
N-1: RED BUTTE-HARRY ALLEN 345 KV	0.75	-2965	0.77	-2882	0.93	-1041	0.70	-2318	0.81	-3534	0.97	-3315	0.85	-4765	0.74	-400
N-1: ROBINSON-HARRY ALLEN 500 KV	0.76	-2929	0.77	-2839	0.93	-1138	0.70	-1283	0.83	-2528	0.97	-2739	0.88	-4236	0.73	-409
N-1: ROCK CK-WAUTOMA 500 KV	0.75	-2844	0.77	-2764	0.93	-932	0.70	-2307	0.83	-3310	0.98	-2798	0.86	-4152	0.74	-381
N-1: ROUND MTN-TABLE MTN 500 KV	0.75	-2838	0.76	-2765	0.93	-1004	0.70	-2281	0.81	-3178	0.97	-3196	0.86	-4652	0.74	-393
N-1: ROUNDUP-LAGRANDE 230 KV	0.75	-2931	0.76	-2853	0.93	-1010	0.70	-2328	0.82	-3430	0.97	-3227	0.86	-4688	0.74	-395
N-1: SCHULTZ-SICKLER 500 KV	0.74	-2959	0.77	-2877	0.93	-1021	0.70	-2328	0.81	-3541	0.97	-3291	0.86	-4496	0.74	-398
N-1: SCHULTZ-VANTAGE 500 KV	0.74	-2961	0.77	-2878	0.93	-1021	0.70	-2328	0.81	-3534	0.97	-3298	0.85	-4521	0.74	-397
N-1: SCHULTZ-WAUTOMA 500 KV	0.75	-2927	0.77	-2849	0.93	-978	0.70	-2323	0.82	-3464	0.97	-3172	0.85	-4309	0.74	-391
N-1: SIGURD-GLEN CANYON 230 KV	0.75	-2966	0.76	-2883	0.93	-1041	0.70	-2327	0.81	-3540	0.97	-3316	0.85	-4766	0.74	-400
N-1: SLATT 500/230 KV XFMR	0.74	-3065	0.76	-2981	0.93	-1034	0.70	-2367	0.81	-3698	0.97	-3331	0.86	-4460	0.73	-406
N-1: SLATT-LONGHORN 500 KV	0.75	-2932	0.77	-2857	0.93	-1034	0.70	-2322	0.81	-3468	0.97	-3203	0.86	-4651	0.74	-399
N-1: SNOK TAP-SNOKING 500 KV	0.75	-2968	0.76	-2885	0.93	-1041	0.70	-2329	0.81	-3545	0.97	-3316	0.85	-4715	0.74	-400
N-1: TABLE MTN-TESLA 500 KV	0.75	-2843	0.76	-2768	0.93	-1002	0.70	-2277	0.81	-3239	0.97	-3229	0.86	-4672	0.74	-393
N-1: TABLE MTN-VACA DIXON 500 KV	0.76	-2771	0.77	-2703	0.93	-982	0.70	-2251	0.82	-3013	0.97	-3156	0.86	-4612	0.74	-389
N-1: VANTAGE 500/230 KV XFMR #1	0.75	-2966	0.76	-2883	0.93	-1041	0.70	-2329	0.81	-3541	0.97	-3311	0.85	-4790	0.74	-400
N-1: VANTAGE 500/230 KV XFMR #2	0.75	-2966	0.76	-2883	0.93	-1041	0.70	-2329	0.81	-3541	0.97	-3311	0.85	-4789	0.74	-400
N-1: WALLA WALLA-TALBOT 230 KV	0.74	-2958	0.77	-2875	0.93	-1024	0.70	-2327	0.81	-3534	0.97	-3302	0.86	-4710	0.74	-397
N-1: WALLA WALLA-WALLULA 230 KV	0.74	-2966	0.76	-2883	0.93	-1038	0.70	-2329	0.81	-3533	0.97	-3310	0.85	-4753	0.74	-400
N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.76	-2664	0.78	-2605	0.94	-807	0.70	-2283	0.87	-2750	0.99	-2169	0.88	-3453	0.75	-358
N-2: ASHE-MARION & BUCKLEY-MARION 500 KV	0.76	-2756	0.77	-2690	0.93	-954	0.70	-2287	0.85	-2855	0.98	-2420	0.88	-3877	0.74	-386
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.77	-2537	0.78	-2493	0.93	-868	0.70	-2240	0.88	-2500	0.98	-2000	0.91	-3376	0.75	-369
N-2: ASHE-MARION & SLATT-COYOTE TAP-LONGHORN 500 KV	0.76	-2772	0.77	-2708	0.93	-953	0.70	-2292	0.84	-2991	0.98	-2494	0.87	-3996	0.74	-385
N-2: ASHE-MARION & SLATT-JOHN DAY 500 KV	0.75	-2710	0.77	-2653	0.93	-946	0.70	-2276	0.85	-2947	0.97	-2394	0.88	-3888	0.74	-384
N-2: ASHE-SLATT & MCNARY-JOHN DAY 500 KV	0.76	-2783	0.77	-2712	0.93	-903	0.70	-2299	0.85	-3128	0.98	-2571	0.86	-3907	0.74	-375
N-2: ASHE-SLATT & SLATT-COYOTE TAP-LONGHORN 500 KV	0.75	-2830	0.77	-2754	0.94	-916	0.70	-2309	0.84	-3218	0.98	-2775	0.86	-4050	0.74	-378
N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.75	-3109	0.76	-3006	0.98	-817	0.70	-2378	0.81	-3623	0.97	-3352	0.86	-4440	0.73	-441
N-2: BETHEL-CEDAR SP 500KV & BETHEL-ROUND BUTTE 230 KV	0.74	-2900	0.77	-2826	0.93	-1040	0.70	-2311	0.82	-3350	0.97	-3077	0.87	-4524	0.74	-400
N-2: BETHEL-CEDAR SP 500KV & BETHEL-SANTIAM 230KV	0.74	-2896	0.77	-2825	0.93	-1037	0.70	-2310	0.82	-3352	0.97	-3082	0.87	-4532	0.74	-400
N-2: BETHEL-CEDAR SP 500KV & SANTIAM-MIKKALO 500KV	0.75	-2868	0.76	-2796	0.93	-1029	0.70	-2304	0.83	-3191	0.98	-2868	0.88	-4354	0.74	-398
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-CHEMAWA 230 KV	0.74	-2947	0.77	-2870	0.93	-1039	0.70	-2326	0.82	-3444	0.98	-3021	0.86	-4668	0.74	-400
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-TROUTDALE 230 KV	0.74	-2953	0.77	-2875	0.93	-1042	0.70	-2326	0.81	-3471	0.98	-3054	0.86	-4691	0.74	-400
N-2: BOISE BENCH-BROWNLEE #1 & #2 230 KV	0.78	-2527	0.79	-2483	0.93	-972	0.70	-2308	0.82	-3339	0.97	-3157	0.86	-4613	0.74	-388
N-2: BOISE BENCH-BROWNLEE #3 & BOISE BENCH-HORSEFLAT#4 230 KV	0.78	-2520	0.79	-2477	0.93	-971	0.70	-2308	0.81	-3335	0.97	-3154	0.86	-4610	0.74	-387
N-2: BRIDGER-POPULUS #1 & #2 345 KV	0.76	-2636	0.78	-2537	0.92	-1035	0.70	-2279	0.81	-3445	0.97	-3245	0.86	-4670	0.74	-421
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV	0.79	-2259	0.81	-2127	0.93	-1002	0.70	-2237	0.82	-3398	0.97	-3208	0.86	-4627	0.74	-422
N-2: BROADVIEW-TOWNSEND #1 & #2 500 KV + RAS	0.73	-3298	0.75	-3221	0.88	-1335	0.70	-2429	0.80	-3872	0.97	-3559	0.85	-4869	0.72	-490
N-2: BROWNLEE-HELLS CANYON & OXBOW-LOLO 230 KV	0.76	-2637	0.77	-2580	0.93	-836	0.70	-2316	0.84	-2963	0.98	-2759	0.88	-4115	0.75	-362
N-2: BROWNLEE-OXBOW & BROWNLEE-HELLS CANYON 230 KV	0.76	-2824	0.76	-2763	0.93	-951	0.70	-2329	0.82	-3292	0.97	-3089	0.87	-4475	0.74	-386
N-2: BUCKLEY-MARION & JOHN DAY-MARION 500 KV	0.75	-2871	0.76	-2799	0.93	-1023	0.70	-2309	0.83	-3147	0.98	-2790	0.88	-4316	0.74	-398

Appendix D - 16hs2a_2250idnw_N_ms Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Midpoint		Townsend		Robinson		Malin		John Day		Hanford		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: CHIEF JO-MONROE & CHIEF JO-SICKLER 500 KV	0.75	-2941	0.77	-2863	0.93	-1004	0.70	-2325	0.81	-3506	0.97	-3252	0.87	-4269	0.74	-395
N-2: CHIEF JO-MONROE 500 KV & CHIEF JO-SNOHOMS4 345 KV	0.74	-2950	0.77	-2872	0.92	-1027	0.70	-2326	0.81	-3506	0.97	-3260	0.86	-4411	0.74	-398
N-2: CHIEF JO-MONROE 500 KV & MONROE-SAMMAMSH 230 KV	0.74	-2958	0.77	-2876	0.93	-1030	0.70	-2327	0.81	-3529	0.97	-3277	0.86	-4494	0.74	-399
N-2: CHIEF JO-SICKLER 500 KV & CHIEF J3-SNOHOMS3 345 KV	0.74	-2953	0.77	-2871	0.93	-1015	0.70	-2326	0.81	-3532	0.97	-3286	0.86	-4459	0.74	-396
N-2: COULEE-CHIEF JO 500 KV & CHIEF J4-SNOHOMS4 345 KV	0.75	-2967	0.76	-2884	0.93	-1039	0.70	-2329	0.81	-3539	0.97	-3306	0.86	-4564	0.74	-400
N-2: COULEE-HANFORD & HANFORD-VANTAGE 500 KV	0.76	-2880	0.78	-2798	0.94	-838	0.70	-2319	0.81	-3466	0.98	-3055	0.84	-3620	0.74	-371
N-2: COULEE-SCHULTZ #1 & #2 500 KV	0.75	-2866	0.76	-2787	0.93	-885	0.70	-2313	0.82	-3433	0.97	-3104	0.88	-3678	0.74	-376
N-2: CUSTERW-ING500 & CUSTERW-MONROE 500 KV	0.74	-2958	0.77	-2875	0.93	-994	0.70	-2328	0.81	-3551	0.97	-3311	0.87	-4520	0.74	-395
N-2: CUSTERW-MONROE #1 & #2 500 KV + RAS	0.73	-3305	0.76	-3209	0.92	-1184	0.70	-2431	0.78	-4236	0.97	-3854	0.84	-5185	0.73	-437
N-2: DC-BIPOLE	0.78	-2127	0.78	-2055	0.94	-836	0.70	-1854	0.84	-2487	0.95	-3170	0.88	-4343	0.74	-372
N-2: DOUBLE PALO VERDE	0.86	-1436	0.86	-1440	0.96	-390	0.70	-1741	0.94	-1947	0.99	-1109	0.96	-1651	0.78	-243
N-2: ECHOLAKE-MAPLE VLY 500 KV & COVINGTON-MAPLE VLY 230 KV	0.75	-2968	0.76	-2885	0.93	-1043	0.70	-2329	0.81	-3538	0.97	-3302	0.86	-4640	0.74	-400
N-2: ECHOLAKE-MAPLE VLY 500 KV & ROCKY RH-MAPLE VLY 345 KV	0.75	-2965	0.77	-2882	0.93	-1040	0.70	-2329	0.81	-3533	0.97	-3279	0.86	-4503	0.74	-400
N-2: GARRISON-TAFT #1 & #2 500 KV + RAS	0.83	-2687	0.85	-2592	0.93	-431	0.70	-2417	0.82	-3403	0.97	-3122	0.87	-4242	0.77	-391
N-2: GRASSLAND-CEDAR SP 500KV & SLATT-BUCKLEY 500KV	0.76	-2636	0.77	-2578	0.93	-952	0.70	-2247	0.86	-2762	0.98	-2356	0.91	-3759	0.74	-385
N-2: GRASSLAND-COYOTE 500KV & SLATT-LONGHORN 500KV	0.76	-2780	0.78	-2726	0.93	-923	0.70	-2326	0.85	-2989	0.97	-2543	0.89	-3842	0.74	-379
N-2: GRIZZLY-MALIN & GRIZZLY-CAPTAIN JACK 500 KV + RAS	0.75	-2701	0.77	-2652	0.93	-1040	0.70	-2263	0.80	-2749	0.97	-3015	0.89	-4505	0.74	-417
N-2: GRIZZLY-MALIN & GRIZZLY-SUMMER LAKE 500 KV + RAS	0.76	-2678	0.77	-2640	0.94	-972	0.70	-2333	0.79	-2959	0.97	-3095	0.89	-4594	0.73	-407
N-2: GRIZZLY-MALIN & MALIN-SUMMER LAKE 500 KV + RAS	0.75	-2891	0.76	-2830	0.93	-1174	0.70	-2263	0.78	-2920	0.97	-3322	0.85	-5171	0.73	-439
N-2: HANFORD-ASHE & HANFORD-LOW MON 500 KV	0.74	-2947	0.77	-2870	0.93	-1007	0.70	-2328	0.81	-3472	0.97	-3239	0.81	-3418	0.74	-396
N-2: HANFORD-WAUTOMA #1 & #2 500 KV	0.75	-2874	0.77	-2799	0.93	-984	0.70	-2310	0.82	-3392	0.97	-3050	0.82	-4109	0.74	-389
N-2: JOHN DAY-BIG EDDY #1 & #2 500 KV	0.75	-2970	0.76	-2896	0.92	-1079	0.70	-2335	0.82	-3330	0.89	-3237	0.90	-4216	0.73	-408
N-2: JOHN DAY-BIG EDDY & JOHN DAY-MARION 500 KV	0.74	-2913	0.77	-2838	0.93	-1033	0.70	-2319	0.82	-3301	0.96	-3074	0.87	-4518	0.74	-399
N-2: JOHN DAY-GRIZZLY #1 & #2 500 KV + RAS	0.77	-2599	0.78	-2573	0.94	-925	0.70	-2302	0.84	-2743	0.97	-2736	0.90	-4229	0.74	-395
N-2: JOHN DAY-GRIZZLY #2 & BUCKLEY-GRIZZLY 500 KV + RAS	0.75	-2991	0.76	-2921	0.93	-1075	0.70	-2371	0.79	-3481	0.97	-3150	0.88	-4589	0.74	-422
N-2: JOHN DAY-MARION & BUCKLEY-MARION 500 KV	0.75	-2871	0.76	-2799	0.93	-1023	0.70	-2309	0.83	-3147	0.98	-2790	0.88	-4316	0.74	-398
N-2: JOHN DAY-MARION & MARION-PEARL 500 KV	0.75	-2808	0.76	-2743	0.93	-996	0.70	-2302	0.85	-2777	0.97	-2855	0.87	-4292	0.74	-393
N-2: JOHN DAY-ROCK CREEK 500 KV & MCNARY-ROSS 345 KV	0.75	-2821	0.77	-2745	0.93	-934	0.70	-2302	0.84	-3228	0.98	-2699	0.87	-4131	0.74	-381
N-2: KEELER-PEARL 500 & SHERWOOD-CARLTON 230 KV	0.74	-2910	0.77	-2838	0.93	-1005	0.70	-2320	0.83	-3313	0.97	-3032	0.87	-4455	0.74	-394
N-2: KNIGHT-OSTRANDER & OSTRANDER-BIG EDDY 500 KV	0.74	-2924	0.77	-2847	0.93	-1034	0.70	-2321	0.83	-3320	0.98	-2865	0.87	-4501	0.74	-399
N-2: KNIGHT-OSTRANDER 500 KV & MCNARY-ROSS 345 KV	0.74	-2916	0.77	-2839	0.93	-1031	0.70	-2320	0.83	-3341	0.98	-2920	0.87	-4484	0.74	-398
N-2: KNIGHT-OSTRANDER 500 KV & MIDWAY-BONNEVILLE 230 KV	0.74	-2913	0.77	-2836	0.93	-1019	0.70	-2318	0.82	-3368	0.98	-2931	0.87	-4483	0.74	-396
N-2: LOWER GRANITE-CENTRAL FERRY #1 & #2 500 KV	0.76	-2849	0.77	-2760	0.94	-839	0.70	-2307	0.81	-3596	0.97	-3361	0.86	-4420	0.75	-365
N-2: MALIN-ROUND MTN #1 & #2 500 KV	0.76	-2669	0.77	-2615	0.93	-1098	0.70	-2148	0.79	-2374	0.97	-3591	0.85	-5146	0.74	-417
N-2: MCNARY-JOHN DAY & ROCK CREEK-JOHN DAY 500 KV	0.76	-2700	0.78	-2639	0.93	-884	0.70	-2279	0.86	-3031	0.98	-2404	0.88	-3847	0.74	-371
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-HORSE HEAVEN 230 KV	0.75	-2849	0.77	-2776	0.93	-1005	0.70	-2305	0.83	-3315	0.97	-2876	0.87	-4359	0.74	-394
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-ROSS 345 KV	0.75	-2846	0.76	-2772	0.93	-1007	0.70	-2304	0.83	-3290	0.98	-2726	0.87	-4302	0.74	-394
N-2: MCNARY-ROSS 345 KV & MCNARY-HORSE HEAVEN 230 KV	0.74	-2926	0.77	-2851	0.93	-1036	0.70	-2321	0.82	-3448	0.97	-3175	0.86	-4593	0.74	-399
N-2: MIDPOINT-SUMMER LAKE 500 KV & MIDPOINT-KING 230 KV	0.70	-2413	0.72	-2090	0.93	-858	0.70	-2294	0.81	-3411	0.97	-3343	0.85	-4797	0.74	-375
N-2: MONROE-CUSTERW & CHIEF JO-MONROE 500 KV	0.74	-2948	0.77	-2869	0.93	-997	0.70	-2327	0.81	-3515	0.97	-3263	0.87	-4326	0.74	-395
N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV + RAS	0.76	-2963	0.78	-2896	0.93	-896	0.70	-2393	0.91	-2838	0.99	-1957	0.93	-2548	0.73	-401
N-2: PAUL-NAPAVINE & PAUL-ALLSTON #2 500 KV + RAS	0.76	-2965	0.78	-2898	0.93	-896	0.70	-2393	0.91	-2907	0.99	-1991	0.93	-2563	0.73	-401
N-2: PAUL-RAVER & RAVER-COVINGT4 500 KV	0.75	-2881	0.77	-2803	0.93	-970	0.70	-2314	0.82	-3384	0.98	-2907	0.88	-4096	0.74	-389
N-2: PEARL-KEELER 500 KV & PEARL-SHERWOOD 230 KV + RAS	0.74	-3081	0.77	-2996	0.93	-1051	0.70	-2371	0.82	-3650	0.97	-3234	0.87	-4362	0.73	-411
N-2: PEARL-OSTRANDER 500 KV & BIG EDDY-MCLOUGLN 230 KV	0.74	-2958	0.77	-2879	0.93	-1041	0.70	-2327	0.81	-3516	0.98	-3080	0.86	-4731	0.74	-400

Appendix D - 16hs2a_2250idnw_N_ms Base Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Midpoint		Townsend		Robinson		Malin		John Day		Hanford		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: PEARL-OSTRANDER 500 KV & OSTRANDER-MCLOUGLN 230 KV	0.74	-2957	0.77	-2878	0.93	-1042	0.70	-2327	0.81	-3502	0.97	-3218	0.86	-4731	0.74	-400
N-2: RAVER-COVINGTON #1 & #2 500 KV	0.75	-2972	0.76	-2889	0.93	-1047	0.70	-2330	0.81	-3552	0.97	-3322	0.86	-4689	0.74	-401
N-2: RAVER-ECHO LAKE & RAVER-SCHULTZ 500 KV	0.74	-2950	0.77	-2872	0.93	-1024	0.70	-2326	0.81	-3510	0.97	-3262	0.86	-4541	0.74	-398
N-2: RAVER-PAUL & NAPAVINE-PAUL 500 KV	0.75	-2874	0.77	-2797	0.93	-964	0.70	-2313	0.83	-3347	0.98	-2888	0.87	-4125	0.74	-388
N-2: RAVER-PAUL 500 KV & COULEE-OLYMPIA 300 KV	0.75	-2985	0.77	-2902	0.93	-997	0.70	-2346	0.81	-3584	0.97	-3101	0.89	-3800	0.74	-399
N-2: RAVER-PAUL 500 KV & TACOMA A-CHEHALIS 230 KV	0.75	-2982	0.77	-2899	0.93	-1001	0.70	-2345	0.81	-3579	0.97	-3105	0.89	-3918	0.74	-399
N-2: RAVER-SCHULTZ #1 & #2 500 KV	0.74	-2937	0.77	-2860	0.93	-1027	0.70	-2324	0.82	-3464	0.97	-3163	0.86	-4262	0.74	-398
N-2: RAVER-TACOMA & RAVER-COVINGT4 500 KV	0.75	-2966	0.76	-2883	0.93	-1041	0.70	-2329	0.81	-3538	0.97	-3298	0.86	-4624	0.74	-400
N-2: RAVER-TACOMA 500 KV & TACOMA-CHRISTOP-COVINGTON 230 KV	0.75	-2964	0.77	-2881	0.93	-1039	0.70	-2328	0.81	-3535	0.97	-3299	0.86	-4652	0.74	-400
N-2: ROUND MTN-TABLE MTN #1 & #2 500 KV + RAS	0.76	-2862	0.77	-2793	0.93	-1167	0.70	-2203	0.77	-2821	0.97	-4026	0.83	-5579	0.74	-426
N-2: SCHULTZ-WAUTOMA & VANTAGE-SCHULTZ 500 KV + RAS	0.73	-3292	0.76	-3195	0.93	-1108	0.70	-2431	0.79	-4218	0.97	-3779	0.82	-4562	0.74	-427
N-2: SICKLER-SCHULTZ & SCHULTZ-VANTAGE 500 KV + RAS	0.74	-3125	0.76	-3034	0.93	-1082	0.70	-2376	0.80	-3863	0.97	-3548	0.85	-4558	0.74	-415
N-2: TABLE MTN-TESLA & TABLE MTN-VACA DIXON 500 KV	0.74	-3114	0.76	-3032	0.93	-1098	0.70	-2379	0.80	-3361	0.97	-3417	0.89	-3980	0.73	-435
N-2: TAFT-BELL 500 KV & BELL-LANCASTER 230 KV	0.75	-2983	0.76	-2900	0.95	-898	0.70	-2339	0.81	-3498	0.97	-3277	0.86	-4541	0.74	-412
N-2: TAFT-BELL 500KV & BELL-BOUNDARY #3 230KV	0.75	-3012	0.76	-2933	0.95	-980	0.70	-2344	0.81	-3488	0.97	-3268	0.86	-4493	0.74	-422
N-2: TAFT-BELL 500KV & BELL-LANCASTER 230KV	0.75	-2983	0.76	-2900	0.95	-898	0.70	-2339	0.81	-3498	0.97	-3277	0.86	-4541	0.74	-412
N-2: TAFT-BELL 500KV & BELL-TRENTWOOD #2 115KV	0.75	-3007	0.76	-2928	0.95	-980	0.70	-2343	0.81	-3483	0.97	-3264	0.86	-4532	0.74	-421
N-2: TAFT-BELL 500KV & LANCASTER-NOXON 230KV	0.75	-3004	0.76	-2924	0.95	-968	0.70	-2342	0.81	-3482	0.97	-3263	0.86	-4529	0.74	-420
N-2: TAFT-DWORSHAK & GARRISON-TAFT #1 500KV	0.84	-2392	0.85	-2330	0.95	-450	0.70	-2308	0.81	-3479	0.97	-3262	0.86	-4500	0.78	-312
N-2: TOWNSEND-GARRISON #1 & #2 500 KV	0.81	-2683	0.84	-2482	1.00	-481	0.70	-2327	0.81	-3517	0.97	-3287	0.86	-4676	0.74	-394
N-2: WAUTOMA-ROCK CK 500 KV & MIDWAY-BIG EDDY 230 KV	0.75	-2813	0.77	-2741	0.94	-910	0.70	-2301	0.84	-3263	0.97	-2845	0.86	-4048	0.74	-377
N-2: WAUTOMA-ROCK CK 500 KV & SPRINGCREEK-BIG EDDY 230 KV	0.75	-2813	0.77	-2741	0.94	-910	0.70	-2301	0.84	-3263	0.97	-2845	0.86	-4048	0.74	-377
N-3: SCHULTZ-RAVER #1 & #2 & #3 500 KV	0.74	-2926	0.77	-2851	0.93	-1019	0.70	-2323	0.82	-3427	0.97	-3108	0.87	-4113	0.74	-397

Appendix D – 16hs2a_2250idnw_ms Base Case Transient Stability Plots

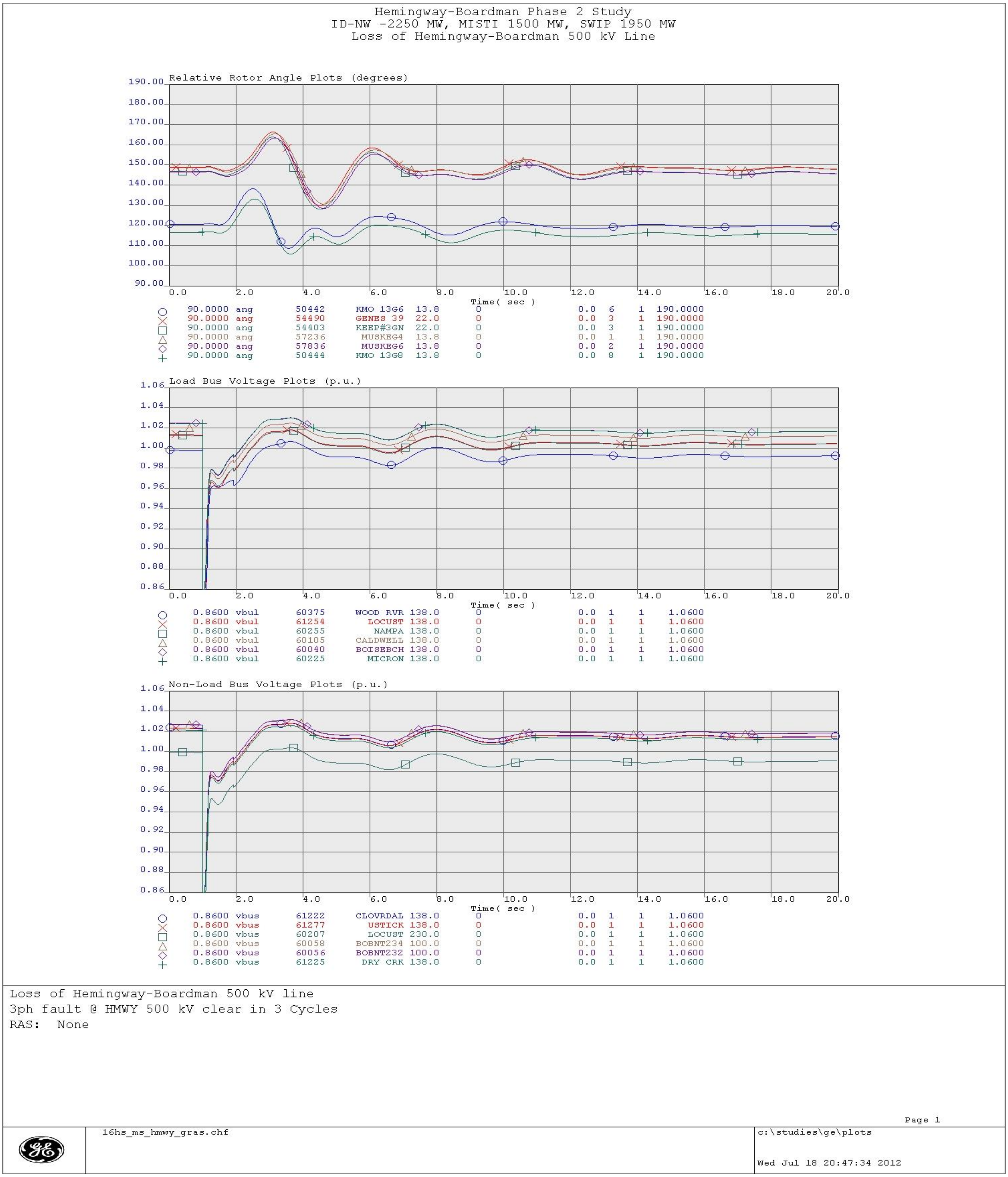


Figure D8: N-1 Loss of Hemingway-Boardman 500 kV Line (Angle & Voltage Plots)

Appendix D – 16hs2a_2250idnw_ms Base Case Transient Stability Plots

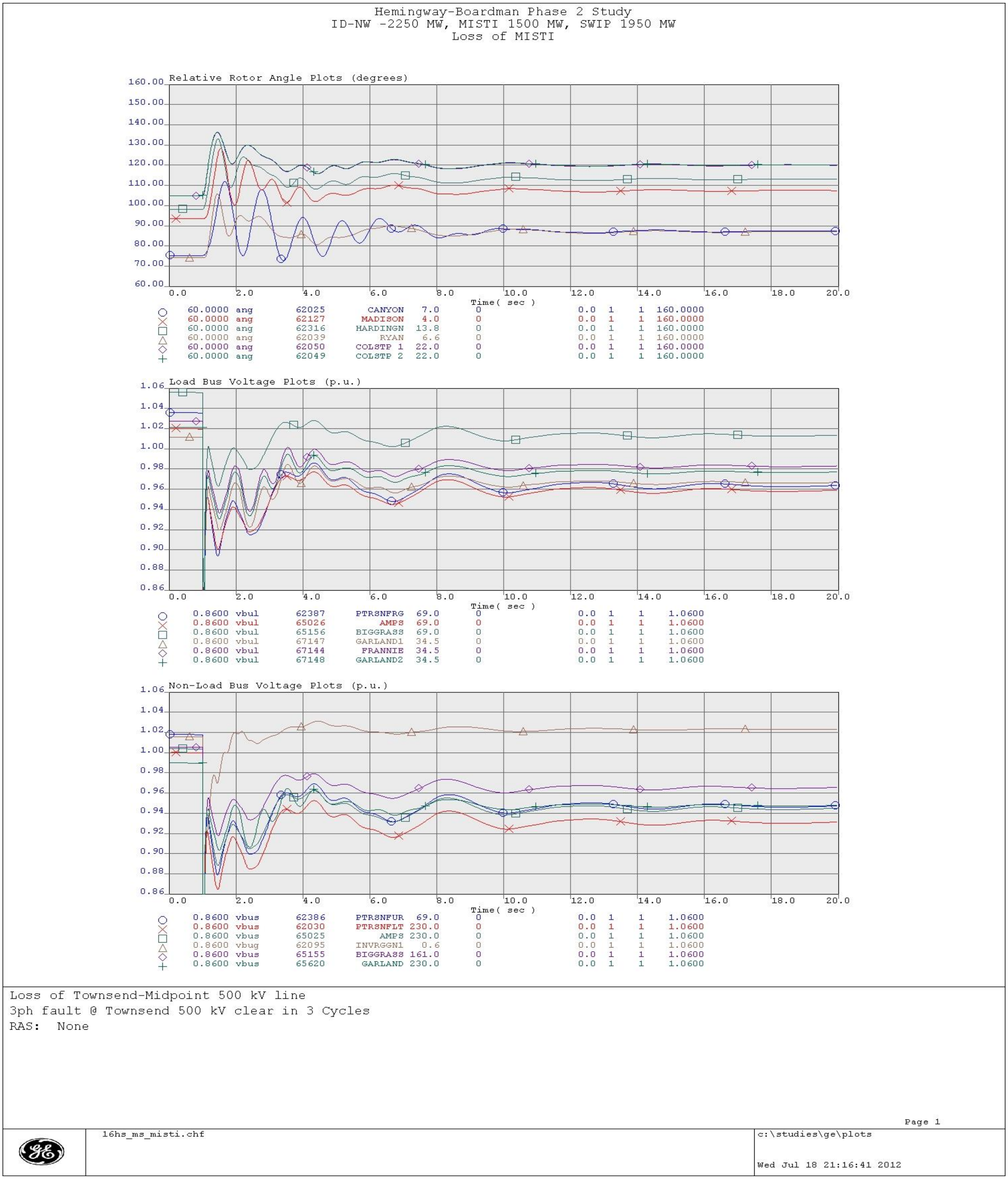
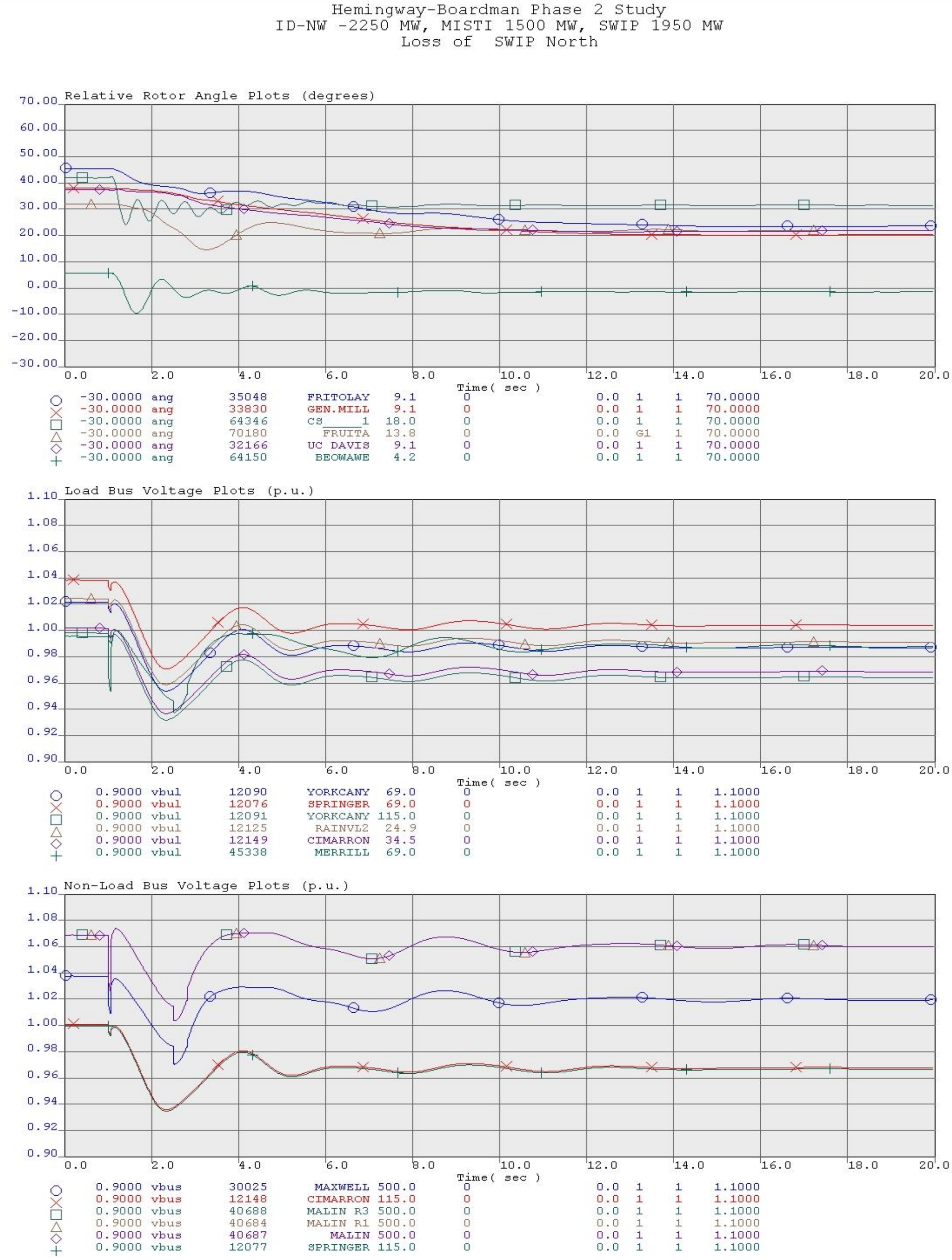


Figure D9: N-1 Loss of Townsend-Midpoint (MSTI) 500 kV Line (Angle & Voltage Plots)

Appendix D – 16hs2a_2250idnw_ms Base Case Transient Stability Plots



Loss of Robinson-Cedar Hill 500 kV line
3ph fault @ RBSN 500 kV clear in 3 Cycles
RAS: None

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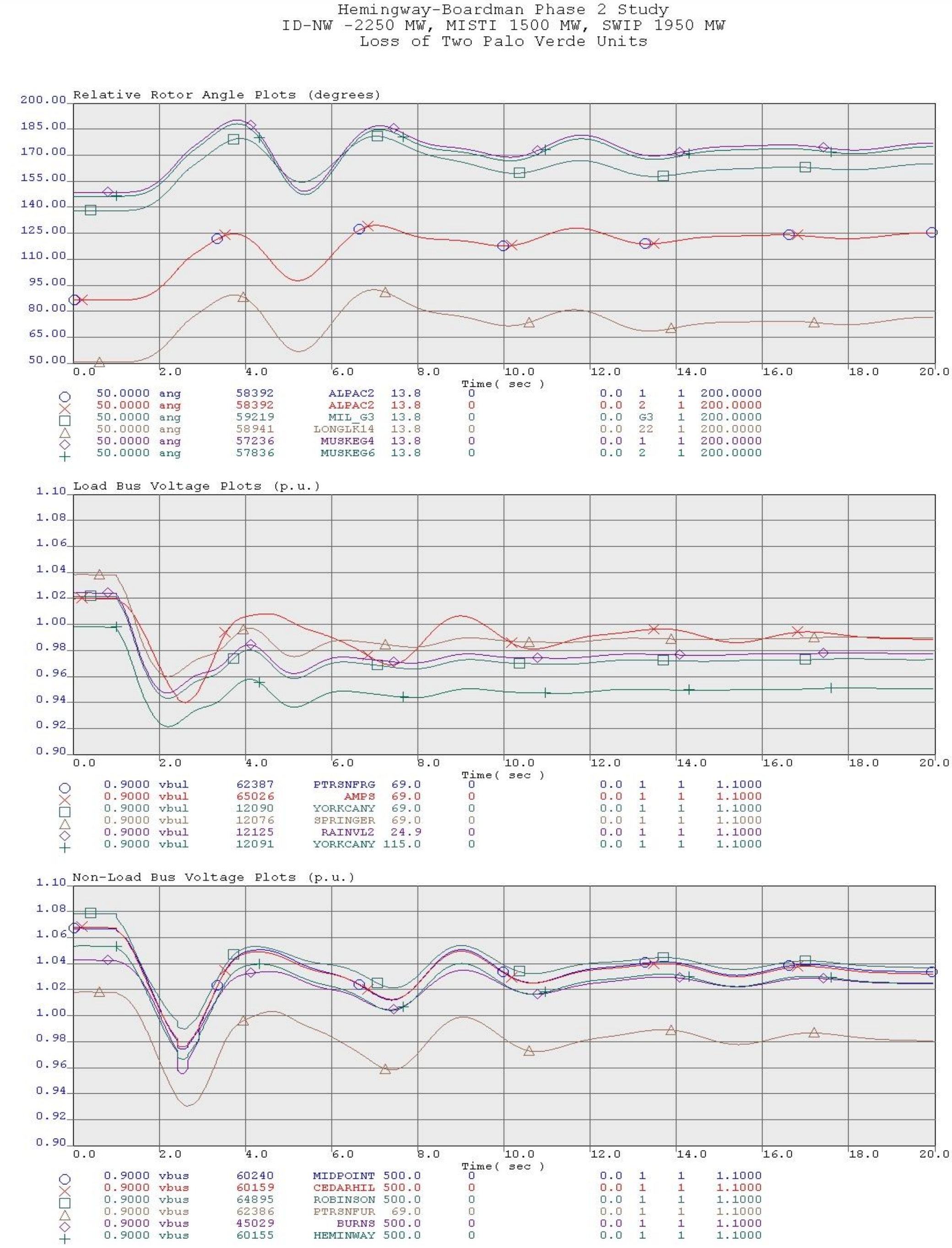
Figure D10: N-1 Loss of Cedar Hill-Robinson (SWIP North) 500 kV Line (Angle & Voltage Plots)

Appendix D – 16hs2a_2250idnw_ms Base Case Transient Stability Plots

Figure D11: Bi-Pole Block – Pacific DC Intertie (Angle & Voltage Plots)

Appendix D – 16hs2a_2250idnw_ms Base Case Transient Stability Plots



Loss of 2 Palo Verde Units
RAS: With Phoenix Area Load Tripping RAS
FACRI Reactive Switching

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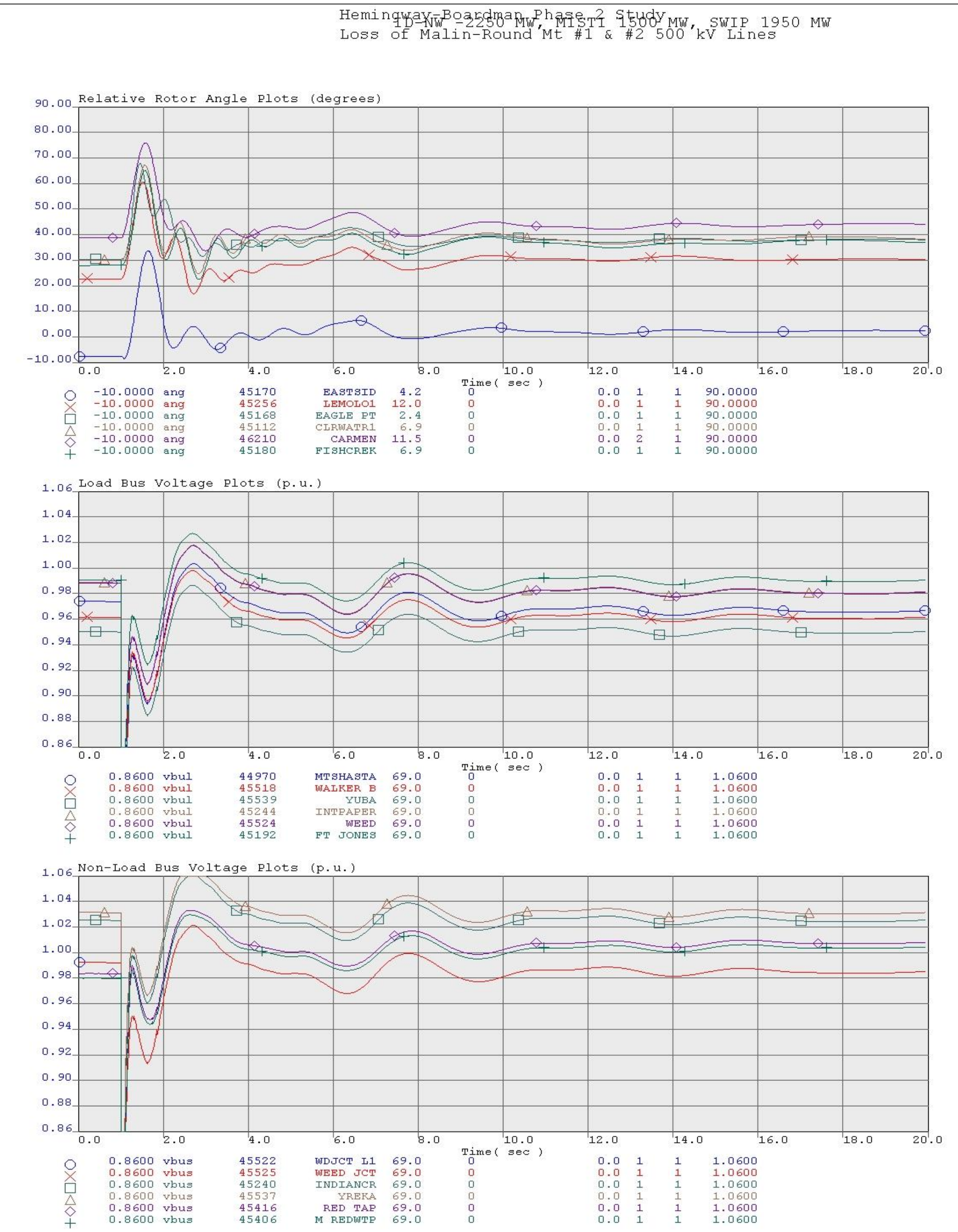
Figure D12: N-2 Loss of Two Palo Verde Units (Angle & Voltage Plots)

Appendix D – 16hs2a_2250idnw_ms Base Case Transient Stability Plots



3-Phase Fault @ Malin 500 kV with 4 Cycle Clearing
Loss of Malin-Round Mtn #1 & #2 500 kV Lines
Opens Round Mtn-Table Mtn #2 500 kV Line
RAS: FACRI and Tracy/Olinda 500 kV Reactive Switching
NW Gen Drop 2400 MW

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Figure D13: N-2 Loss of Malin-Round Mt #1 & #2 500 kV Lines (Angle & Voltage Plots)

Appendix D - 16hs2a_2250idnw_ms Base Case Transient Stability Results

Fault	Disturbance/Outage	RAS Actions		Largest Swing Voltage Bus (% change)	Lowest Swing Voltage Bus (absolute value)	Largest Swing Voltage Load Bus (% change)	Lowest Load Bus Frequency (Hz)	Comments
		Cycles	Remedial Action					
N-1 3 Cy 3PH Hemingway 500 kV	Hemingway-Grassland 500 kV	Var	FACRI insertion of Ft Rock Series Caps and Malin Shunt Cap C1	Wood Rvr 138 11.0%	Logn#4 46.0 0.871	Wood Rvr 138 11.0%	Bridger3 22.0 59.881	Stable & Damped
N-1 3 Cy 3PH Townsend 500 kV	MSTI (Townsend-Midpoint 500 kV)	Var	FACRI insert Ft Rock Series Caps	Ptrsnfrg 69 13.7%	Ptrsnflt 230 0.865	Ptrsnfrg 69 13.7%	Montana1 13.8 59.822	Stable & Damped
N-1 3 Cy 3PH Robinson 500 kV	SWIPN (CedarHill-Robinson 500 kV)	Var	FACRI insertion of Ft Rock Series Caps and Malin Shunt Cap C1	Yorkcany 69 6.7%	Sprague 69 0.902	Yorkcany 69 6.7%	Cs____1 18.0 59.852	Stable & Damped
Bi-pole Block	PDCI Bipole	Var	FACRI insertion of Ft Rock Series Caps and Malin Shunt Cap C1 Tracy&Olinda React Switching NW 2550 MW Gen Drop	Yorkcany 69 7.8%	Sprague 69 0.907	Yorkcany 69 7.8%	Sync_g19 13.8 59.759	Stable & Damped
N-2	Loss of 2 Palo Verde units	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1 & CaptJack Shunt Cap C1	Midpoint 500 8.7%	Goldhill 69 0.886	Ptrsnfrg 69 8.6%	MuskeG4 13.8 59.779	Stable & Damped
N-2 4 Cy 3PH Malin 500 kV	Malin-Round Mt #1 500 kV Malin-Round Mt #2 500 kV Round Mt-Table Mt #2 500 kV	Var	Chief Jo Braking Resistor Tracy&Olinda React Switching NW 2400 MW Gen Drop FACRI FtRock Series Caps Flash Malin-Round Mt S-Caps	Mtshasta 69 15.2%		Mtshasta 69 15.2%	Kno 13g6 13.8 59.753	Stable & Damped

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Shunt HANFORD_500.0 (40499) #s
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Bus MALIN R3_500.0 (40688)
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Bus HOT SPR_500.0 (40553)
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP S1_ 18.0 (47641)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G2_ 18.0 (47640)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G1_ 18.0 (47639)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 2
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN Bus ASHE R1_500.0 (40062)
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Bus SANTIAM_500.0 (40941)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Shunt OSTRNDER_500.0 (40809) #s
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3

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Contingency Studied	Actions Taken in the Contingency
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOK TAP_500.0 (41001)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOKING_500.0 (41007)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt MONROE_500.0 (40749) #s
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR G2_ 20.0 (47744)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2AX_ 4.2 (47746)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2FG_ 13.8 (47747)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR G1_ 20.0 (47740)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1AX_ 4.2 (47742)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1FG_ 13.8 (47743)
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Transformer TONO_115.0 (42806) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Shunt OLY E_230.0 (40794) #s
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN Shunt MONROE_500.0 (40749) #s
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Transformer ALLSTON_500.0 (40045) TO ALLSTN E_230.0 (40043) CKT 2
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Bus HATWAI_500.0 (40521)
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Bus HATWAI_230.0 (40519)
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line NPULLMAN_115.0 (48291) TO SHAWNEE_115.0 (48383) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line MOSCITYT_115.0 (48245) TO SPULLMAN_115.0 (48413) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS HOT SPR_500.0 (40553) TO -148.3 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	CLOSE Line LEON_115.0 (48183) TO MOSCCITY_115.0 (48243) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line MOSCCITY_115.0 (48243) TO MOSCITYT_115.0 (48245) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS N LEWIST_115.0 (48253) TO 44.4 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS THIRHACH_115.0 (48431) TO 91.6 MVR
BF 4708 Hatwai 500 kV Bus	OPEN Bus HATWAI_500.0 (40521)
BF 4708 Hatwai 500 kV Bus	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4708 Hatwai 500 kV Bus	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Transformer CHIEF JO_500.0 (40233) TO CHIEF J2_230.0 (40232) CKT 3

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Contingency Studied	Actions Taken in the Contingency
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Transformer BIG EDDY_500.0 (40111) TO BIGEDDY1_230.0 (41341) CKT 2
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Bus CGS_ 25.0 (40063)
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN Bus BURNS_500.0 (45029)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R3_500.0 (40688)
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN Bus ROUND BU_500.0 (43485)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Bus MAPLE VL_500.0 (40693)
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M1_500.0 (43115)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G1_ 18.0 (47639) CKT 1

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G2_ 18.0 (47640) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP S1_ 18.0 (47641) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
BF 5266 Slatt-Buckly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Bus BURNS_500.0 (45029)
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF Lolo 230kV	OPEN Bus LOLO_230.0 (48197)
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	CLOSE Shunt QUARTZ_138.0 (60305) #c1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	CLOSE Shunt QUARTZ_138.0 (60305) #c1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Gen BOARD CT_ 18.5 (43044) #1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Transformer BOARD ST_ 16.0 (43045) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Transformer BOARD CT_ 18.5 (43044) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Gen BOARD ST_ 16.0 (43045) #1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
BF PGE Grassland-Slatt 500kV & Boardman Plant	OPEN Transformer BOARD F_ 24.0 (43047) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Slatt 500kV & Boardman Plant	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
Bus: Alvey 500 kV + RAS	OPEN Bus ALVEY_500.0 (40051)
Bus: Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
Bus: Bell BPA 500 kV	OPEN Bus BELL BPA_500.0 (40091)
Bus: Bell BPA 500 kV	OPEN Bus COULE R1_500.0 (40288)
Bus: Bell BPA 500 kV	OPEN Bus BELL SC_500.0 (40096)
Bus: Buckley 500 kV	OPEN Bus BUCKLEY_500.0 (40155)
Bus: Dixonville 500 kV	OPEN Bus DIXONVLE_500.0 (45095)
Bus: Dixonville 500 kV	SET SWITCHED SHUNT AT BUS GRANT PS_230.0 (45123) TO 147.4 MVR
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #2
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #3
Bus: Hot Springs 500 kV	OPEN Bus HOT SPR_500.0 (40553)
Bus: Keeler 500 kV + RAS	OPEN Bus KEELER_500.0 (40601)
Bus: Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
Bus: Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_500.0 (41401)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_230.0 (41402)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_230.0 (47386)
Bus: Rock Creek 500 kV	OPEN Bus ENRGZR T_230.0 (47823)
Bus: Rock Creek 500 kV	OPEN Bus WHITE CK_230.0 (47827)
Bus: Rock Creek 500 kV	OPEN Bus IMRIE_230.0 (47822)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_ 34.5 (47387)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC C1_ 34.5 (47388)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC W1_ 0.7 (47389)
Bus: Rock Creek 500 kV	OPEN Bus DOOLEY T_230.0 (47465)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 3_ 34.5 (47496)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 2_ 34.5 (47493)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C2_ 34.5 (47494)

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Contingency Studied	Actions Taken in the Contingency
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W2_ 0.7 (47495)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C3_ 34.5 (47497)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W3_ 0.7 (47498)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE 1_ 34.5 (47829)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 1_ 34.5 (47825)
Bus: Rock Creek 500 kV	OPEN Bus WILLIS T_230.0 (47824)
Bus: Rock Creek 500 kV	OPEN Bus TULMN 1_ 34.5 (47826)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C1_ 34.5 (47936)
Bus: Rock Creek 500 kV	OPEN Bus TULMN C1_ 34.5 (47938)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 2_ 34.5 (47903)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 1_ 34.5 (47902)
Bus: Rock Creek 500 kV	OPEN Bus MILLRA S_230.0 (47857)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE C1_ 34.5 (47865)
Bus: Rock Creek 500 kV	OPEN Bus MILLR 1_ 34.5 (47966)
Bus: Rock Creek 500 kV	OPEN Bus HARVST W_230.0 (47858)
Bus: Rock Creek 500 kV	OPEN Bus HRVST 1_ 34.5 (47979)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE W1_ 0.6 (47866)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C1_ 34.5 (47904)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C2_ 34.5 (47905)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W1_ 0.7 (47906)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W2_ 0.7 (47907)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W1_ 0.7 (47937)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W2_ 0.6 (47940)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W1_ 0.7 (47939)
Bus: Rock Creek 500 kV	OPEN Bus MILLR C1_ 34.5 (47967)
Bus: Rock Creek 500 kV	OPEN Bus MILLR W1_ 0.6 (47968)
Bus: Rock Creek 500 kV	OPEN Bus HRVST C1_ 34.5 (47980)
Bus: Rock Creek 500 kV	OPEN Bus HRVST W1_ 0.7 (47981)
Bus: Sickler 500 kV	OPEN Bus SICKLER_500.0 (40973)
Bus: Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
Bus: Summer Lake 500 kV	OPEN Bus SUMMER L_500.0 (41043)
Bus: Summer Lake 500 kV	OPEN Bus BURNS_500.0 (45029)
Bus: Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-1: Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
N-1: Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
N-1: Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
N-1: Allston-Napavine 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-1: Allston-Paul #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-1: Alvery-Dixonville 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO DIXONVLE_500.0 (45095) CKT 1
N-1: Alvey-Marion 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
N-1: Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-1: Ashe-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
N-1: Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-1: Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-1: Bell-Coulee 500 kV	OPEN Bus COULE R1_500.0 (40288)
N-1: Bell-Taft 500 kV	OPEN Bus BELL SC_500.0 (40096)
N-1: Big Eddy-Celilo 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO CELILO1_500.0 (41311) CKT 1
N-1: Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-1: Big Eddy-Knight 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO KNIGHT_500.0 (41450) CKT 1
N-1: Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-1: Boise Bench-Brownlee #3 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-1: Brady-Antelope 230 kV	OPEN Line BRADY_230.0 (60073) TO ANTLOPE_230.0 (65075) CKT 1
N-1: Broadview-Garrison #1 500 kV	OPEN Bus GAR1EAST_500.0 (40451)
N-1: Broadview-Garrison #1 500 kV	OPEN Bus TOWN1_500.0 (62013)
N-1: Brownlee-Ontario 230 kV	OPEN MultiSectionLine BROWNLEE_230.0 (60095) TO ONTARIO_230.0 (60265) CKT 1
N-1: Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-1: Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-1: Buckley-Slatt 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-1: Captain Jack-Olinda 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO OLINDA_500.0 (30020) CKT 1
N-1: CaptJack-Kfalls 500 kV	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
N-1: Cascade Crossing 500 kV	OPEN Bus CDR SPRG_500.0 (43950)
N-1: Cascade Crossing 500 kV	OPEN Bus CDRSBET1_500.0 (43951)

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Contingency Studied	Actions Taken in the Contingency
N-1: Cascade Crossing 500 kV	OPEN Bus BETHCRS1_500.0 (43491)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHEL5_500.0 (43041)
N-1: Cedar Hill-Robinson 500 kV (SWIP)	OPEN MultiSectionLine CEDARHIL_500.0 (60159) TO ROBINSON_500.0 (64895) CKT 1
N-1: Chief Jo-Coulee 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-1: Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-1: Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-1: Coulee-Hanford 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-1: Coulee-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Covington4-Raver 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-1: Covington5-Raver 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
N-1: Coyote-Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
N-1: CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-1: Dixonville-Meridian 500 kV	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
N-1: Drycreek-Lolo 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO LOLO_230.0 (48197) CKT 1
N-1: Drycreek-N Lewiston 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO N LEWIST_230.0 (48255) CKT 1
N-1: Drycreek-Wala Ava 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO WALA AVA_230.0 (48451) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Dworshak-Taft 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-1: Echo Lake-Maple Valley 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO MAPLE VL_500.0 (40693) CKT 1
N-1: Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-1: Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Echo Lake-Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
N-1: Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-1: Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSHE1_115.0 (32229)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSESHE_115.0 (32230)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTL1_115.0 (32233)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_115.0 (32234)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_ 13.2 (32460)
N-1: Goldhill-Placer 115 kV	OPEN Bus FLINT1_115.0 (32236)
N-1: Grassland-Coyote 500 kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-1: Grassland-Slatt 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
N-1: Grizzly-John Day #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-1: Grizzly-Malin 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN MultiSectionLine PONDROSA_500.0 (40837) TO SUMMER L_500.0 (41043) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZ R3_500.0 (40488) TO PONDROSA_500.0 (40837) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO GRIZZ R3_500.0 (40488) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Grizzly-Round Bu 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO ROUND BU_500.0 (43485) CKT 1
N-1: Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-1: Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-1: Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Transformer HATWAI_500.0 (40521) TO HATWAI_230.0 (40519) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 67.1 MVR
N-1: Hatwai-Lolo 230 kV	OPEN Line HATWAI_230.0 (40519) TO LOLO_230.0 (48197) CKT 1
N-1: Hatwai-Low Gran 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Hatwai-N Lewiston 230 kV	OPEN Line HATWAI_230.0 (40519) TO N LEWIST_230.0 (48255) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO HURICANE_230.0 (45103) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN MultiSectionLine HURICANE_230.0 (45103) TO WALAWALA_230.0 (45327) CKT 1
N-1: Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt MALIN_500.0 (40687) #s
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Hemingway-Summer Lake 500 kV	OPEN Line HEMINWAY_500.0 (60155) TO BURNS_500.0 (45029) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN MultiSectionLine BURNS_500.0 (45029) TO SUMMER L_500.0 (41043) CKT 1
N-1: Hill Top 345/230 Xfmr	OPEN Transformer HIL TOP_230.0 (40537) TO HIL TOP_345.0 (64058) CKT 1
N-1: Horse Hv-McNary 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-1: Horse Hv-McNary 230 kV	SET SWITCHED SHUNT AT BUS HARVALUM_230.0 (40511) TO 40.7 MVR
N-1: Hot Springs-Taft 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line COYOTECR_345.0 (64032) TO HUMBOLDT_345.0 (64059) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line MAGGIECR_120.0 (64070) TO CARLIN_120.0 (64169) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt EIGHTMFK_120.0 (64457) #b
N-1: Humboldt-Coyote Ck 345 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 10.8 MVR
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt MIDPOINT_345.0 (60235) #2
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO &1_345.0 (67582)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO_345.0 (66225)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #2_ 99.0 (65014)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #3_ 99.0 (65017)
N-1: Ing500-CusterW 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-1: John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-1: John Day-Rock Ck 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-1: John Day-Slatt 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-1: Kfalls-Meridian 500 kV	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
N-1: Knight-Wautoma 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
N-1: LaGrande-North Powder 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO N POWDER_230.0 (60312) CKT 1
N-1: Lanes-Marion 500 kV	OPEN Line LANE_500.0 (40629) TO MARION_500.0 (40699) CKT 1
N-1: Lit Goose-Central Ferry 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
N-1: Lit Goose-Low Mon 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
N-1: Low Gran-Central Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Low Mon-Sac Tap 500 kV	OPEN Line LOW MON_500.0 (40683) TO SACJWA T_500.0 (40917) CKT 1
N-1: Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
N-1: Malin-Hilltop 230 kV	OPEN Line CANBYTAP_230.0 (40171) TO HIL TOP_230.0 (40537) CKT 1
N-1: Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-1: Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-1: Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-1: Maple Vly-Rocky RH 345 kV	OPEN MultiSectionLine MAPLE VL_345.0 (40691) TO ROCKY RH_345.0 (40891) CKT 1
N-1: Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Line MARION_500.0 (40699) TO SANTIAM_500.0 (40941) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Shunt SANTIAM_230.0 (40939) #s
N-1: McLouglin-Ostrander 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-1: McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary S2-McNary S3 230 kV	OPEN Line MCNRY S2_230.0 (41352) TO MCNRY S3_230.0 (41353) CKT 1
N-1: McNary-Board T1 230 kV	OPEN Line BOARD T1_230.0 (40121) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-1: McNary-Longhorn 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
N-1: McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-1: McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-1: McNary-Roundup 230 kV	OPEN Line MCNRY S1_230.0 (41351) TO ROUNDUP_230.0 (40905) CKT 1

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJWA T_500.0 (40917)
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
N-1: McNary-Sac Tap-Low Mon 500 kV	CLOSE Gen ICE H1-2_ 13.8 (40559) #1
N-1: Midpoint-Hemingway 500 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Humboldt 345 kV	OPEN Bus IDAHO-NV_345.0 (64061)
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS HIL TOP_230.0 (40537) TO 52.2 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO TWNSNDPS_500.0 (62503) CKT 1
N-1: Midpoint-Townsend 500 kV (MSTI)	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)	SET SWITCHED SHUNT AT BUS RIVERTON_230.0 (66305) TO 32.4 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)	SET SWITCHED SHUNT AT BUS GARLAND1_ 34.5 (67147) TO 5 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)	SET SWITCHED SHUNT AT BUS GARLAND2_ 34.5 (67148) TO 5 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)	SET SWITCHED SHUNT DILLON S_ 69.0 (62345) #1 TO 24 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)	SET SWITCHED SHUNT AT BUS BIGGRASS_ 69.0 (65156) TO 29.4 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)	SET SWITCHED SHUNT AT BUS AMPS_ 69.0 (65026) TO 30 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)	SET SWITCHED SHUNT AT BUS FRANNIE_ 34.5 (67144) TO 4 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)	SET SWITCHED SHUNT AT BUS FRANNIE2_ 34.5 (67145) TO 4 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO TWNSNDPS_500.0 (62503) CKT 1
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	SET SWITCHED SHUNT AT BUS RIVERTON_230.0 (66305) TO 32.4 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	SET SWITCHED SHUNT AT BUS GARLAND2_ 34.5 (67148) TO 5 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	SET SWITCHED SHUNT DILLON S_ 69.0 (62345) #1 TO 24 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	SET SWITCHED SHUNT AT BUS BIGGRASS_ 69.0 (65156) TO 29.4 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	SET SWITCHED SHUNT AT BUS AMPS_ 69.0 (65026) TO 30 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	SET SWITCHED SHUNT AT BUS FRANNIE_ 34.5 (67144) TO 4 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	SET SWITCHED SHUNT AT BUS GARLAND1_ 34.5 (67147) TO 5 MVR
N-1: Midpoint-Townsend 500 kV (MSTI)+PTSN Shunt	SET SWITCHED SHUNT AT BUS FRANNIE2_ 34.5 (67145) TO 4 MVR
N-1: Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
N-1: Ontario-Caldwell 230 kV	OPEN MultiSectionLine CALDWELL_230.0 (60110) TO LANGLEY_230.0 (60266) CKT 1
N-1: Ostrander-Knight 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-1: Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-1: Ostrander-Troutdale 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO TROUTDAL_500.0 (41095) CKT 1
N-1: Oxbow-Brownlee #2 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 2
N-1: Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-1: Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-1: Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO SATSOP_500.0 (40949) CKT 1
N-1: Pearl-Keeler 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-1: Pinto-Four Corner 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Ponderosa A 500/230 kV Xfmr	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Ponderosa B 500/230 kV Xfmr	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Raver-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-1: Raver-Tacoma 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus H ALLEN_345.0 (18001)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus HA PS_345.0 (18002)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus UTAH-NEV_345.0 (67657)
N-1: Robinson-Harry Allen 500 kV	OPEN MultiSectionLine ROBINSON_500.0 (64895) TO H ALLEN_500.0 (18450) CKT 1
N-1: Robinson-Harry Allen 500 kV	SET SWITCHED SHUNT AT BUS ROBINSON_500.0 (64895) TO 0 MVR
N-1: Rock Ck-Wautoma 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Round Mtn-Table Mtn 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-1: Roundup-Lagrande 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO ROUNDUP_230.0 (40905) CKT 1
N-1: Schultz-Sickler 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-1: Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-1: Schultz-Wautoma 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Sigurd-Glen Canyon 230 kV	OPEN Bus SIGURDPS_230.0 (66355)
N-1: Slatt 500/230 kV Xfmr	OPEN Transformer SLATT_500.0 (40989) TO SLATT_230.0 (40986) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-1: Snok Tap-Snoking 500 kV	OPEN Line SNOK TAP_500.0 (41001) TO SNOKING_500.0 (41007) CKT 1

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Table Mtn-Tesla 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-1: Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-1: Vantage 500/230 kV Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
N-1: Vantage 500/230 kV Xfmr #2	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 2
N-1: Walla Walla-Talbot 230 kV	OPEN Line TALBOT_230.0 (44912) TO WALAWALA_230.0 (45327) CKT 1
N-1: Walla Walla-Wallula 230 kV	OPEN Line WALAWALA_230.0 (45327) TO WALLULA_230.0 (45331) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Line BETHEL_230.0 (43039) TO ROUNDB N_230.0 (43483) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	CLOSE Shunt BETHEL5_500.0 (43041) #1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN MultiSectionLine BETHEL_230.0 (43039) TO SANTIAM_230.0 (40939) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	CLOSE Shunt BETHEL5_500.0 (43041) #1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap MIKKALO_500.0 (43970) TO MKLOSNT2_500.0 (43971) CKT 2
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap SANTIAM_500.0 (40941) TO SANTMKO2_500.0 (43492) CKT 2
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN MultiSectionLine BIGEDDY2_230.0 (41342) TO CHEMAWA_230.0 (40213) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Bus PARKDALE_230.0 (40813)
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 2
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIHOR41_230.0 (61995) CKT 4 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO HORSEFLT_230.0 (60102) CKT 4
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO11_230.0 (61998) CKT 1 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO21_230.0 (61997) CKT 2 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 1
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine BRIDGER_345.0 (60085) TO 3MIKNOLL_345.0 (60084) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	CLOSE Shunt KINPORT_345.0 (60190) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Townsend #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Townsend #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN2_500.0 (62012) CKT 2

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Broadview-Townsend #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Broadview-Townsend #1 & #2 500 kV + RAS	OPEN Gen COLSTP 2_ 22.0 (62049) #1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Transformer HELLSCYN_230.0 (60150) TO HELSCYN1_ 14.4 (60151) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN Line MONROE_230.0 (40747) TO NOVELTY_230.0 (42304) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus CHIEF J3_345.0 (40223)
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus SNOHOMS3_345.0 (40993)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #I
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO3_ 13.8 (41216) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO4_ 13.8 (41217) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO5_ 13.8 (41218) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO6_ 13.8 (41219) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO7_ 13.8 (41220) #F
N-2: DC-BIPOLE	OPEN Shunt MALIN_500.0 (40687) #s
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: DC-BIPOLE	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: DC-BIPOLE	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: DC-BIPOLE	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: DC-BIPOLE	CHANGE INJECTION GROUP RAS PDCI Gen Drop Units BY 'PDCI_gen_drop_value_less300' MW in generator merit order by opening
N-2: DC-BIPOLE	OPEN Bus SYLMAR1_230.0 (26097)
N-2: DC-BIPOLE	OPEN Bus SYLMAR2_230.0 (26099)
N-2: DC-BIPOLE	OPEN Shunt SYLMAR S_230.0 (24147) #b
N-2: DC-BIPOLE	OPEN Shunt SYLMARLA_230.0 (26094) #b
N-2: DC-BIPOLE	OPEN Shunt BIGEDDY2_230.0 (41342) #s
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #b

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS ANTELOPE_230.0 (24401) TO 158.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt BARRE_230.0 (24016) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS BARRE_230.0 (24016) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt CHINO_230.0 (24025) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS CHINO_230.0 (24025) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt DEVERS_230.0 (24804) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS DEVERS_230.0 (24804) TO 316.8 MVR
N-2: DC-BIPOLE	CLOSE Shunt EL NIDO_230.0 (24040) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS EL NIDO_230.0 (24040) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt GOULD_230.0 (24059) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS GOULD_230.0 (24059) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LCIENEGA_230.0 (24082) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LCIENEGA_230.0 (24082) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LAGUBELL_230.0 (24076) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LAGUBELL_230.0 (24076) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOMW_230.0 (24093) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOMW_230.0 (24093) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOME_230.0 (25656) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOME_230.0 (25656) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRAGE_230.0 (24806) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRAGE_230.0 (24806) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MOORPARK_230.0 (24099) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MOORPARK_230.0 (24099) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_230.0 (24100) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS OLINDA_230.0 (24100) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt PADUA_230.0 (24112) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PADUA_230.0 (24112) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt PARDEE_230.0 (24114) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PARDEE_230.0 (24114) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt RIOHONDO_230.0 (24126) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS RIOHONDO_230.0 (24126) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt SANBRDNO_230.0 (24132) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS SANBRDNO_230.0 (24132) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt S.CLARA_230.0 (24128) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS S.CLARA_230.0 (24128) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #b
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #2
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VALLEYSC_115.0 (24160) TO 187.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt VILLA PK_230.0 (24154) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VILLA PK_230.0 (24154) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VINCENT_230.0 (24155) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VINCENT_230.0 (24155) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VSTA_230.0 (24901) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VSTA_230.0 (24901) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt WALNUT_230.0 (24158) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS WALNUT_230.0 (24158) TO 79.2 MVR
N-2: DC-BIPOLE	OPEN Bus CELILO4_230.0 (41314)
N-2: DC-BIPOLE	OPEN Bus CELILO3_230.0 (41313)
N-2: DC-BIPOLE	OPEN Bus CELILO2_500.0 (41312)
N-2: DC-BIPOLE	OPEN Bus CELILO1_500.0 (41311)
N-2: Double Palo Verde	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-2: Double Palo Verde	OPEN Shunt MALIN_500.0 (40687) #s
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: Double Palo Verde	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: Double Palo Verde	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Double Palo Verde	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: Double Palo Verde	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: Double Palo Verde	OPEN Gen PALOVRD2_ 24.0 (14932) #1
N-2: Double Palo Verde	OPEN Gen PALOVRD1_ 24.0 (14931) #1
N-2: Double Palo Verde	CHANGE LOAD AT BUS AGUAFAPS_ 69.0 (14400) BY -120 MW (cnst pf)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Line COVINGTN_230.0 (40303) TO MAPLEV12_230.0 (40692) CKT 2
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_345.0 (40691)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus ROCKY RH_345.0 (40891)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN Bus PONDROSB_500.0 (40834)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus PONDROSA_500.0 (40837)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus GRIZZ R3_500.0 (40488)
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus CASCADTP_230.0 (40185)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus WINDSHAR_230.0 (41155)
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus ALFALFA_230.0 (40039)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus OUTLOOK_230.0 (45229)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #6
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG2_ 13.2 (38755) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #10
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #11
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine MCNARY_345.0 (40721) TO ROSS_345.0 (40901) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN Line KING_230.0 (60177) TO MIDPOINT_230.0 (60232) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line PEARL #_230.0 (43773) TO SHERWOOD_230.0 (43527) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN MultiSectionLine BIGEDDY3_230.0 (41343) TO MCLOUGLN_230.0 (43313) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT5_500.0 (40306)
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus COULEE_300.0 (40285)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus OLYMPIA_300.0 (40795)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Bus CENTR SS_230.0 (47748)
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN Bus CHRISTOP_230.0 (42505)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 2
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Transformer ROUND MT_500.0 (30005) TO RD MT 1M_500.0 (30065) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_DLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_SLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 1_ 12.5 (38825)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 2_ 12.5 (38830)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 3_ 12.5 (38835)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 4_ 12.5 (38840)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 5_ 12.5 (38845)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT1_ 13.8 (38700)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT2_ 13.8 (38705)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT3_ 13.8 (38710)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT4_ 13.8 (38715)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 4-5_ 13.8 (31782)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBOU2-3_ 11.5 (31808)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 1_ 11.5 (31810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 1_ 18.0 (34600)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 2_ 18.0 (34602)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 3_ 18.0 (34604)
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus ADDY N_230.0 (40021)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	SET SWITCHED SHUNT AT BUS THIRHACH_115.0 (48431) TO 91.6 MVR
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Line BELL BPA_115.0 (40087) TO BIGELOW_115.0 (40113) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine LANCASTR_230.0 (40624) TO NOXONBPA_230.0 (40787) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Townsend-Garrison #1 & #2 500 kV	OPEN Line GAR1EAST_500.0 (40451) TO TOWNSEND_500.0 (62500) CKT 1
N-2: Townsend-Garrison #1 & #2 500 kV	OPEN Line GAR2EAST_500.0 (40453) TO TOWNSEND_500.0 (62500) CKT 2
N-2: Townsend-Garrison #1 & #2 500 kV	CLOSE Shunt GARRISON_500.0 (40459) #r
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3

Appendix D - 16hs2a_2250idnw_N_ms Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4

Appendix E

16hs2a_2250idnw_N_solo Base Case (Hemingway-Boardman Stand Alone)

Appendix E – 16hs2sa_2250idnw_solo Base Case Post-Transient Contingency Results

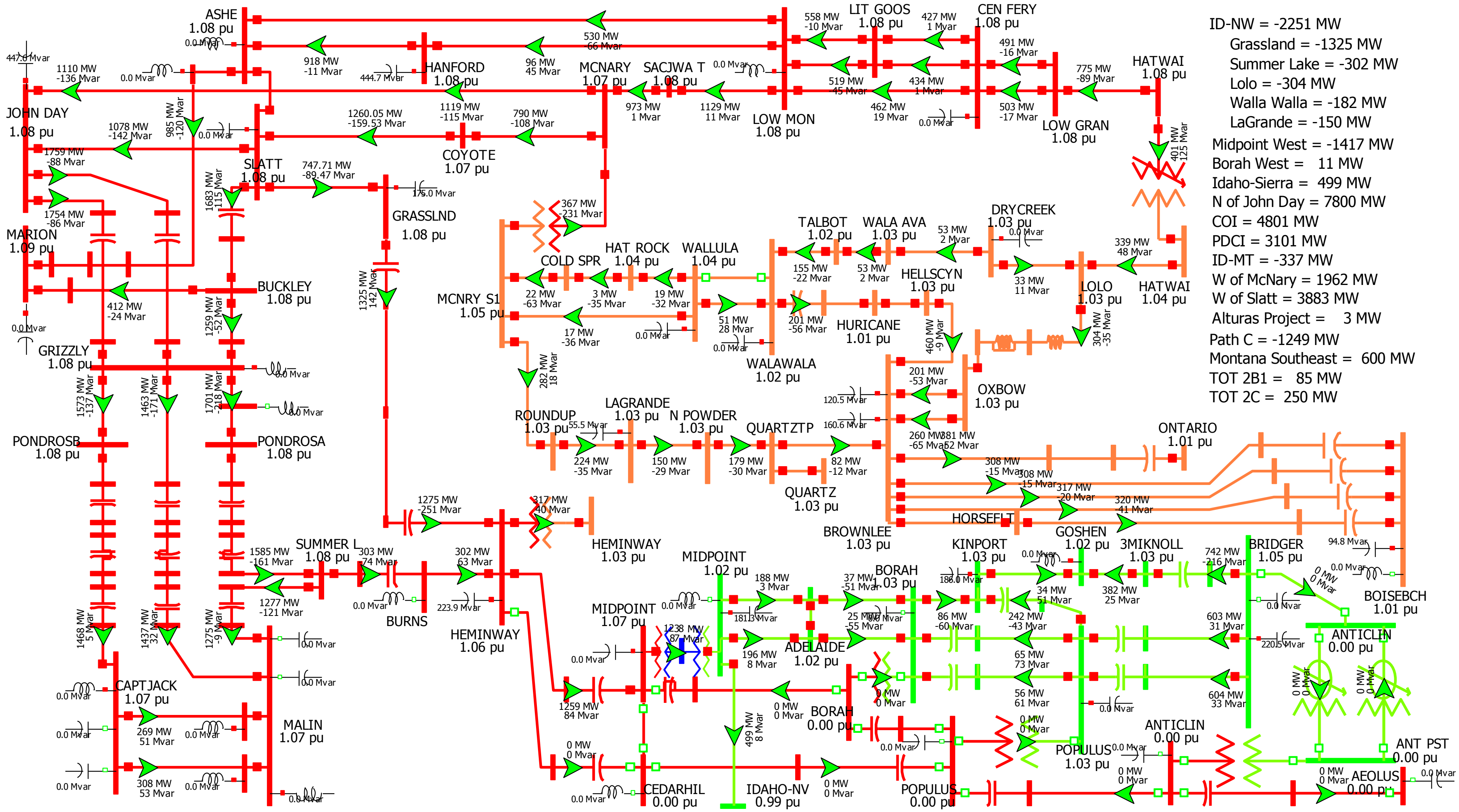

Figure E1: 16hs2sa_2250idnw_N Base Case **Pre-Contingency**

Appendix E – 16hs2sa_2250idnw_solo Base Case Post-Transient Contingency Results

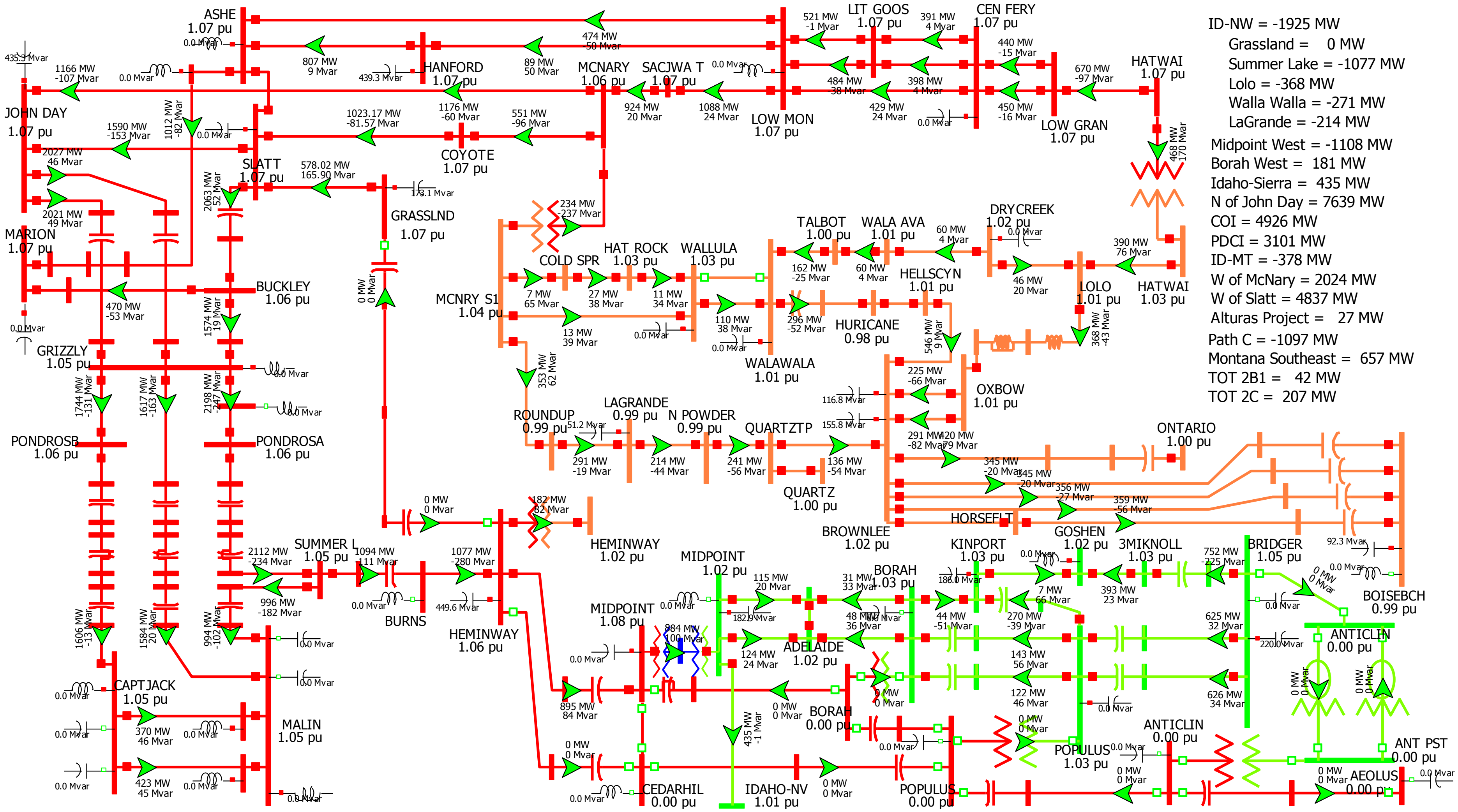

Figure E2: 16hs2sa_2250idnw_N Base Case **N-1: Hemingway-Grassland 500 kV Line + PTSN Shunt**

Appendix E – 16hs2sa_2250idnw_solo Base Case Post-Transient Contingency Results

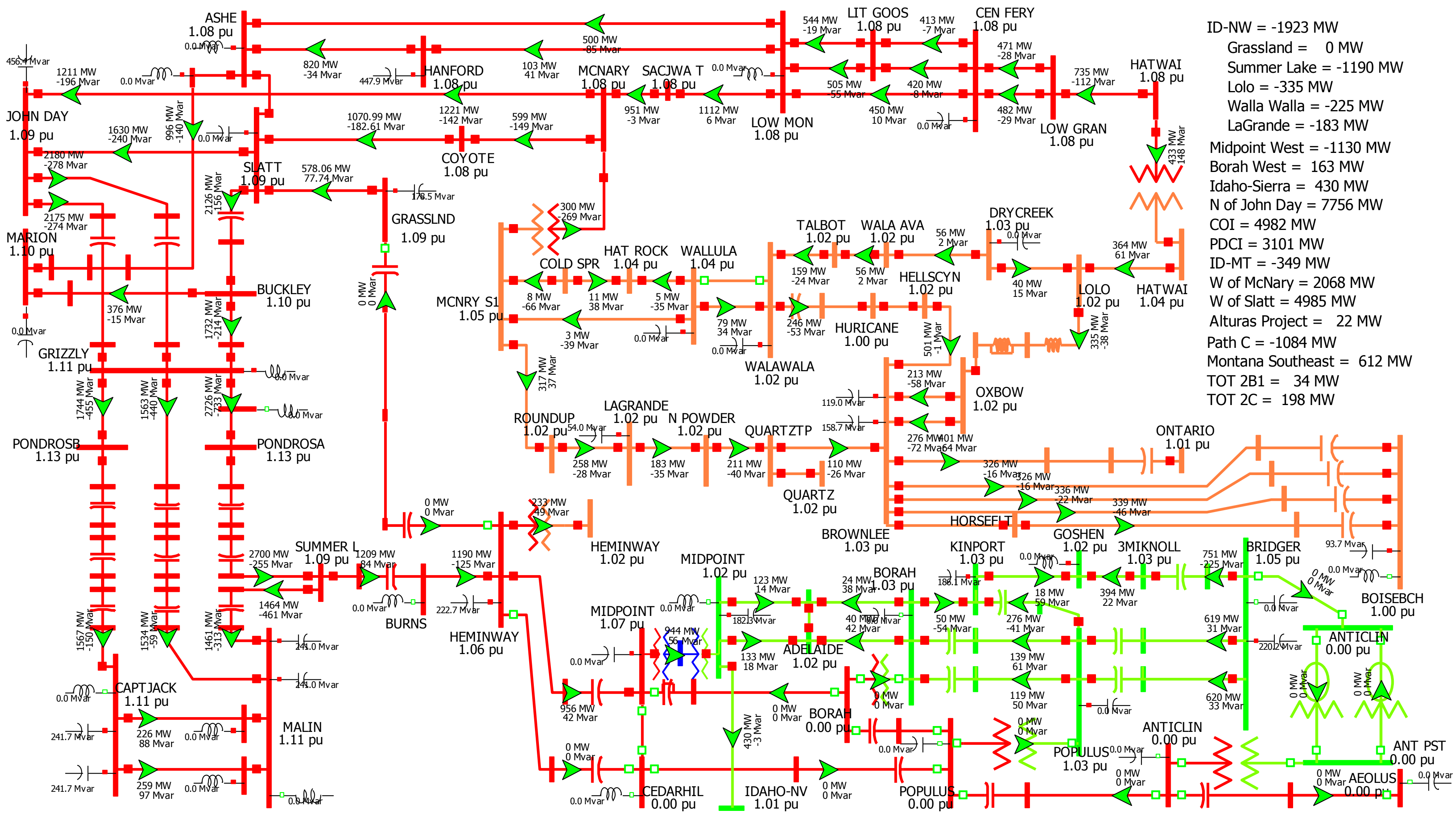

Figure E3: 16hs2sa_2250idnw_N Base Case **N-1: Hemingway-Grassland 500 kV Line + FACRI**

Appendix E – 16hs2sa_2250idnw_solo Base Case Post-Transient Contingency Results

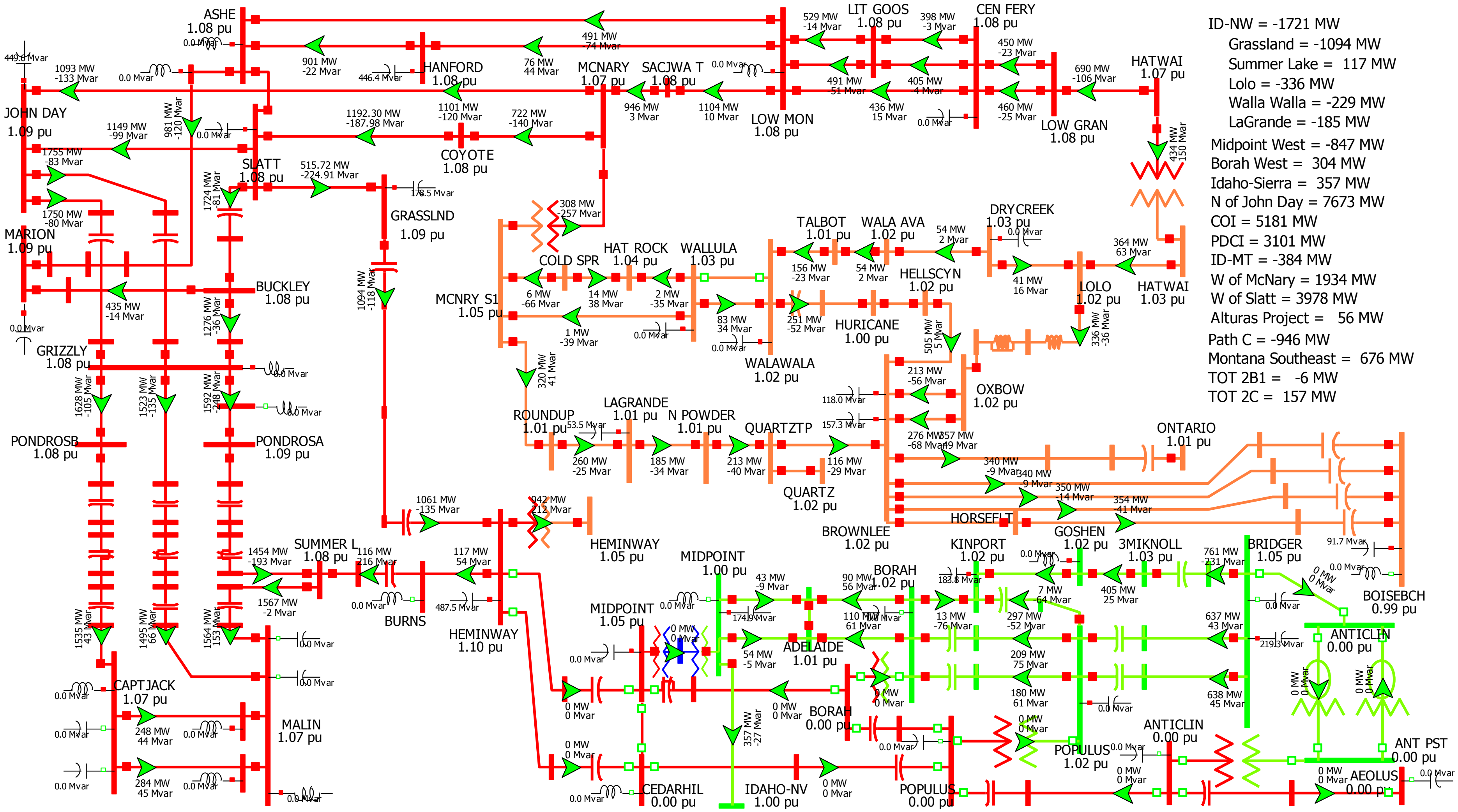

Figure E4: 16hs2sa_2250idnw_N Base Case **N-1: Midpoint-Hemingway 500 kV Line + PTSN Shunt**

Appendix E – 16hs2sa_2250idnw_solo Base Case Post-Transient Contingency Results

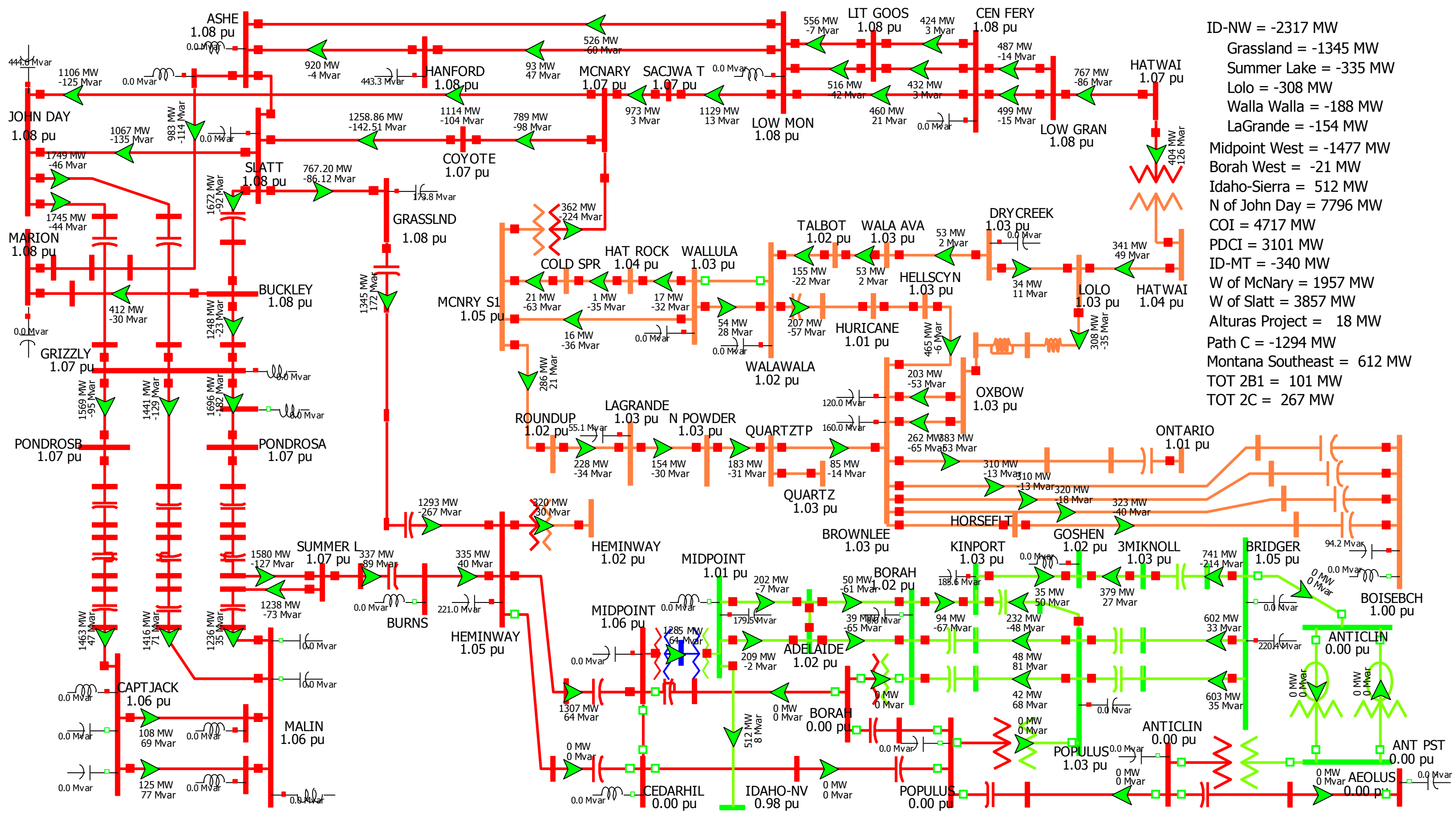

Figure E5: 16hs2sa_2250idnw_N Base Case **N-1: Malin-Round Mtn 500 kV Line**

Appendix E – 16hs2sa_2250idnw_solo Base Case Post-Transient Contingency Results

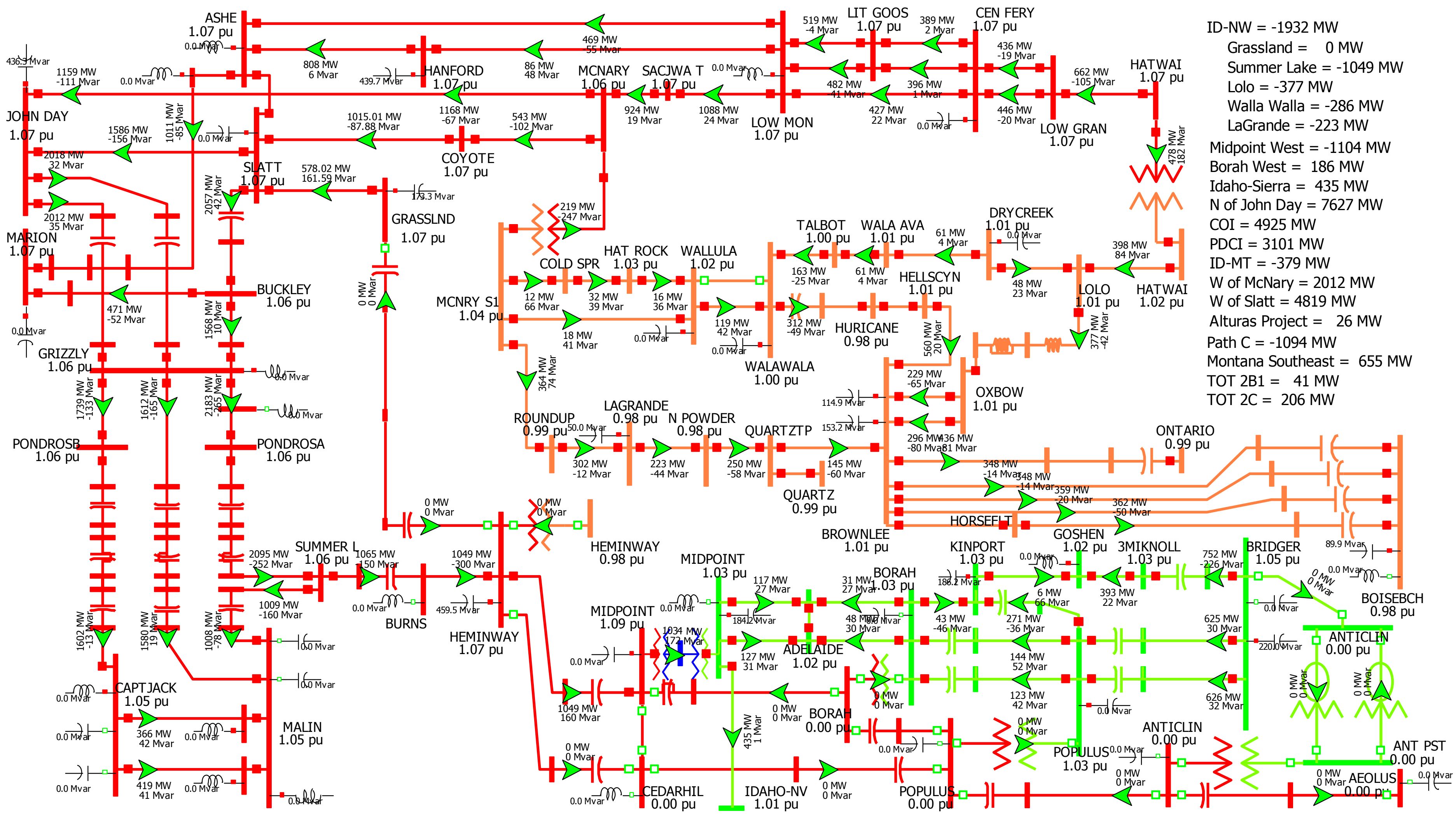

Figure E6: 16hs2sa_2250idnw_N Base Case **BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr**

Appendix E – 16hs2sa_2250idnw_solo Base Case Post-Transient Contingency Results

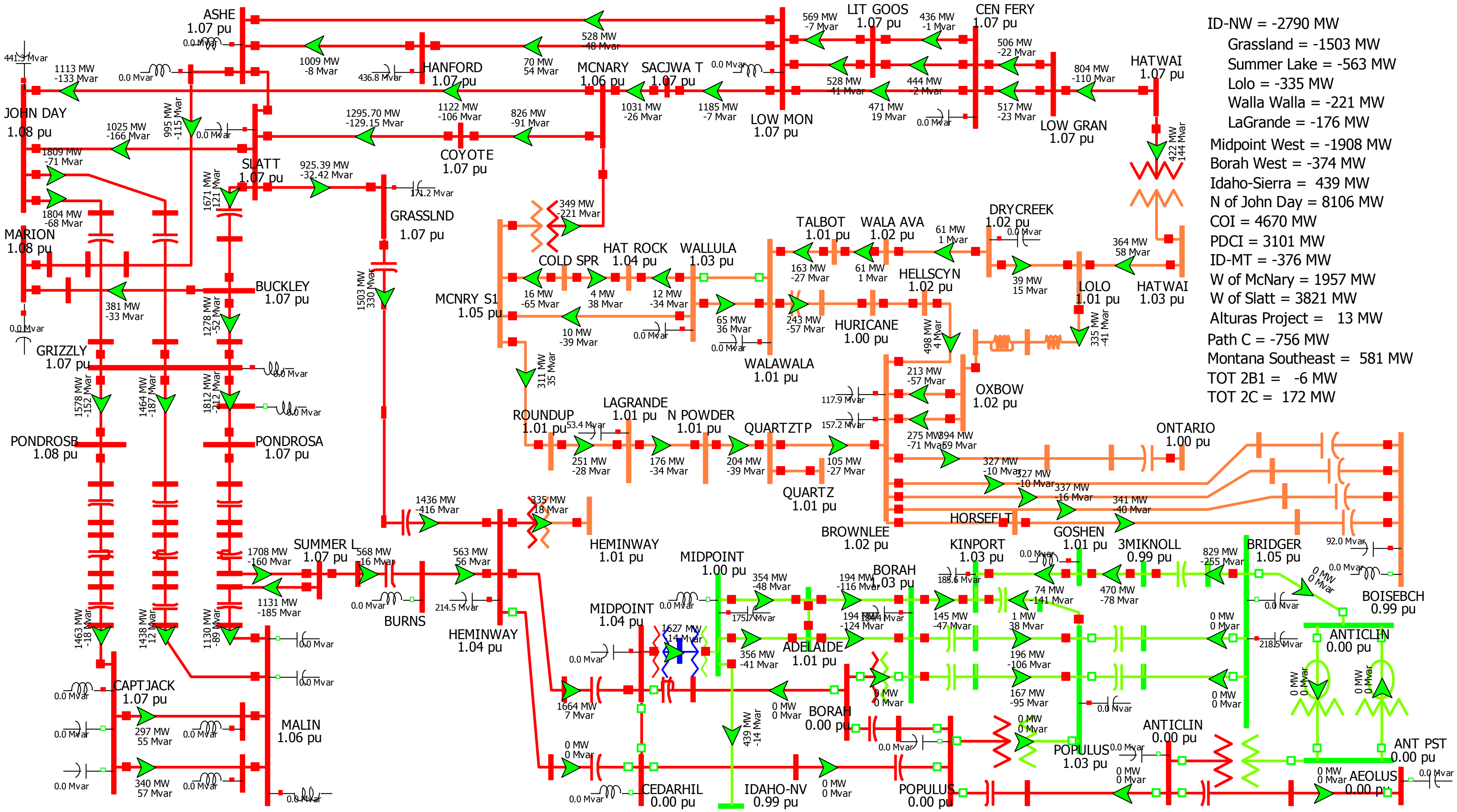

Figure E7: 16hs2sa_2250idnw_N Base Case **BF IPC Hemingway-Grassland 500 kV Line & Hemingway 500/230 Xfmr**

Appendix E – 16hs2sa_2250idnw_solo Base Case Post-Transient Contingency Results

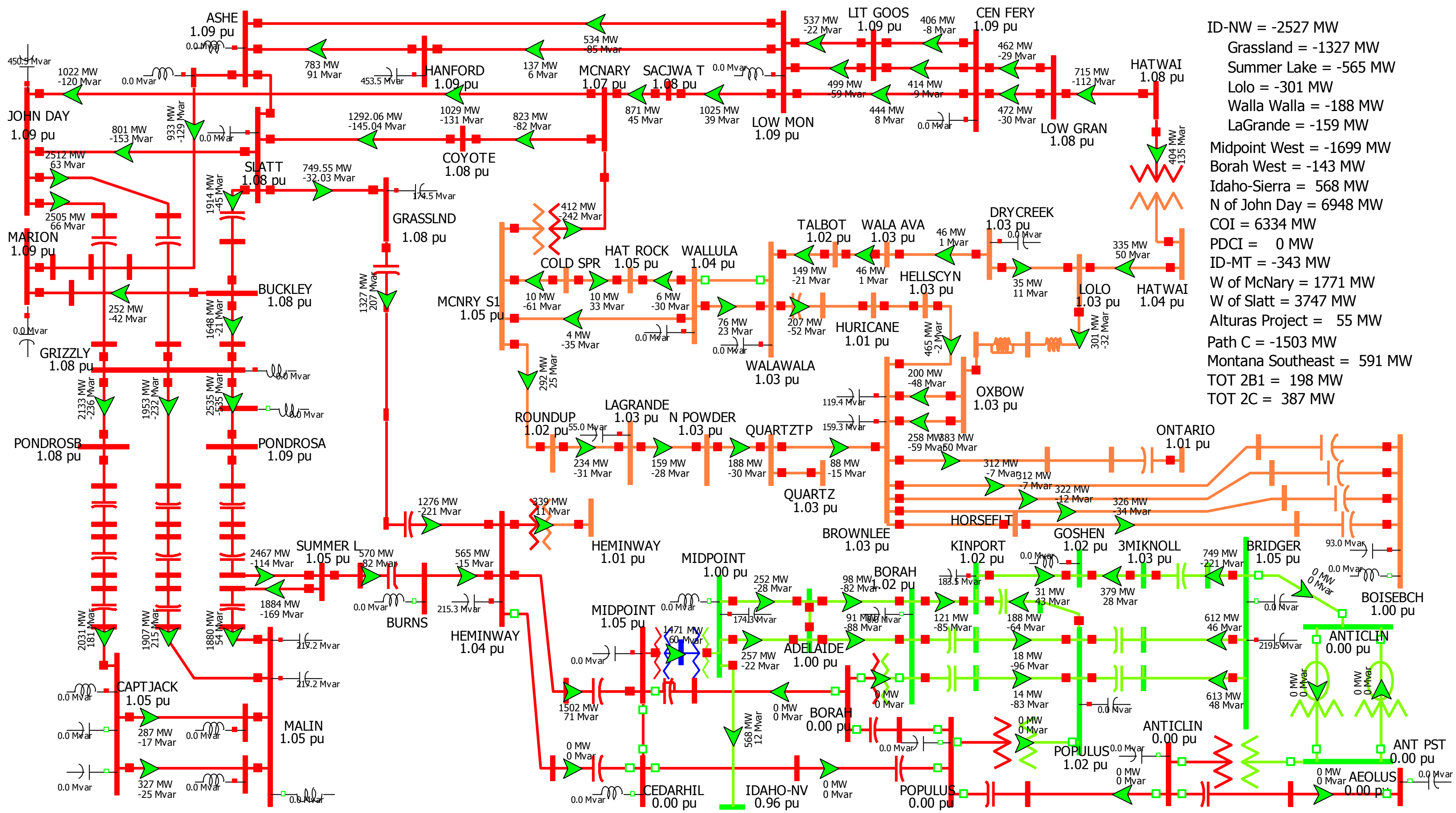

Figure E8: 16hs2sa_2250idnw_N Base Case **Bi-Pole Loss of Pacific DC Intertie**

Appendix E – 16hs2sa_2250idnw_solo Base Case Post-Transient Contingency Results

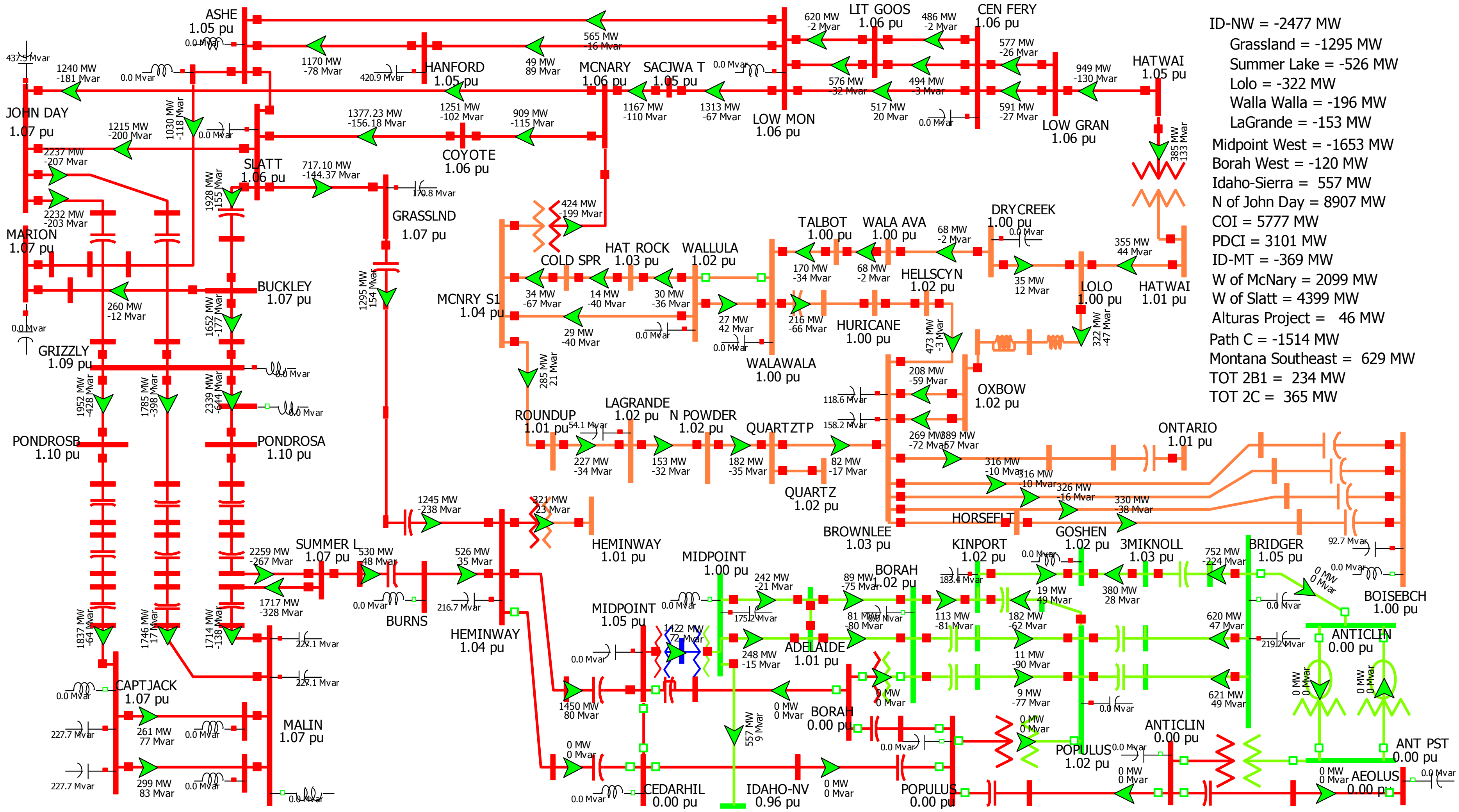

Figure E9: 16hs2sa_2250idnw_N Base Case **Loss of Two Palo Verde Units**

Appendix E – 16hs2sa_2250idnw_solo Base Case Post-Transient Contingency Results

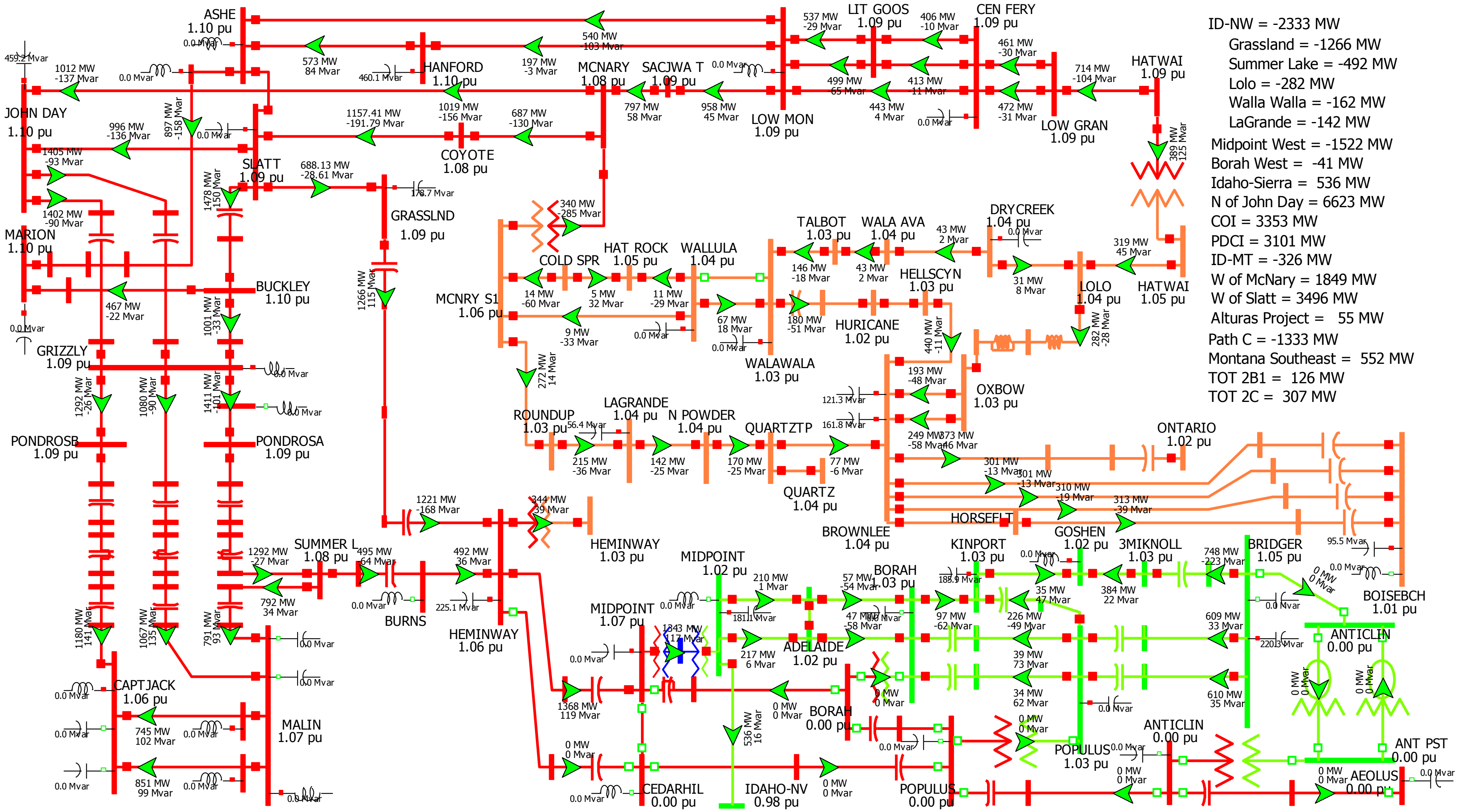

Figure E10: 16hs2sa_2250idnw_N Base Case **N-2 Loss of Malin-Round Mtn #1 & #2 500 kV Lines**

Appendix E - 16hs2a_2250idnw_solo Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	No Violations							
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	447.3	983.3	979.0	100.4%	1287.7	76.4%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	GLENDL (45113) -> GRANT PS (45123) CKT 1 at GLENDL	Branch Amp	340.5	794.9	722.9	110.0%	1265.2	62.8%
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4028 Taft-Dworshak & Taft Reactor 500kV	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	No Violations							
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1701.3	2942.3	2199.7	133.8%	3235.5	90.9%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1701.3	2942.3	2199.7	133.8%	3235.5	90.9%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1700.0	2935.0	2666.9	110.1%	3999.9	73.4%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1691.6	2924.6	2667.0	109.7%	4000.0	73.1%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU11 (90079) -> MALROU12 (90080) CKT 1 at MALROU11	Branch Amp	1654.9	2923.9	2229.7	131.1%	3514.1	83.2%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1654.9	2923.9	2699.7	108.3%	3999.9	73.1%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1647.9	2899.4	2699.7	107.4%	4000.0	72.5%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	PTRSNFUR (62386)	% Δ Volts	0.969	0.918				5.3%
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	No Violations							
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	No Violations							
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations							
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1701.3	2977.3	2199.7	135.3%	3235.5	92.0%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1701.3	2977.3	2199.7	135.3%	3235.5	92.0%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1700.0	2969.8	2666.9	111.4%	3999.9	74.2%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1691.6	2959.5	2667.0	111.0%	4000.0	74.0%
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Coyote-Slatt 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4234 McNary-Coyote-Slatt & McNary-Hermcalp 500 kV	No Violations							
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	275.9	367.4	320.0	114.8%	370.0	99.3%
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	646.8	1260.3	950.0	132.7%	1286.0	98.0%
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	84.5	94.5	94.0	100.5%	139.0	68.0%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	275.9	352.1	320.0	110.0%	370.0	95.2%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	646.8	1145.5	950.0	120.6%	1286.0	89.1%
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations							

Appendix E - 16hs2a_2250idnw_solo Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	No Violations							
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations							
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations							
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	No Violations							
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	No Violations							
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations							
BF 4542 Paul-Allston 500 kV & Center G2	No Violations							
BF 4542 Paul-Napavine 500 kV & Center G1	No Violations							
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OLYMPIA (40797)	% Δ Volts	1.064	1.001				5.9%
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OLYMPIA (40797)	% Δ Volts	1.064	0.996				6.4%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	No Violations							
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations							
BF 4700 Hatwai 500kV & 230 kV + RAS	No Violations							
BF 4708 Hatwai 500 kV Bus	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	821.0	800.0	102.6%	1199.9	68.4%
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	769.9	946.5	920.0	102.9%	1046.8	90.4%
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	769.9	946.9	920.0	102.9%	1046.8	90.5%
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations							
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	No Violations							
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	No Violations							
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1305.8	1237.0	105.6%	1396.0	93.5%
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	769.9	934.1	920.0	101.5%	1046.8	89.2%
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	807.0	800.0	100.9%	1199.9	67.3%
BF 5006 Slatt-Coyote-McNary & Slatt-Grassland 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1249.4	1237.0	101.0%	1396.0	89.5%
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations							
BF 5021 Slatt-John Day & Slatt-Coyote-McNary 500 kV	No Violations							
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	No Violations							

Appendix E - 16hs2a_2250idnw_solo Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations							
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations							
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 5214 Low Mon-McNary & Calpine PH 500 kV	No Violations							
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1392.1	1237.0	112.5%	1396.0	99.7%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	769.9	1009.5	920.0	109.7%	1046.8	96.4%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	821.8	800.0	102.7%	1199.9	68.5%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	LAGRANDE (40619)	% Δ Volts	0.981	0.925				5.7%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	IMNAHA (60278)	% Δ Volts	0.997	0.944				5.3%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	N POWDER (60313)	% Δ Volts	0.997	0.945				5.2%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1244.4	1237.0	100.6%	1396.0	89.1%
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1241.1	1237.0	100.3%	1396.0	88.9%
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	859.0	800.0	107.4%	1199.9	71.6%
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	PTRSNFUR (62386)	% Δ Volts	0.969	0.905				6.6%
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	AMPS (65025)	% Δ Volts	0.96	0.899				6.4%
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	PTRSNFLT (62030)	% Δ Volts	0.952	0.892				6.3%
BF IPC Midpoint-Hem 500 kV & Hem 500/230 Xfmr	No Violations							
BF Lolo 230kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1259.5	1237.0	101.8%	1396.0	90.2%
BF McNary 230 kV SECT 1	No Violations							
BF McNary 230 kV SECT 2	JONTMB11 (90164)	% Δ Volts	1.027	0.967				5.8%
BF McNary 230 kV SECT 3	MCNARY (40717)	% Δ Volts	1.028	0.946				8.0%
BF McNary 230 kV SECT 3	MCN PH6 (44128)	% Δ Volts	1.03	0.948				8.0%
BF McNary 230 kV SECT 3	MCN TX7 (44121)	% Δ Volts	1.03	0.949				7.9%
BF McNary 230 kV SECT 3	PATTER T (40819)	% Δ Volts	1.024	0.945				7.7%
BF McNary 230 kV SECT 3	BERRIAN (40103)	% Δ Volts	1.023	0.946				7.5%
BF McNary 230 kV SECT 3	H2F (40493)	% Δ Volts	1.022	0.95				7.0%
BF McNary 230 kV SECT 3	FRANKLIN (40443)	% Δ Volts	1.01	0.951				5.8%
BF McNary 230 kV SECT 3	MCNARY (40715)	% Δ Volts	1.007	0.95				5.7%
BF McNary 230 kV SECT 3	UMATILLA (45313)	% Δ Volts	1.007	0.952				5.5%
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1317.0	1237.0	106.5%	1396.0	94.3%
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	769.9	954.4	920.0	103.7%	1046.8	91.2%
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	811.1	800.0	101.4%	1199.9	67.6%
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	HEMBOA11 (61953)	% Δ Volts	1.078	0.994				7.8%
Bus: Alvey 500 kV + RAS	No Violations							
Bus: Bell BPA 500 kV	No Violations							
Bus: Buckley 500 kV	No Violations							

Appendix E - 16hs2a_2250idnw_solo Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
Bus: Dixonville 500 kV	No Violations							
Bus: Hot Springs 500 kV	No Violations							
Bus: Keeler 500 kV + RAS	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	84.5	97.6	94.0	103.9%	139.0	70.2%
Bus: Sickler 500 kV	No Violations							
Bus: Summer Lake 500 kV	No Violations							
N-1: Allston-Keeler 500 kV + RAS	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	84.5	97.6	94.0	103.8%	139.0	70.2%
N-1: Allston-Napavine 500 kV	No Violations							
N-1: Allston-Paul #2 500 kV	No Violations							
N-1: Alvery-Dixonville 500 kV	No Violations							
N-1: Alvey-Marion 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	885.6	1033.0	1009.1	102.4%	1285.2	80.4%
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Bell-Coulee 500 kV	No Violations							
N-1: Bell-Taft 500 kV	No Violations							
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV	No Violations							
N-1: Broadview-Garrison #1 500 kV	No Violations							
N-1: Brownlee-Ontario 230 kV	QUARTZ (60305) -> NELSN TP (61055) CKT 1 at QUARTZ	Branch Amp	213.9	401.7	400.0	100.4%	491.2	81.8%
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 1 at COTWDWAP	Branch Amp	252.2	837.8	785.7	106.6%	926.3	90.5%
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 2 at COTWDWAP	Branch Amp	252.2	837.8	785.7	106.6%	926.3	90.5%
N-1: Captain Jack-Olinda 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1701.3	2612.7	2199.7	118.8%	3235.5	80.8%
N-1: Captain Jack-Olinda 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1701.3	2612.7	2199.7	118.8%	3235.5	80.8%
N-1: Captain Jack-Olinda 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1817.5	2467.0	2199.9	112.1%	3280.5	75.2%
N-1: Captain Jack-Olinda 500 kV	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1802.1	2446.1	2199.9	111.2%	3280.5	74.6%
N-1: Captain Jack-Olinda 500 kV	MALROU11 (90079) -> MALROU12 (90080) CKT 1 at MALROU11	Branch Amp	1654.9	2537.0	2229.7	113.8%	3514.1	72.2%
N-1: Captain Jack-Olinda 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1945.6	2624.7	2477.9	105.9%	3999.9	65.6%
N-1: CaptJack-Kfalls 500 kV	No Violations							
N-1: Chief Jo-Coulee 500 kV	No Violations							
N-1: Chief Jo-Monroe 500 kV	No Violations							
N-1: Chief Jo-Sickler 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Covington4-Raver 500 kV	No Violations							
N-1: Covington5-Raver 500 kV	No Violations							
N-1: CusterW-Monroe 500 kV	No Violations							
N-1: Dixonville-Meridian 500 kV	GLENDL (45113) -> GRANT PS (45123) CKT 1 at GLENDL	Branch Amp	340.5	752.3	722.9	104.1%	1265.2	59.5%

Appendix E - 16hs2a_2250idnw_solo Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	822.6	800.0	102.8%	1199.9	68.6%
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Echo Lake-Maple Valley 500 kV	No Violations							
N-1: Echo Lake-Raver 500 kV	No Violations							
N-1: Echo Lake-Schultz 500 kV	No Violations							
N-1: Echo Lake-Snok Tap 500 kV	No Violations							
N-1: Garrison-Taft #2 500 kV	No Violations							
N-1: Goldhill-Placer 115 kV	No Violations							
N-1: Grassland-Coyote 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1245.2	1237.0	100.7%	1396.0	89.2%
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Hatwai 500/230 kV Xfmr + RAS	No Violations							
N-1: Hatwai-Lolo 230 kV	No Violations							
N-1: Hatwai-Low Gran 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	769.9	946.2	920.0	102.9%	1046.8	90.4%
N-1: Hatwai-N Lewiston 230 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	769.9	966.3	920.0	105.0%	1046.8	92.3%
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Grassland 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1352.2	1237.0	109.3%	1396.0	96.9%
N-1: Hemingway-Grassland 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	769.9	976.0	920.0	106.1%	1046.8	93.2%
N-1: Hemingway-Grassland 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	820.5	800.0	102.6%	1199.9	68.4%
N-1: Hemingway-Grassland 500 kV	PTRSNFUR (62386)	% Δ Volts	0.969	0.903				6.8%
N-1: Hemingway-Grassland 500 kV	PTRSNFLT (62030)	% Δ Volts	0.952	0.89				6.5%
N-1: Hemingway-Grassland 500 kV	AMPS (65025)	% Δ Volts	0.96	0.908				5.4%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1709.8	2928.2	2400.0	122.0%	3199.9	91.5%
N-1: Hemingway-Grassland 500 kV + FACRI	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1244.7	1237.0	100.6%	1396.0	89.2%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1716.2	2943.7	2400.0	122.7%	3800.0	77.5%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1350.3	1237.0	109.2%	1396.0	96.7%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	769.9	973.9	920.0	105.9%	1046.8	93.0%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	823.4	800.0	102.9%	1199.9	68.6%
N-1: Hemingway-Summer Lake 500 kV	No Violations							
N-1: Hill Top 345/230 Xfmr	No Violations							
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: Hot Springs-Taft 500 kV	No Violations							
N-1: Humboldt-Coyote Ck 345 kV	No Violations							
N-1: Huntington-Pinto-Four Corners 345 kV	No Violations							

Appendix E - 16hs2a_2250idnw_solo Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Ing500-CusterW 500 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Kfalls-Meridian 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	No Violations							
N-1: Lanes-Marion 500 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-Sac Tap 500 kV	No Violations							
N-1: Malin 500/230 Xfmr	No Violations							
N-1: Malin-Hilltop 230 kV	No Violations							
N-1: Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1701.3	2944.9	2199.7	133.9%	3235.5	91.0%
N-1: Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1701.3	2944.9	2199.7	133.9%	3235.5	91.0%
N-1: Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALROU21	Branch Amp	1700.0	2937.4	2666.9	110.1%	3999.9	73.4%
N-1: Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1691.6	2927.5	2667.0	109.8%	4000.0	73.2%
N-1: Malin-Round Mtn #2 500 kV	MALROU11 (90079) -> MALROU12 (90080) CKT 1 at MALROU11	Branch Amp	1654.9	2919.6	2229.7	130.9%	3514.1	83.1%
N-1: Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1654.9	2919.6	2699.7	108.1%	3999.9	73.0%
N-1: Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1647.9	2906.9	2699.7	107.7%	4000.0	72.7%
N-1: Malin-Summer Lake 500 kV	No Violations							
N-1: Maple Vly-Rocky RH 345 kV	No Violations							
N-1: Marion-Pearl 500 kV	No Violations							
N-1: Marion-Santiam 500 kV	No Violations							
N-1: McLouglin-Ostrander 230 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary S2-McNary S3 230 kV	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-Coyote-Slatt 500 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1241.9	1237.0	100.4%	1396.0	89.0%
N-1: McNary-Sac Tap-Low Mon 500 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1243.5	1237.0	100.5%	1396.0	89.1%
N-1: Midpoint-Hemingway 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	855.5	800.0	106.9%	1199.9	71.3%
N-1: Midpoint-Hemingway 500 kV	PTRSNFUR (62386)	% Δ Volts	0.969	0.871				10.1%
N-1: Midpoint-Hemingway 500 kV	PTRSNFLT (62030)	% Δ Volts	0.952	0.86				9.7%
N-1: Midpoint-Hemingway 500 kV	AMPS (65025)	% Δ Volts	0.96	0.879				8.4%
N-1: Midpoint-Hemingway 500 kV	BIGGRASS (65155)	% Δ Volts	0.98	0.928				5.3%
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1241.1	1237.0	100.3%	1396.0	88.9%
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	856.7	800.0	107.1%	1199.9	71.4%
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	PTRSNFUR (62386)	% Δ Volts	0.969	0.907				6.4%
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	AMPS (65025)	% Δ Volts	0.96	0.9				6.2%
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	PTRSNFLT (62030)	% Δ Volts	0.952	0.894				6.1%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1240.9	1237.0	100.3%	1396.0	88.9%
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA Shunt	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	858.1	800.0	107.3%	1199.9	71.5%
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA Shunt	PTRSNFUR (62386)	% Δ Volts	0.969	0.911				6.0%
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA Shunt	PTRSNFLT (62030)	% Δ Volts	0.952	0.897				5.8%
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA Shunt	AMPS (65025)	% Δ Volts	0.96	0.906				5.6%
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA & MLCK Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1240.0	1237.0	100.2%	1396.0	88.8%
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA & MLCK Shunt	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	858.7	800.0	107.3%	1199.9	71.6%
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA & MLCK Shunt	AMPS (65025)	% Δ Volts	0.96	0.909				5.3%
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA & MLCK Shunt	PTRSNFUR (62386)	% Δ Volts	0.969	0.918				5.3%
N-1: Midpoint-Humboldt 345 kV	CAL S PS (64023) -> CAL SUB (64025) CKT 1 at CAL SUB	Branch MVA	93.3	157.1	150.0	104.7%	180.0	87.3%
N-1: Napavine-Paul 500 kV	No Violations							
N-1: Olympia-Paul 500 kV	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1263.8	1237.0	102.2%	1396.0	90.5%
N-1: Paul-Satsop 500 kV	No Violations							
N-1: Pearl-Keeler 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	275.9	343.8	320.0	107.4%	370.0	92.9%
N-1: Pearl-Keeler 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	646.8	1127.6	950.0	118.7%	1286.0	87.7%
N-1: Pinto-Four Corner 345 kV	No Violations							
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Raver-Paul 500 kV	No Violations							
N-1: Raver-Tacoma 500 kV	No Violations							
N-1: Red Butte-Harry Allen 345 kV	No Violations							
N-1: Robinson-Harry Allen 500 kV	No Violations							
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1817.5	3271.7	2199.9	148.7%	3280.5	99.7%
N-1: Round Mtn-Table Mtn 500 kV	ROUND MT (30005) -> ROUTAB21 (30018) CKT 2 at ROUTAB21	Branch Amp	1817.5	3271.7	2667.0	122.7%	4000.0	81.8%
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB22 (30019) -> TABLE MT (30015) CKT 2 at ROUTAB22	Branch Amp	1807.7	3258.1	2667.0	122.2%	4000.0	81.5%
N-1: Roundup-Lagrande 230 kV	No Violations							
N-1: Schultz-Sickler 500 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Sigurd-Glen Canyon 230 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Snok Tap-Snoking 500 kV	No Violations							
N-1: Table Mtn-Tesla 500 kV	E.NICOLS (32212) -> RIO OSO (32214) CKT 1 at E.NICOLS	Branch Amp	296.2	336.9	326.3	103.2%	416.7	80.8%
N-1: Table Mtn-Tesla 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1945.6	2921.7	2477.9	117.9%	3999.9	73.0%
N-1: Table Mtn-Tesla 500 kV	TABLE MT (30015) -> TABVAC11 (30031) CKT 1 at TABLE MT	Branch Amp	1945.6	2921.7	2667.0	109.6%	4000.0	73.0%
N-1: Table Mtn-Tesla 500 kV	TABVAC12 (30032) -> VACA-DIX (30030) CKT 1 at TABVAC12	Branch Amp	1919.0	2901.2	2667.0	108.8%	4000.0	72.5%
N-1: Table Mtn-Tesla 500 kV	VACTES11 (30044) -> TESLA (30040) CKT 1 at VACTES11	Branch Amp	1420.3	2325.5	2230.0	104.3%	3555.9	65.4%
N-1: Table Mtn-Vaca Dixon 500 kV	PEASE (32200) -> E.MRY J1 (32288) CKT 1 at PEASE	Branch Amp	404.8	449.4	441.8	101.7%	507.1	88.6%

Appendix E - 16hs2a_2250idnw_solo Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Table Mtn-Vaca Dixon 500 kV	E.NICOLS (32212) -> RIO OSO (32214) CKT 1 at E.NICOLS	Branch Amp	296.2	357.3	326.3	109.5%	416.7	85.7%
N-1: Table Mtn-Vaca Dixon 500 kV	TABTES11 (30041) -> TABTES12 (30043) CKT 1 at TABTES11	Branch Amp	1496.3	2642.4	2230.0	118.5%	3555.9	74.3%
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations							
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Coyote-McNary 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & Slatt-Coyote-McNary 500 kV	No Violations							
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	822.2	800.0	102.8%	1199.9	68.5%
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Bridger-Populus #1 & #2 345 kV + RAS	MIDPOINT (60240) -> MPSNT501 (60237) CKT 1 at MPSNT501	Branch MVA	1241.0	1641.3	1500.0	109.4%	1650.0	99.5%
N-2: Bridger-Populus #1 & #2 345 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	800.0	800.0	100.0%	1199.9	66.7%
N-2: Bridger-Populus #1 & #2 345 kV + RAS	MIDHEM11 (61988) -> MIDPOINT (60240) CKT 1 at MIDHEM11	Branch Amp	1382.4	1813.9	1732.1	104.7%	3600.0	50.4%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	MIDPOINT (60240) -> MPSNT501 (60237) CKT 1 at MPSNT501	Branch MVA	1241.0	1632.2	1500.0	108.8%	1650.0	98.9%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	850.4	800.0	106.3%	1199.9	70.9%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	MIDHEM11 (61988) -> MIDPOINT (60240) CKT 1 at MIDHEM11	Branch Amp	1382.4	1831.9	1732.1	105.8%	3600.0	50.9%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	BIGGRASS (65155)	% Δ Volts	0.98	0.91				7.1%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	AMPS (65025)	% Δ Volts	0.96	0.891				7.2%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	PTRSNFUR (62386)	% Δ Volts	0.969	0.902				6.9%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	PTRSNFLT (62030)	% Δ Volts	0.952	0.889				6.6%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SPAR CYN (66765)	% Δ Volts	0.987	0.938				5.0%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	No Violations							
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	LAGRANDE (40619)	% Δ Volts	0.981	0.927				5.5%
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	PILOT RK (45413)	% Δ Volts	0.986	0.935				5.2%
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	ATHENA (45015)	% Δ Volts	0.986	0.936				5.1%
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	769.9	940.2	920.0	102.2%	1046.8	89.8%
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations							
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations							
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations							
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	No Violations							
N-2: DC-BIPOLE	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1709.8	2711.2	2400.0	113.0%	3199.9	84.7%

Appendix E - 16hs2a_2250idnw_solo Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: DC-BIPOLE	E.NICOLS (32212) -> RIO OSO (32214) CKT 1 at E.NICOLS	Branch Amp	296.2	332.6	326.3	101.9%	416.7	79.8%
N-2: DC-BIPOLE	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1817.5	2378.2	2199.9	108.1%	3280.5	72.5%
N-2: DC-BIPOLE	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1802.1	2358.1	2199.9	107.2%	3280.5	71.9%
N-2: DC-BIPOLE	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1716.2	2725.1	2400.0	113.5%	3800.0	71.7%
N-2: DC-BIPOLE	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1701.3	2310.2	2199.7	105.0%	3235.5	71.4%
N-2: DC-BIPOLE	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1701.3	2310.2	2199.7	105.0%	3235.5	71.4%
N-2: DC-BIPOLE	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1624.0	2312.5	2134.0	108.4%	3499.9	66.1%
N-2: DC-BIPOLE	MIDWAY (30060) -> MIDVIN11 (30061) CKT 1 at MIDVIN11	Branch Amp	1602.3	2278.7	2134.0	106.8%	3499.9	65.1%
N-2: DC-BIPOLE	MIDVIN12 (30062) -> VINCENT (24156) CKT 1 at MIDVIN12	Branch Amp	1580.4	2249.9	2134.0	105.4%	3499.9	64.3%
N-2: DC-BIPOLE	MALROU11 (90079) -> MALROU12 (90080) CKT 1 at MALROU11	Branch Amp	1654.9	2244.9	2229.7	100.7%	3514.1	63.9%
N-2: DC-BIPOLE	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1945.6	2508.5	2477.9	101.2%	3999.9	62.7%
N-2: DC-BIPOLE	YORKCANY (12091)	% Δ Volts	0.999	0.943				5.6%
N-2: DC-BIPOLE	SPRINGER (12077)	% Δ Volts	1.001	0.947				5.4%
N-2: DC-BIPOLE	CIMARRON (12148)	% Δ Volts	1.002	0.948				5.4%
N-2: DC-BIPOLE	RAINVL_T (12130)	% Δ Volts	1.007	0.955				5.2%
N-2: DC-BIPOLE	RAINVL1 (12129)	% Δ Volts	1.007	0.955				5.2%
N-2: Double Palo Verde	HESPERUS (79071) -> COYOTE G (79191) CKT 1 at HESPERUS	Branch Amp	345.1	433.5	431.8	100.4%	441.8	98.1%
N-2: Double Palo Verde	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM14	Branch Amp	1709.8	2477.4	2400.0	103.2%	3199.9	77.4%
N-2: Double Palo Verde	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	801.6	800.0	100.2%	1199.9	66.8%
N-2: Double Palo Verde	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1716.2	2496.6	2400.0	104.0%	3800.0	65.7%
N-2: Double Palo Verde	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1624.0	2164.6	2134.0	101.4%	3499.9	61.8%
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations							
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations							
N-2: Garrison-Taft #1 & #2 500 kV + RAS	No Violations							
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	1716.2	3134.9	2400.0	130.6%	3800.0	82.5%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM11	Branch Amp	1370.5	2972.4	2700.0	110.1%	4000.0	74.3%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	1594.3	2959.9	2400.0	123.3%	3800.0	77.9%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1579.8	2945.5	2400.0	122.7%	3800.0	77.5%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	1594.3	2952.8	2400.0	123.0%	3800.0	77.7%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1579.8	2941.5	2400.0	122.6%	3800.0	77.4%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations							
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	1805.8	3057.1	2900.0	105.4%	4350.0	70.3%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH12	Branch Amp	1867.4	3397.5	3000.0	113.2%	4050.0	83.9%
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	No Violations							
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1870.3	3771.5	2667.4	141.4%	4099.2	92.0%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI11	Branch Amp	1834.9	3661.7	2667.4	137.3%	4099.2	89.3%

Appendix E - 16hs2a_2250idnw_solo Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPTJACK	Branch Amp	1834.9	3661.7	2667.4	137.3%	4099.2	89.3%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	1963.7	3175.6	2993.0	106.1%	4514.9	70.3%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	1963.7	3175.6	2993.0	106.1%	4514.9	70.3%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	1934.0	3143.0	2993.0	105.0%	4514.9	69.6%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at MAXWELL	Branch Amp	1934.0	3143.0	2993.0	105.0%	4514.9	69.6%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	1912.8	3106.2	2993.0	103.8%	4514.9	68.8%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	HORSE HV (40547)	% Δ Volts	1.033	0.979				5.2%
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	HORSE HV (40547)	% Δ Volts	1.033	0.98				5.1%
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1121.0	1248.6	1237.0	100.9%	1396.0	89.4%
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	866.0	800.0	108.2%	1199.9	72.2%
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	PTRSNFUR (62386)	% Δ Volts	0.969	0.895				7.6%
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	PTRSNFLT (62030)	% Δ Volts	0.952	0.882				7.4%
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	AMPS (65025)	% Δ Volts	0.96	0.89				7.3%
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	DILLON S (62084)	% Δ Volts	0.975	0.913				6.4%
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	BIGGRASS (65155)	% Δ Volts	0.98	0.918				6.3%
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	GARLAND1 (67147)	% Δ Volts	1.017	0.963				5.3%
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	SHERDNMT (62158)	% Δ Volts	0.98	0.928				5.3%
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations							
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	No Violations							
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	No Violations							
N-2: Paul-Raver & Raver-Covingt4 500 kV	No Violations							
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	275.9	345.3	320.0	107.9%	370.0	93.3%
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	646.8	1132.1	950.0	119.2%	1286.0	88.0%
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	No Violations							
N-2: Raver-Covington #1 & #2 500 kV	No Violations							
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations							
N-2: Raver-Paul & Napavine-Paul 500 kV	No Violations							
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations							
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations							
N-2: Raver-Schultz #1 & #2 500 kV	No Violations							
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations							
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations							
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	DELEVN (30114) -> CORTINA (30450) CKT 1 at CORTINA	Branch Amp	665.5	870.9	830.9	104.8%	926.3	94.0%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1870.3	3513.4	2667.4	131.7%	4099.2	85.7%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI12	Branch Amp	1834.9	3419.7	2667.4	128.2%	4099.2	83.4%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPTJACK	Branch Amp	1834.9	3405.5	2667.4	127.7%	4099.2	83.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	1963.7	3457.6	2993.0	115.5%	4514.9	76.6%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	1963.7	3457.6	2993.0	115.5%	4514.9	76.6%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	1934.0	3438.9	2993.0	114.9%	4514.9	76.2%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at OLIMAX12	Branch Amp	1934.0	3438.9	2993.0	114.9%	4514.9	76.2%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	1912.8	3406.9	2993.0	113.8%	4514.9	75.5%
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	No Violations							

Appendix E - 16hs2a_2250idnw_solo Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	No Violations							
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHE (30790) -> MCMULLN1 (30825) CKT 1 at MCMULLN1	Branch Amp	288.7	921.6	825.9	111.6%	976.5	94.4%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	MCMULLN1 (30825) -> KEARNEY (30830) CKT 1 at MCMULLN1	Branch Amp	235.3	863.1	825.1	104.6%	975.0	88.5%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHEJ (34159) -> HAMMONDS (34160) CKT 1 at HAMMONDS	Branch Amp	388.6	466.4	462.9	100.8%	579.9	80.4%
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	ADDY (40017)	% Δ Volts	1.016	0.961				5.4%
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	METCHIP (48223)	% Δ Volts	1.012	0.959				5.2%
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	ORIN (48301)	% Δ Volts	1.007	0.955				5.2%
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	ARDEN (48015)	% Δ Volts	1.009	0.957				5.2%
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	COLV AVA (48083)	% Δ Volts	1.006	0.955				5.1%
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	No Violations							
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	No Violations							
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	722.8	802.7	800.0	100.3%	1199.9	66.9%
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations							

Appendix E - 16hs2a_2250idnw_solo Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 11L12 MERIDIAN-KLAM FALLS 500 KV+KFGEN2+ST	0.86	-921	0.92	-2915	0.77	-1830	0.98	-2424	0.83	-2926	0.94	-1480	0.71	-612	0.76	-342
BF 11L22 CAPT JACK-KLAM FALLS 500 KV+KFGEN2+ST	0.86	-899	0.92	-2983	0.77	-1774	0.98	-2010	0.81	-2894	0.93	-1831	0.71	-606	0.76	-336
BF 11R1 MERIDIAN-KLAM FALLS 500 KV & MERIDIAN 500/230 KV XFMR	0.86	-930	0.92	-3185	0.77	-1854	0.98	-2171	0.83	-3109	0.94	-1502	0.70	-625	0.76	-342
BF 11R6 MERIDIAN-DIXONVILLE 500 KV & MERIDIAN 500/230 KV XFMR	0.86	-889	0.92	-3048	0.77	-1748	0.98	-1985	0.87	-2457	0.94	-1691	0.71	-609	0.76	-331
BF 4003 HANFORD-VANTAGE & HANFORD CAPS	0.85	-923	0.89	-2761	0.77	-1862	0.98	-1983	0.88	-2938	0.93	-1850	0.71	-603	0.76	-335
BF 4019 CAPTJACK-MALIN #2 & MALIN 500/230 XFMR	0.86	-941	0.91	-3279	0.76	-1877	0.98	-2277	0.84	-3161	0.93	-1977	0.70	-628	0.76	-345
BF 4028 TAFT-DWORSHAK & TAFT REACTOR 500KV	0.86	-979	0.92	-3023	0.76	-1938	0.98	-2309	0.85	-3219	0.93	-2004	0.73	-566	0.77	-295
BF 4046 JOHN DAY-GRIZZLY #2 & GRIZZLY-MALIN #2 500 KV	0.87	-771	0.95	-2331	0.79	-1454	0.99	-1230	0.88	-1928	0.94	-1303	0.72	-569	0.77	-304
BF 4064 CAPTJACK-MALIN & MALIN-ROUND MTN #1 500 KV	0.86	-908	0.92	-3130	0.77	-1774	0.98	-2501	0.85	-2583	0.93	-1883	0.71	-615	0.76	-335
BF 4072 GRIZZLY-MALIN #2 & MALIN-ROUND MTN #2 500 KV	0.87	-803	0.94	-2569	0.79	-1503	0.98	-1477	0.86	-1835	0.94	-1445	0.72	-581	0.77	-312
BF 4095 LOW MON-HANFORD & HANFORD-WAUTOMA 500 KV	0.86	-940	0.90	-2952	0.77	-1886	0.98	-2641	0.86	-3125	0.93	-1965	0.70	-625	0.76	-343
BF 4104 ASHE-HANFORD & HANFORD-WAUTOMA 500 KV	0.86	-942	0.89	-2749	0.77	-1897	0.98	-2206	0.86	-3134	0.93	-1963	0.71	-616	0.76	-339
BF 4111 HOT SPRINGS-TAFT & TAFT-DWORSHAK 500 KV	0.86	-974	0.93	-2857	0.76	-1925	0.98	-2271	0.86	-3186	0.93	-1993	0.76	-476	0.77	-276
BF 4114 GARRISON-TAFT #1 +TAFT REACTOR 500KV	0.85	-951	0.91	-3281	0.76	-1903	0.98	-2316	0.85	-3216	0.93	-2012	0.77	-480	0.76	-314
BF 4119 GARRISON-TAFT #1 & TAFT-BELL 500 KV	0.86	-944	0.92	-2942	0.76	-1888	0.98	-2231	0.86	-3127	0.93	-1974	0.80	-396	0.76	-311
BF 4131 SLATT-JOHN DAY & JOHN DAY-GRIZZLY #2 500 KV	0.86	-859	0.93	-2753	0.78	-1648	0.98	-1560	0.87	-2585	0.93	-1659	0.71	-601	0.76	-326
BF 4143 (OR 4134) JOHN DAY-GRIZZLY #1 & JOHN DAY CAPS 500 KV	0.86	-851	0.94	-2512	0.78	-1664	0.98	-1413	0.89	-2323	0.94	-1510	0.71	-594	0.76	-322
BF 4148 HOT SPRINGS-TAFT & GARRISON-TAFT #2 500 KV	0.85	-944	0.92	-3093	0.76	-1887	0.98	-2269	0.85	-3173	0.93	-1995	0.80	-397	0.77	-296
BF 4170 JOHN DAY-MARION & JOHN DAY CAPS 500 KV	0.86	-915	0.93	-2779	0.77	-1813	0.98	-1682	0.88	-2667	0.93	-1508	0.70	-619	0.76	-341
BF 4186 (OR 4582) MALIN-ROUND MTN 500 KV & MALIN 500/230 XFMR	0.86	-899	0.92	-3102	0.77	-1745	0.98	-2041	0.85	-2539	0.93	-1849	0.71	-612	0.76	-334
BF 4194 ROCK CK-JOHN DAY & BIG EDDY-JOHN DAY 500 KV	0.85	-904	0.92	-2720	0.77	-1826	0.98	-1800	0.89	-2833	0.93	-1778	0.71	-599	0.76	-324
BF 4197 JOHN DAY-BIG EDDY #1 & JOHN DAY CAPS 500 KV	0.85	-931	0.92	-2965	0.76	-1848	0.97	-1959	0.87	-2858	0.93	-1849	0.70	-625	0.76	-344
BF 4202 JOHN DAY-BIG EDDY#2 & BIG EDDY-OSTRANDER 500 KV	0.86	-949	0.92	-3169	0.76	-1892	0.98	-2109	0.86	-3079	0.93	-1892	0.70	-632	0.76	-348
BF 4231 MCNARY-COYOTE-SLATT 500 KV & MCNARY 500/230 KV XFMR	0.86	-900	0.92	-2980	0.78	-1933	0.98	-2218	0.85	-3245	0.93	-1973	0.70	-629	0.76	-345
BF 4234 MCNARY-COYOTE-SLATT & MCNARY-HERMCALP 500 KV	0.85	-985	0.93	-2700	0.76	-2048	0.98	-2184	0.87	-3385	0.93	-2016	0.70	-626	0.76	-354
BF 4247 LIT GOOS-LOW MON #2 & LOW MON-MCNARY 500 KV	0.85	-931	0.92	-2708	0.77	-1874	0.98	-2068	0.87	-3023	0.93	-1882	0.71	-597	0.77	-321
BF 4259 LIT GOOS-LOW MON #2 & LOW MON-HANFORD 500 KV	0.86	-942	0.91	-3018	0.76	-1894	0.98	-2236	0.86	-3142	0.93	-1981	0.70	-625	0.76	-343
BF 4268 MONROE-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.86	-950	0.92	-3067	0.76	-1910	0.98	-2307	0.85	-3221	0.93	-2009	0.70	-622	0.76	-344
BF 4276 ING500-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.86	-950	0.91	-3212	0.76	-1908	0.98	-2304	0.85	-3209	0.93	-2006	0.70	-627	0.76	-345
BF 4280 KEELER-PEARL & PEARL-MARION 500 KV	0.85	-921	0.93	-2851	0.77	-1829	0.98	-1844	0.89	-2651	0.92	-1320	0.71	-612	0.76	-336
BF 4280 KEELER-PEARL & PEARL-OSTRANDER 500 KV + RAS	0.85	-989	0.92	-2856	0.76	-2018	0.99	-2105	0.87	-3333	0.93	-1819	0.70	-629	0.76	-361
BF 4287 PEARL-OSTRANDER 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.86	-940	0.93	-3031	0.76	-1877	0.99	-1948	0.86	-2955	0.93	-1762	0.70	-627	0.76	-345
BF 4293 SCHULTZ-RAVER & RAVER COVINGTON5 500 KV	0.86	-949	0.92	-3107	0.76	-1905	0.98	-2274	0.85	-3180	0.93	-1999	0.70	-629	0.76	-346
BF 4336 CHIEF JO-SICKLER 500 KV & SICKLER 500/230 XFMR	0.86	-947	0.92	-2957	0.76	-1906	0.98	-2268	0.85	-3184	0.93	-1996	0.70	-621	0.76	-343
BF 4336 SICKLER-SCHULTZ 500 KV & SICKLER 500/230 XFMR	0.86	-947	0.92	-2965	0.76	-1905	0.98	-2257	0.86	-3164	0.93	-1992	0.70	-621	0.76	-343
BF 4377 ASHE-MARION & MARION-ALVEY 500 KV + RAS	0.85	-976	0.92	-2993	0.76	-1982	0.98	-2135	0.87	-2998	0.93	-1618	0.70	-643	0.76	-369
BF 4386 BUCKLEY-MARION & MARION-SANTIAM 500 KV	0.86	-945	0.92	-3200	0.76	-1880	0.98	-2194	0.86	-3093	0.92	-1715	0.70	-631	0.76	-347
BF 4439 BIG EDDY-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.86	-949	0.92	-3186	0.76	-1897	0.98	-2167	0.85	-3075	0.93	-1870	0.70	-631	0.76	-347
BF 4442 BIG EDDY-OSTRANDER 500 KV & OSTRANDER-MCLOUGHLIN 230 KV	0.86	-948	0.92	-3208	0.76	-1896	0.98	-2180	0.86	-3109	0.94	-1816	0.70	-631	0.76	-347
BF 4448 KNIGHT-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.85	-943	0.92	-3098	0.76	-1884	0.99	-2009	0.87	-3015	0.93	-1835	0.70	-629	0.76	-345
BF 4450 KNIGHT-OSTRANDER & OSTRANDER-PEARL 500 KV	0.85	-941	0.92	-3089	0.76	-1879	0.99	-1935	0.86	-3028	0.93	-1864	0.70	-628	0.76	-345
BF 4502 PAUL-ALLSTON & ALLSTON-KEELER 500 KV + RAS	0.85	-1058	0.95	-2273	0.75	-2206	0.98	-2402	0.86	-3833	0.93	-1988	0.70	-641	0.75	-385
BF 4510 PEARL-MARION 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.85	-929	0.93	-2945	0.77	-1842	0.98	-1923	0.88	-2723	0.92	-1339	0.70	-622	0.76	-341
BF 4526 CUSTERW-MONROE & MONROE-ECHO LAKE 500 KV + RAS	0.85	-1080	0.91	-3362	0.74	-2230	0.97	-2879	0.82	-4095	0.92	-2368	0.70	-680	0.75	-400
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV	0.85	-919	0.93	-2596	0.77	-1844	0.98	-1960	0.87	-2926	0.93	-1873	0.71	-604	0.76	-332
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV + RAS	0.85	-966	0.94	-2584	0.76	-1964	0.98	-2214	0.86	-3313	0.93	-2026	0.70	-621	0.76	-351
BF 4540 PAUL-NAPAVINE & PAUL-SATSOP 500 KV	0.86	-943	0.92	-3138	0.77	-1889	0.98	-2206	0.86	-3124	0.93	-1955	0.70	-625	0.76	-343
BF 4542 PAUL-ALLSTON 500 KV & CENTER G2	0.85	-976	0.92	-3004	0.76	-1985	0.98	-2301	0.86	-3334	0.93	-1995	0.70	-628	0.76	-355
BF 4542 PAUL-NAPAVINE 500 KV & CENTER G1	0.85	-981	0.92	-3075	0.76	-1996	0.98	-2398	0.85	-3426	0.93	-2064	0.70	-632	0.76	-357
BF 4550 OLYMPIA-PAUL & PAUL-ALLSTON 500 KV	0.86	-939	0.92	-3055	0.76	-1881	0.98	-2124	0.87	-3043	0.93	-1899	0.70	-621	0.76	-342
BF 4554 OLYMPIA-PAUL 500 KV & TONO 500/115 XFMR	0.86	-953	0.91	-3274	0.76	-1915	0.98	-2336	0.85	-3227	0.93	-2018	0.70	-632	0.76	-347
BF 4572 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.86	-850	0.92	-2692	0.78	-1834	0.99	-2055	0.87	-3075	0.93	-1847	0.71	-598	0.76	-321

Appendix E - 16hs2a_2250idnw_solo Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 4630 CEN FERRY-LIT GOOS #1 & LIT GOOS-LOW MON #1 500 KV	0.86	-945	0.91	-3228	0.76	-1901	0.98	-2276	0.85	-3178	0.93	-1996	0.70	-626	0.76	-343
BF 4652 TAFT-DWORSHAK & TAFT-HATWAI 500 KV + RAS	0.85	-1072	0.91	-3269	0.74	-2152	0.98	-2774	0.83	-3817	0.93	-2234	0.72	-594	0.76	-353
BF 4672 MONROE-CHIEF JO 500 KV & MONROE CAPS	0.86	-941	0.93	-2514	0.76	-1885	0.98	-2123	0.87	-3057	0.93	-1937	0.71	-616	0.76	-342
BF 4676 LIT GOOS-LOW MON & LOW MON-ASHE 500 KV	0.85	-935	0.91	-3053	0.77	-1887	0.98	-2214	0.86	-3131	0.93	-1973	0.70	-623	0.76	-341
BF 4690 PAUL-ALLSTON 500 KV & ALLSTON 500/230 XFMR	0.85	-938	0.92	-3084	0.76	-1879	0.98	-2121	0.87	-3041	0.93	-1899	0.70	-621	0.76	-341
BF 4700 HATWAI 500KV & 230 KV + RAS	0.86	-1098	0.91	-3236	0.73	-2171	0.98	-2735	0.83	-3788	0.93	-2219	0.72	-588	0.76	-349
BF 4708 HATWAI 500 KV BUS	0.86	-982	0.93	-2710	0.75	-1947	0.98	-2259	0.86	-3198	0.93	-1992	0.75	-513	0.78	-261
BF 4728 COULEE-CHIEF JO 500 KV & CHEIF JO 500/230 XFMR	0.86	-948	0.91	-3078	0.76	-1904	0.98	-2268	0.85	-3173	0.93	-1994	0.70	-624	0.76	-345
BF 4775 CEN FERRY-LOW GRAN #1 & #2 500 KV + RAS	0.86	-910	0.92	-2899	0.78	-1912	0.98	-2392	0.85	-3364	0.93	-2056	0.72	-567	0.77	-307
BF 4776 HATWAI-LOW GRAN & LOW GRAN-CEN FERRY 500 KV	0.86	-891	0.92	-2977	0.78	-1866	0.98	-2324	0.85	-3259	0.93	-2017	0.73	-555	0.77	-299
BF 4870 JOHN DAY-BIG EDDY 500 KV & BIG EDDY 500/230 KV	0.86	-954	0.92	-3240	0.76	-1906	0.97	-2273	0.86	-3137	0.93	-1981	0.70	-633	0.76	-348
BF 4888 ASHE-SLATT & CGS 500 KV	0.85	-998	0.92	-2704	0.76	-2093	0.98	-2477	0.85	-3634	0.93	-2081	0.70	-619	0.76	-356
BF 4891 LOW MON-ASHE & ASHE-SLATT 500 KV	0.85	-904	0.91	-2403	0.77	-1855	0.99	-1815	0.87	-2863	0.93	-1758	0.71	-592	0.76	-322
BF 4901 LOW MON-ASHE & ASHE-HANFORD 500 KV	0.86	-913	0.90	-2558	0.77	-1893	0.98	-2126	0.87	-3095	0.93	-1943	0.71	-596	0.76	-323
BF 4940 LOW MON-ASHE & ASHE-MARION 500 KV	0.86	-888	0.93	-2448	0.77	-1770	0.99	-1549	0.89	-2573	0.93	-1524	0.71	-601	0.76	-328
BF 4957 SUMMER L-MALIN & SUMMER L-HEMINGWAY 500 KV	0.88	-743	0.93	-2985	0.79	-1076	0.98	-1926	0.84	-2516	0.93	-1773	0.72	-583	0.77	-315
BF 4959 GRIZZLY-SUMMER L & SUMMER L-MALIN 500 KV	0.88	-787	0.93	-2856	0.79	-1136	0.98	-1773	0.85	-2348	0.94	-1638	0.72	-583	0.77	-314
BF 4996 CAPTJACK-MALIN #1 & #2 500 KV	0.86	-931	0.91	-3288	0.76	-1853	0.98	-2709	0.76	-3077	0.93	-2016	0.70	-626	0.76	-343
BF 5003 SLATT-BUCKLEY & SLATT-BOARDMAN 500 KV	0.86	-792	0.95	-2132	0.81	-1635	0.99	-1074	0.91	-2017	0.94	-1250	0.74	-537	0.78	-278
BF 5006 SLATT-COYOTE-MCNARY & SLATT-GRASSLAND 500 KV	0.85	-878	0.94	-2527	0.80	-1758	0.98	-1664	0.89	-2742	0.93	-1705	0.72	-570	0.77	-303
BF 5015 ASHE-SLATT & SLATT-BUCKLEY 500 KV	0.86	-860	0.93	-2352	0.78	-1724	0.99	-1470	0.91	-2468	0.94	-1467	0.72	-582	0.77	-314
BF 5018 ASHE-SLATT & SLATT-JOHN DAY 500 KV	0.85	-901	0.92	-2569	0.77	-1804	0.98	-1716	0.89	-2835	0.93	-1763	0.71	-599	0.76	-325
BF 5021 SLATT-JOHN DAY & SLATT-COYOTE-MCNARY 500 KV	0.85	-941	0.92	-2876	0.77	-1884	0.98	-1936	0.87	-3171	0.93	-1942	0.70	-625	0.76	-343
BF 5028 BUCKLEY-GRIZZLY & GRIZZLY-SUMMER LAKE 500 KV	0.87	-770	0.94	-2562	0.79	-1482	0.98	-1463	0.88	-2230	0.94	-1469	0.72	-567	0.77	-302
BF 5040 GRIZZLY-JOHN DAY & GRIZZLY-ROUND BU 500 KV	0.86	-869	0.93	-2836	0.78	-1706	0.98	-2172	0.87	-2611	0.93	-1694	0.71	-602	0.76	-325
BF 5114 ECHO LAKE-RAVER & ECHO LAKE- SNOK TAP 500 KV	0.86	-946	0.92	-2900	0.76	-1903	0.98	-2239	0.86	-3161	0.93	-1993	0.71	-616	0.76	-342
BF 5117 ECHO LAKE-MAPLE VALLEY & ECHO LAKE-RAVER 500 KV	0.86	-946	0.92	-2897	0.76	-1900	0.98	-2220	0.86	-3147	0.93	-1985	0.70	-623	0.76	-343
BF 5148 COULEE-SCHULTZ & ECHO LAKE-SCHULTZ 500 KV	0.86	-936	0.93	-2572	0.77	-1878	0.98	-2125	0.86	-3078	0.93	-1946	0.71	-604	0.76	-335
BF 5170 WAUTOMA-SCHULTZ & SCHULTZ-RAVER 500 KV	0.85	-934	0.91	-2789	0.77	-1880	0.98	-2080	0.87	-3045	0.93	-1908	0.71	-602	0.76	-333
BF 5179 VANTAGE-SCHULTZ & SCHULTZ-RAVER #4	0.86	-948	0.91	-2985	0.76	-1903	0.98	-2226	0.86	-3141	0.93	-1974	0.71	-618	0.76	-341
BF 5211 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.86	-850	0.92	-2692	0.78	-1834	0.99	-2055	0.87	-3075	0.93	-1847	0.71	-598	0.76	-321
BF 5214 LOW MON-MCNARY & CALPINE PH 500 KV	0.85	-967	0.93	-2466	0.76	-1959	0.98	-2020	0.88	-3122	0.93	-1901	0.71	-597	0.76	-332
BF 5250 HANFORD-WAUTOMA#1 & WAUTOMA-KNIGHT 500 KV	0.85	-899	0.92	-2622	0.77	-1809	0.98	-1777	0.89	-2785	0.93	-1744	0.71	-598	0.76	-325
BF 5259 HANFORD-WAUTOMA#2 & WAUTOMA-ROCK CK 500 KV	0.85	-900	0.92	-2604	0.77	-1822	0.99	-1784	0.89	-2854	0.93	-1769	0.71	-591	0.76	-322
BF 5266 SLATT-BUCKLY 500 KV	0.86	-889	0.93	-2836	0.77	-1753	0.98	-1790	0.88	-2716	0.93	-1688	0.71	-611	0.76	-334
BF 5339 VANTAGE-SCHULTZ 500 KV & VANTAGE 500/230 XFMR #1	0.86	-950	0.91	-3112	0.76	-1909	0.98	-2262	0.86	-3159	0.93	-1986	0.70	-622	0.76	-342
BF 5345 VANTAGE-HANFORD 500 KV & VANTAGE 500/230 XFMR #1	0.86	-941	0.89	-3079	0.76	-1904	0.98	-2228	0.86	-3159	0.93	-1974	0.71	-616	0.76	-340
BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.91	-487	0.94	-2693	0.80	-1278	0.98	-1636	0.89	-2303	0.94	-1580	0.74	-533	0.78	-272
BF IPC HEMINGWAY-SUMMER L 500 KV & HEMINGWAY 500/230 XFMR	0.91	-599	0.91	-3267	0.75	-1140	0.98	-2705	0.85	-2991	0.93	-2005	0.71	-604	0.76	-331
BF IPC MIDPOINT-HEM 500 KV & ADEL-MIDPOINT 345 KV + PTSN	0.88	-739	0.91	-3329	0.78	-1436	0.98	-2771	0.85	-2882	0.93	-1995	0.75	-484	0.79	-237
BF LOLO 230KV	0.87	-960	0.92	-3069	0.74	-1905	0.98	-2112	0.86	-2992	0.93	-1924	0.71	-609	0.76	-328
BF MCNARY 230 KV SECT 1	0.86	-1001	0.92	-3173	0.75	-2015	0.98	-2459	0.84	-3453	0.93	-2086	0.70	-629	0.76	-355
BF MCNARY 230 KV SECT 2	0.86	-979	0.92	-3178	0.76	-1968	0.98	-2807	0.83	-3355	0.96	-1880	0.70	-630	0.76	-352
BF MCNARY 230 KV SECT 3	0.86	-959	0.92	-3031	0.76	-1938	0.98	-2705	0.86	-3223	0.93	-1985	0.70	-630	0.76	-351
BF PGE SLATT-GRASSLAND 500 KV & BOARDMAN COAL GEN	0.86	-828	0.94	-2452	0.82	-1552	0.98	-1588	0.89	-2485	0.94	-1591	0.73	-537	0.77	-287
BUS: ALVEY 500 KV + RAS	0.85	-997	0.91	-3472	0.75	-2020	0.98	-2544	0.86	-2976	0.94	-1887	0.70	-653	0.75	-375
BUS: BELL BPA 500 KV	0.86	-950	0.93	-2996	0.76	-1909	0.98	-2277	0.85	-3170	0.93	-1993	0.72	-583	0.76	-354
BUS: BUCKLEY 500 KV	0.86	-861	0.94	-2561	0.77	-1673	0.99	-1451	0.89	-2420	0.93	-1333	0.71	-602	0.76	-328
BUS: DIXONVILLE 500 KV	0.86	-876	0.92	-3037	0.77	-1715	0.98	-1951	0.87	-2373	0.94	-1724	0.71	-605	0.76	-328
BUS: HOT SPRINGS 500 KV	0.86	-948	0.91	-3231	0.76	-1904	0.98	-2298	0.85	-3205	0.93	-2003	0.71	-602	0.76	-341
BUS: KEELER 500 KV + RAS	0.85	-1059	0.95	-2185	0.75	-2201	0.99	-2041	0.89	-3488	0.94	-1694	0.70	-643	0.75	-386
BUS: SICKLER 500 KV	0.86	-946	0.92	-2891	0.76	-1903	0.98	-2242	0.86	-3159	0.93	-1988	0.71	-618	0.76	-342

Appendix E - 16hs2a_2250idnw_solo Base Case VQ Results V is the voltage at Qm & Qm is the Reactive Margin Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BUS: SUMMER LAKE 500 KV	0.89	-725	0.94	-2775	0.79	-1046	0.98	-1714	0.85	-2285	0.94	-1611	0.72	-577	0.77	-311
N-1: ALLSTON-KEELER 500 KV + RAS	0.85	-1063	0.95	-2399	0.74	-2217	0.98	-2932	0.86	-3883	0.93	-2036	0.70	-644	0.75	-386
N-1: ALLSTON-NAPAVINE 500 KV	0.85	-938	0.92	-3078	0.76	-1879	0.98	-2118	0.87	-3039	0.93	-1897	0.70	-621	0.76	-341
N-1: ALLSTON-PAUL #2 500 KV	0.85	-938	0.92	-3083	0.76	-1879	0.98	-2118	0.87	-3039	0.93	-1898	0.70	-621	0.76	-341
N-1: ALVERY-DIXONVILLE 500 KV	0.86	-882	0.92	-3052	0.77	-1731	0.98	-1974	0.87	-2405	0.93	-1815	0.71	-607	0.76	-330
N-1: ALVEY-MARION 500 KV	0.86	-895	0.93	-2971	0.77	-1767	0.98	-1903	0.87	-2527	0.93	-1710	0.71	-610	0.76	-333
N-1: ASHE-HANFORD 500 KV	0.86	-949	0.90	-2880	0.76	-1910	0.98	-2698	0.86	-3157	0.93	-1987	0.70	-622	0.76	-342
N-1: ASHE-LOW MON 500 KV	0.86	-939	0.91	-3105	0.76	-1892	0.98	-2243	0.86	-3142	0.93	-1982	0.70	-626	0.76	-343
N-1: ASHE-MARION 500 KV	0.86	-896	0.93	-2625	0.77	-1788	0.99	-1609	0.89	-2618	0.93	-1546	0.71	-605	0.76	-331
N-1: ASHE-SLATT 500 KV	0.85	-908	0.92	-2625	0.77	-1863	0.99	-1863	0.88	-2921	0.93	-1792	0.71	-597	0.76	-323
N-1: BELL-COULEE 500 KV	0.86	-948	0.92	-3096	0.76	-1904	0.98	-2285	0.85	-3178	0.93	-1998	0.72	-591	0.76	-342
N-1: BELL-TAFT 500 KV	0.86	-953	0.92	-3150	0.76	-1911	0.98	-2286	0.85	-3171	0.93	-1995	0.72	-592	0.76	-356
N-1: BIG EDDY-CELILO 500 KV	0.86	-950	0.91	-3306	0.76	-1909	0.98	-2308	0.85	-3210	0.93	-2007	0.70	-631	0.76	-346
N-1: BIG EDDY-JOHN DAY 500 KV	0.86	-952	0.91	-3259	0.76	-1906	0.97	-2317	0.85	-3175	0.93	-1994	0.70	-632	0.76	-347
N-1: BIG EDDY-KNIGHT 500 KV	0.86	-934	0.92	-3081	0.77	-1875	0.98	-2097	0.87	-3054	0.93	-1918	0.70	-619	0.76	-339
N-1: BIG EDDY-OSTRANDER 500 KV	0.85	-948	0.92	-3217	0.76	-1896	0.98	-2207	0.86	-3123	0.93	-1909	0.70	-630	0.76	-347
N-1: BOISE BENCH-BROWNLEE #3 230 KV	0.86	-876	0.91	-3270	0.77	-1780	0.98	-2265	0.85	-3148	0.93	-1989	0.70	-626	0.76	-343
N-1: BRADY-ANTELOPE 230 KV	0.86	-946	0.91	-3283	0.76	-1897	0.98	-2295	0.85	-3198	0.93	-2001	0.70	-585	0.76	-344
N-1: BROADVIEW-GARRISON #1 500 KV	0.86	-955	0.91	-3271	0.76	-1915	0.98	-2326	0.85	-3230	0.93	-2017	0.76	-516	0.77	-285
N-1: BROWNLEE-ONTARIO 230 KV	0.86	-836	0.91	-3234	0.79	-1669	0.98	-2233	0.86	-3106	0.93	-1977	0.70	-624	0.76	-342
N-1: BUCKLEY-GRIZZLY 500 KV	0.86	-895	0.93	-2988	0.77	-1778	0.98	-1933	0.86	-2805	0.93	-1808	0.71	-610	0.76	-333
N-1: BUCKLEY-MARION 500 KV	0.85	-940	0.92	-3138	0.76	-1865	0.98	-2120	0.86	-3023	0.93	-1579	0.70	-629	0.76	-346
N-1: BUCKLEY-SLATT 500 KV	0.86	-889	0.93	-2840	0.77	-1753	0.98	-1790	0.88	-2716	0.93	-1688	0.71	-611	0.76	-334
N-1: CAPTAIN JACK-OLINDA 500 KV	0.87	-850	0.93	-2865	0.78	-1611	0.98	-1797	0.86	-2029	0.94	-1684	0.72	-591	0.76	-318
N-1: CAPTJACK-KFALLS 500 KV	0.86	-880	0.92	-3130	0.77	-1717	0.98	-2018	0.80	-2835	0.93	-2034	0.71	-607	0.76	-330
N-1: CHIEF JO-COULEE 500 KV	0.86	-950	0.91	-3124	0.76	-1907	0.98	-2281	0.85	-3180	0.93	-1998	0.70	-627	0.76	-346
N-1: CHIEF JO-MONROE 500 KV	0.86	-946	0.93	-2962	0.76	-1900	0.98	-2254	0.86	-3151	0.93	-1989	0.70	-624	0.76	-344
N-1: CHIEF JO-SICKLER 500 KV	0.86	-948	0.91	-3075	0.76	-1904	0.98	-2278	0.85	-3180	0.93	-1996	0.70	-621	0.76	-342
N-1: COULEE-HANFORD 500 KV	0.85	-941	0.92	-2695	0.77	-1901	0.98	-2174	0.86	-3149	0.93	-1952	0.72	-588	0.76	-327
N-1: COULEE-SCHULTZ 500 KV	0.85	-941	0.93	-2801	0.77	-1890	0.98	-2206	0.86	-3140	0.93	-1975	0.71	-608	0.76	-336
N-1: COVINGTON4-RAVER 500 KV	0.86	-951	0.91	-3274	0.76	-1911	0.98	-2317	0.85	-3216	0.93	-2011	0.70	-631	0.76	-347
N-1: COVINGTON5-RAVER 500 KV	0.86	-951	0.91	-3272	0.76	-1911	0.98	-2317	0.85	-3215	0.93	-2011	0.70	-631	0.76	-347
N-1: CUSTERW-MONROE 500 KV	0.86	-950	0.92	-3088	0.76	-1912	0.98	-2310	0.85	-3223	0.93	-2010	0.70	-623	0.76	-344
N-1: DIXONVILLE-MERIDIAN 500 KV	0.86	-888	0.92	-3060	0.77	-1748	0.98	-2001	0.85	-2585	0.93	-1766	0.71	-608	0.76	-331
N-1: DRYCREEK-LOLO 230 KV	0.86	-950	0.91	-3307	0.76	-1909	0.98	-2311	0.85	-3211	0.93	-2008	0.70	-630	0.76	-346
N-1: DRYCREEK-N LEWISTON 230 KV	0.86	-952	0.91	-3299	0.76	-1910	0.98	-2307	0.85	-3208	0.93	-2006	0.70	-630	0.76	-346
N-1: DRYCREEK-WALA AVA 230 KV	0.86	-953	0.91	-3290	0.76	-1910	0.98	-2304	0.85	-3207	0.93	-2005	0.70	-629	0.76	-345
N-1: DWORSHAK-HATWAI 500 KV + RAS	0.86	-987	0.93	-2663	0.76	-1942	0.98	-2239	0.86	-3196	0.93	-1984	0.75	-514	0.78	-260
N-1: DWORSHAK-TAFT 500 KV	0.86	-976	0.92	-2920	0.76	-1929	0.98	-2284	0.86	-3187	0.93	-1995	0.75	-509	0.77	-282
N-1: ECHO LAKE-MAPLE VALLEY 500 KV	0.86	-952	0.91	-3156	0.76	-1911	0.98	-2295	0.85	-3210	0.93	-2008	0.70	-631	0.76	-347
N-1: ECHO LAKE-RAVER 500 KV	0.86	-948	0.91	-3192	0.76	-1904	0.98	-2287	0.85	-3183	0.93	-2004	0.70	-627	0.76	-345
N-1: ECHO LAKE-SCHULTZ 500 KV	0.86	-947	0.91	-3077	0.76	-1901	0.98	-2248	0.86	-3148	0.93	-1989	0.70	-628	0.76	-345
N-1: ECHO LAKE-SNOK TAP 500 KV	0.86	-947	0.92	-2948	0.76	-1904	0.98	-2250	0.86	-3167	0.93	-1996	0.71	-617	0.76	-342
N-1: GARRISON-TAFT #2 500 KV	0.85	-945	0.91	-3158	0.76	-1891	0.98	-2276	0.85	-3170	0.93	-1996	0.79	-434	0.76	-306
N-1: GOLDHILL-PLACER 115 KV	0.86	-953	0.91	-3345	0.76	-1914	0.98	-2342	0.85	-3249	0.93	-2024	0.70	-632	0.76	-346
N-1: GRASSLAND-COYOTE 500 KV	0.86	-951	0.91	-3309	0.76	-1910	0.98	-2312	0.85	-3212	0.93	-2009	0.70	-631	0.76	-346
N-1: GRASSLAND-SLATT 500 KV	0.85	-874	0.93	-2834	0.80	-1715	0.98	-1792	0.88	-2697	0.93	-1737	0.72	-573	0.77	-305
N-1: GRIZZLY-JOHN DAY #2 500 KV	0.86	-872	0.93	-2884	0.78	-1720	0.98	-1781	0.87	-2639	0.93	-1703	0.71	-602	0.76	-326
N-1: GRIZZLY-MALIN 500 KV	0.86	-860	0.93	-2854	0.78	-1670	0.98	-1773	0.85	-2500	0.94	-1634	0.71	-602	0.76	-326
N-1: GRIZZLY-PONDEROSA A-SUMMER L 500 KV	0.86	-821	0.93	-2874	0.78	-1598	0.98	-2232	0.86	-2569	0.94	-1669	0.72	-584	0.77	-314
N-1: GRIZZLY-PONDEROSA B-CAPT JACK 500 KV	0.86	-856	0.93	-2812	0.78	-1661	0.98	-2172	0.86	-2450	0.94	-1616	0.71	-601	0.76	-325
N-1: GRIZZLY-ROUND BU 500 KV	0.86	-950	0.91	-3293	0.76	-1902	0.98	-2705	0.85	-3193	0.93	-2000	0.70	-631	0.76	-346

Appendix E - 16hs2a_2250idnw_solo Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: HANFORD-LOW MON 500 KV	0.86	-946	0.91	-3061	0.76	-1900	0.98	-2261	0.85	-3167	0.93	-1989	0.70	-628	0.76	-345
N-1: HANFORD-VANTAGE 500 KV	0.86	-941	0.89	-3078	0.76	-1904	0.98	-2227	0.86	-3158	0.93	-1973	0.71	-615	0.76	-340
N-1: HANFORD-WAUTOMA 500 KV	0.86	-945	0.91	-3197	0.76	-1899	0.98	-2265	0.85	-3173	0.93	-1988	0.70	-628	0.76	-345
N-1: HATWAI 500/230 KV XFMR + RAS	0.86	-977	0.91	-3263	0.75	-1932	0.98	-2263	0.85	-3151	0.93	-1989	0.70	-631	0.76	-342
N-1: HATWAI-LOLO 230 KV	0.86	-956	0.91	-3273	0.76	-1914	0.98	-2288	0.85	-3185	0.93	-1999	0.70	-628	0.76	-344
N-1: HATWAI-LOW GRAN 500 KV	0.86	-892	0.92	-3002	0.78	-1870	0.98	-2344	0.85	-3273	0.93	-2026	0.73	-556	0.77	-300
N-1: HATWAI-N LEWISTON 230 KV	0.86	-952	0.91	-3301	0.76	-1911	0.98	-2308	0.85	-3209	0.93	-2007	0.70	-630	0.76	-346
N-1: HELLS CANYON-BROWNLEE 230 KV	0.86	-816	0.92	-3010	0.78	-1725	0.98	-2025	0.87	-2905	0.93	-1889	0.71	-601	0.76	-328
N-1: HELLS CANYON-WALLA WALLA 230 KV	0.85	-1006	0.92	-3143	0.75	-1911	0.98	-2166	0.86	-3050	0.93	-1950	0.70	-618	0.76	-338
N-1: HEMINGWAY-GRASSLAND 500 KV	0.88	-682	0.94	-2625	0.82	-1270	0.98	-1580	0.89	-2261	0.94	-1548	0.74	-521	0.78	-267
N-1: HEMINGWAY-GRASSLAND 500 KV + FACRI	0.87	-774	0.91	-3220	0.78	-1422	0.98	-2751	0.87	-3232	0.93	-2028	0.72	-579	0.77	-313
N-1: HEMINGWAY-GRASSLAND 500 KV + PTSN SHUNT	0.88	-688	0.94	-2641	0.82	-1282	0.98	-1589	0.89	-2274	0.94	-1554	0.74	-529	0.78	-269
N-1: HEMINGWAY-SUMMER LAKE 500 KV	0.88	-798	0.91	-3270	0.78	-1171	0.98	-2688	0.85	-2980	0.93	-1997	0.71	-605	0.76	-330
N-1: HILL TOP 345/230 XFMR	0.85	-948	0.91	-3300	0.76	-1886	0.98	-2294	0.85	-3116	0.93	-1998	0.70	-630	0.76	-346
N-1: HORSE HV-MCNARY 230 KV	0.86	-941	0.91	-3259	0.76	-1895	0.98	-2276	0.85	-3173	0.93	-1989	0.70	-630	0.76	-346
N-1: HOT SPRINGS-TAFT 500 KV	0.86	-948	0.91	-3231	0.76	-1904	0.98	-2298	0.85	-3205	0.93	-2003	0.71	-602	0.76	-341
N-1: HUMBOLDT-COYOTE CK 345 KV	0.86	-1027	0.91	-3223	0.76	-1978	0.98	-2228	0.85	-2991	0.93	-1939	0.70	-639	0.76	-350
N-1: HUNTINGTON-PINTO-FOUR CORNERS 345 KV	0.86	-964	0.91	-3329	0.76	-1941	0.98	-2317	0.85	-3194	0.93	-2007	0.70	-638	0.76	-352
N-1: ING500-CUSTERW 500 KV	0.86	-950	0.91	-3219	0.76	-1909	0.98	-2305	0.85	-3209	0.93	-2006	0.70	-627	0.76	-345
N-1: JOHN DAY-MARION 500 KV	0.85	-936	0.92	-3115	0.76	-1865	0.98	-2048	0.87	-2968	0.93	-1605	0.70	-627	0.76	-345
N-1: JOHN DAY-ROCK CK 500 KV	0.85	-902	0.92	-2737	0.77	-1827	0.99	-1798	0.87	-2874	0.93	-1787	0.71	-598	0.76	-324
N-1: JOHN DAY-SLATT 500 KV	0.86	-932	0.91	-3142	0.76	-1827	0.98	-2006	0.86	-3092	0.93	-1938	0.70	-628	0.76	-345
N-1: KFALLS-MERIDIAN 500 KV	0.86	-934	0.92	-3205	0.76	-1863	0.98	-2210	0.83	-3184	0.94	-1561	0.70	-626	0.76	-343
N-1: KNIGHT-WAUTOMA 500 KV	0.85	-902	0.92	-2682	0.77	-1815	0.98	-1802	0.89	-2800	0.93	-1758	0.71	-599	0.76	-326
N-1: LAGRANDE-NORTH POWDER 230 KV	0.87	-914	0.91	-3268	0.76	-1887	0.98	-2247	0.86	-3105	0.93	-1979	0.70	-624	0.76	-342
N-1: LANES-MARION 500 KV	0.85	-940	0.92	-3164	0.76	-1876	0.98	-2149	0.87	-2968	0.94	-1759	0.70	-627	0.76	-344
N-1: LIT GOOSE-CENTRAL FERRY 500 KV	0.86	-949	0.91	-3283	0.76	-1907	0.98	-2300	0.85	-3207	0.93	-2004	0.70	-629	0.76	-345
N-1: LIT GOOSE-LOW MON 500 KV	0.86	-947	0.91	-3249	0.76	-1904	0.98	-2287	0.85	-3183	0.93	-2000	0.70	-628	0.76	-344
N-1: LOW GRAN-CENTRAL FERRY 500 KV	0.86	-946	0.91	-3263	0.76	-1904	0.98	-2297	0.85	-3207	0.93	-2003	0.70	-626	0.76	-344
N-1: LOW MON-SAC TAP 500 KV	0.85	-939	0.92	-2824	0.77	-1885	0.98	-2149	0.85	-3070	0.93	-1907	0.71	-602	0.76	-324
N-1: MALIN 500/230 XFMR	0.86	-943	0.91	-3284	0.76	-1882	0.98	-2285	0.85	-3175	0.93	-1980	0.70	-629	0.76	-345
N-1: MALIN-HILLTOP 230 KV	0.86	-938	0.91	-3286	0.77	-1863	0.98	-2283	0.85	-3129	0.93	-1995	0.70	-627	0.76	-344
N-1: MALIN-ROUND MTN #1 500 KV	0.86	-910	0.92	-3135	0.77	-1778	0.98	-2076	0.85	-2589	0.93	-1887	0.71	-615	0.76	-335
N-1: MALIN-ROUND MTN #2 500 KV	0.86	-907	0.92	-3125	0.77	-1771	0.98	-2060	0.85	-2557	0.93	-1878	0.71	-615	0.76	-335
N-1: MALIN-SUMMER LAKE 500 KV	0.86	-940	0.92	-3101	0.76	-1739	0.98	-2039	0.83	-2718	0.93	-1814	0.70	-628	0.76	-344
N-1: MAPLE VLY-ROCKY RH 345 KV	0.86	-949	0.92	-3133	0.76	-1906	0.98	-2287	0.85	-3182	0.93	-2001	0.70	-629	0.76	-346
N-1: MARION-PEARL 500 KV	0.85	-936	0.91	-3153	0.77	-1861	0.98	-2106	0.87	-2833	0.92	-1384	0.70	-625	0.76	-343
N-1: MARION-SANTIAM 500 KV	0.86	-957	0.91	-3360	0.76	-1926	0.98	-2375	0.85	-3249	0.93	-2088	0.70	-632	0.76	-347
N-1: MCLOUGLIN-OSTRANDER 230 KV	0.86	-951	0.91	-3292	0.76	-1910	0.98	-2292	0.85	-3194	0.93	-1963	0.70	-631	0.76	-347
N-1: MCNARY 500/230 KV XFMR	0.86	-892	0.91	-3325	0.77	-1884	0.98	-2363	0.85	-3251	0.93	-2005	0.70	-632	0.76	-347
N-1: MCNARY S2-MCNARY S3 230 KV	0.86	-950	0.91	-3267	0.76	-1908	0.98	-2312	0.85	-3213	0.93	-2007	0.70	-631	0.76	-347
N-1: MCNARY-BOARD T1 230 KV	0.85	-941	0.91	-3308	0.76	-1885	0.98	-2275	0.85	-3141	0.93	-1990	0.70	-629	0.76	-344
N-1: MCNARY-COYOTE-SLATT 500 KV	0.85	-946	0.92	-2950	0.77	-1953	0.98	-2169	0.87	-3207	0.93	-1974	0.70	-623	0.76	-341
N-1: MCNARY-JOHN DAY 500 KV	0.86	-903	0.92	-2987	0.77	-1826	0.98	-1926	0.88	-2929	0.93	-1859	0.70	-627	0.76	-344
N-1: MCNARY-ROSS 345 KV	0.86	-937	0.92	-3188	0.77	-1886	0.98	-2215	0.86	-3123	0.93	-1952	0.70	-630	0.76	-346
N-1: MCNARY-ROUNDUP 230 KV	0.88	-833	0.92	-3181	0.78	-1803	0.98	-2166	0.86	-3040	0.93	-1948	0.71	-615	0.76	-337
N-1: MCNARY-SAC TAP-LOW MON 500 KV	0.85	-935	0.92	-2772	0.77	-1879	0.98	-2094	0.87	-3035	0.93	-1894	0.71	-601	0.76	-324
N-1: MIDPOINT-HEMINGWAY 500 KV	0.88	-732	0.91	-3314	0.78	-1429	0.98	-2326	0.85	-2875	0.93	-1990	0.74	-482	0.78	-251
N-1: MIDPOINT-HEMINGWAY 500 KV + PTSN SHUNT	0.88	-740	0.91	-3340	0.77	-1439	0.98	-2776	0.85	-2891	0.93	-1997	0.74	-495	0.78	-255
N-1: MIDPOINT-HEMINGWAY 500 KV + PTSN & BORA SHUNT	0.88	-768	0.91	-3353	0.76	-1480	0.98	-2788	0.85	-2911	0.93	-2002	0.74	-501	0.78	-257
N-1: MIDPOINT-HEMINGWAY 500 KV + PTSN & BORA & MLCK SHUNT	0.88	-772	0.91	-3375	0.76	-1487	0.98	-2797	0.85	-2919	0.93	-2006	0.74	-522	0.78	-261
N-1: MIDPOINT-HUMBOLDT 345 KV	0.85	-1028	0.92	-3202	0.75	-1999	0.98	-2647	0.85	-2976	0.93	-1936	0.70	-639	0.76	-350

Appendix E - 16hs2a_2250idnw_solo Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: NAPAVINE-PAUL 500 KV	0.86	-944	0.91	-3219	0.76	-1892	0.98	-2229	0.86	-3139	0.93	-1974	0.70	-626	0.76	-343
N-1: OLYMPIA-PAUL 500 KV	0.86	-953	0.91	-3352	0.76	-1915	0.98	-2345	0.85	-3232	0.93	-2029	0.70	-632	0.76	-347
N-1: ONTARIO-CALDWELL 230 KV	0.86	-905	0.91	-3273	0.77	-1788	0.98	-2268	0.85	-3148	0.93	-1992	0.70	-627	0.76	-344
N-1: OSTRANDER-KNIGHT 500 KV	0.85	-942	0.92	-3151	0.76	-1882	0.98	-2129	0.86	-3034	0.93	-1872	0.70	-628	0.76	-345
N-1: OSTRANDER-PEARL 500 KV	0.86	-949	0.91	-3260	0.76	-1901	0.98	-2224	0.84	-3185	0.93	-1983	0.70	-630	0.76	-346
N-1: OSTRANDER-TROUTDALE 500 KV	0.86	-953	0.91	-3273	0.76	-1912	0.98	-2273	0.86	-3156	0.93	-1970	0.70	-632	0.76	-347
N-1: OXBOW-BROWNLEE #2 230 KV	0.86	-937	0.91	-3302	0.77	-1893	0.98	-2304	0.85	-3205	0.93	-2005	0.70	-630	0.76	-346
N-1: OXBOW-LOLO 230 KV	0.87	-949	0.92	-3075	0.75	-1894	0.98	-2113	0.86	-2992	0.93	-1924	0.71	-610	0.76	-328
N-1: PAUL-SATSOP 500 KV	0.86	-949	0.91	-3253	0.76	-1907	0.98	-2283	0.85	-3177	0.93	-1987	0.70	-630	0.76	-346
N-1: PEARL-KEELER 500 KV + RAS	0.85	-993	0.93	-2889	0.76	-2027	0.98	-2259	0.86	-3373	0.93	-1905	0.70	-631	0.76	-361
N-1: PINTO-FOUR CORNER 345 KV	0.86	-956	0.91	-3288	0.76	-1919	0.98	-2301	0.85	-3182	0.93	-2001	0.70	-633	0.76	-349
N-1: PONDEROSA A 500/230 KV XFMR	0.86	-952	0.91	-3308	0.76	-1909	0.98	-2310	0.85	-3207	0.93	-2006	0.70	-631	0.76	-347
N-1: PONDEROSA B 500/230 KV XFMR	0.86	-950	0.91	-3309	0.76	-1907	0.98	-2312	0.85	-3210	0.93	-2008	0.70	-631	0.76	-346
N-1: RAVER-PAUL 500 KV	0.86	-921	0.92	-2633	0.77	-1849	0.98	-1994	0.86	-2979	0.93	-1904	0.71	-606	0.76	-333
N-1: RAVER-TACOMA 500 KV	0.86	-950	0.91	-3196	0.76	-1908	0.98	-2294	0.85	-3197	0.93	-2002	0.70	-630	0.76	-346
N-1: RED BUTTE-HARRY ALLEN 345 KV	0.85	-965	0.91	-3269	0.76	-1946	0.98	-2263	0.85	-3112	0.93	-1978	0.70	-639	0.76	-355
N-1: ROBINSON-HARRY ALLEN 500 KV	0.86	-912	0.91	-3303	0.77	-1780	0.98	-2312	0.85	-3227	0.93	-2016	0.70	-625	0.76	-344
N-1: ROCK CK-WAUTOMA 500 KV	0.85	-902	0.92	-2656	0.77	-1826	0.99	-1807	0.87	-2872	0.93	-1779	0.71	-593	0.76	-323
N-1: ROUND MTN-TABLE MTN 500 KV	0.86	-925	0.92	-3184	0.77	-1831	0.98	-2182	0.85	-2843	0.93	-1943	0.70	-620	0.76	-339
N-1: ROUNDUP-LAGRANDE 230 KV	0.87	-901	0.92	-3201	0.76	-1871	0.98	-2199	0.86	-3071	0.93	-1961	0.70	-620	0.76	-339
N-1: SCHULTZ-SICKLER 500 KV	0.86	-946	0.92	-2988	0.76	-1905	0.98	-2255	0.86	-3164	0.93	-1991	0.70	-620	0.76	-343
N-1: SCHULTZ-VANTAGE 500 KV	0.86	-951	0.91	-3112	0.76	-1909	0.98	-2264	0.85	-3172	0.93	-1986	0.70	-623	0.76	-342
N-1: SCHULTZ-WAUTOMA 500 KV	0.86	-937	0.91	-2906	0.77	-1888	0.98	-2112	0.87	-3059	0.93	-1918	0.71	-605	0.76	-334
N-1: SIGURD-GLEN CANYON 230 KV	0.86	-950	0.91	-3309	0.76	-1907	0.98	-2313	0.85	-3211	0.93	-2009	0.70	-630	0.76	-346
N-1: SLATT 500/230 KV XFMR	0.85	-989	0.92	-3034	0.76	-2022	0.98	-2360	0.85	-3429	0.93	-2058	0.70	-628	0.76	-357
N-1: SNOK TAP-SNOKING 500 KV	0.86	-951	0.91	-3242	0.76	-1910	0.98	-2309	0.85	-3213	0.93	-2008	0.70	-630	0.76	-346
N-1: TABLE MTN-TESLA 500 KV	0.86	-927	0.91	-3216	0.77	-1839	0.98	-2221	0.85	-2919	0.93	-1963	0.70	-619	0.76	-338
N-1: TABLE MTN-VACA DIXON 500 KV	0.86	-912	0.92	-3161	0.77	-1795	0.98	-2147	0.85	-2698	0.93	-1924	0.71	-614	0.76	-334
N-1: VANTAGE 500/230 KV XFMR #1	0.86	-950	0.91	-3319	0.76	-1910	0.98	-2313	0.85	-3214	0.93	-2010	0.70	-631	0.76	-346
N-1: VANTAGE 500/230 KV XFMR #2	0.86	-950	0.91	-3318	0.76	-1910	0.98	-2313	0.85	-3214	0.93	-2010	0.70	-631	0.76	-346
N-1: WALLA WALLA-TALBOT 230 KV	0.86	-958	0.91	-3240	0.76	-1908	0.98	-2287	0.85	-3180	0.93	-1998	0.70	-625	0.76	-342
N-1: WALLA WALLA-WALLULA 230 KV	0.86	-939	0.91	-3290	0.76	-1909	0.98	-2304	0.85	-3202	0.93	-2006	0.70	-629	0.76	-346
N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.86	-832	0.94	-1834	0.79	-1687	0.99	-1084	0.93	-2132	0.94	-1241	0.73	-552	0.77	-297
N-2: ASHE-MARION & BUCKLEY-MARION 500 KV	0.86	-883	0.94	-2378	0.77	-1733	0.99	-1349	0.90	-2331	0.93	-1130	0.71	-603	0.76	-330
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.86	-812	0.95	-1929	0.79	-1544	0.99	-940	0.93	-1922	0.94	-1121	0.72	-576	0.77	-312
N-2: ASHE-MARION & SLATT-COYOTE-MCNARY 500 KV	0.85	-886	0.94	-2259	0.78	-1819	0.99	-1416	0.91	-2556	0.93	-1505	0.71	-600	0.76	-327
N-2: ASHE-MARION & SLATT-JOHN DAY 500 KV	0.86	-872	0.94	-2421	0.78	-1685	0.99	-1346	0.91	-2475	0.93	-1459	0.71	-600	0.76	-328
N-2: ASHE-SLATT & MCNARY-JOHN DAY 500 KV	0.85	-856	0.92	-2353	0.79	-1772	0.99	-1499	0.90	-2594	0.94	-1583	0.72	-587	0.77	-318
N-2: ASHE-SLATT & SLATT-COYOTE-MCNARY 500 KV	0.85	-860	0.93	-1979	0.79	-1870	0.99	-1457	0.91	-2656	0.94	-1543	0.72	-586	0.77	-317
N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.86	-1030	0.92	-3044	0.75	-2051	0.98	-2574	0.84	-3548	0.93	-2131	0.81	-370	0.78	-247
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-CHEMAWA 230 KV	0.86	-945	0.92	-3190	0.76	-1889	0.98	-2165	0.86	-3076	0.94	-1767	0.70	-630	0.76	-346
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-TROUTDALE 230 KV	0.86	-948	0.92	-3215	0.76	-1895	0.98	-2188	0.86	-3117	0.93	-1885	0.70	-631	0.76	-347
N-2: BOISE BENCH-BROWNLEE #1 & #2 230 KV	0.85	-679	0.92	-3122	0.81	-1382	0.98	-2103	0.86	-2935	0.93	-1916	0.71	-609	0.76	-331
N-2: BOISE BENCH-BROWNLEE #3 & BOISE BENCH-HORSEFLAT#4 230 KV	0.85	-678	0.92	-3120	0.81	-1375	0.98	-2099	0.87	-2916	0.93	-1914	0.71	-609	0.76	-331
N-2: BRIDGER-POPULUS #1 & #2 345 KV + RAS	0.88	-741	0.93	-2546	0.82	-1282	0.98	-1823	0.89	-2715	0.93	-1783	0.71	-538	0.76	-338
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV + RAS	0.88	-688	0.94	-2461	0.86	-1069	0.98	-1755	0.89	-2625	0.93	-1746	0.72	-497	0.76	-335
N-2: BROADVIEW-GARRISONT #1 & #2 500 KV + RAS	0.84	-1050	0.90	-3726	0.74	-2140	0.98	-3302	0.82	-3897	0.93	-2282	0.70	-710	0.78	-468
N-2: BROWNLEE-HELLS CANYON & OXBOW-LOLO 230 KV	0.86	-845	0.94	-2589	0.77	-1631	0.98	-1650	0.90	-2451	0.93	-1677	0.72	-566	0.77	-298
N-2: BROWNLEE-OXBOW & BROWNLEE-HELLS CANYON 230 KV	0.86	-806	0.92	-3003	0.79	-1711	0.98	-2017	0.87	-2898	0.93	-1883	0.71	-600	0.76	-327
N-2: BUCKLEY-MARION & JOHN DAY-MARION 500 KV	0.86	-925	0.93	-2872	0.76	-1820	0.98	-1844	0.87	-2724	0.93	-1145	0.70	-625	0.76	-345
N-2: CHIEF JO-MONROE & CHIEF JO-SICKLER 500 KV	0.86	-941	0.93	-2625	0.77	-1888	0.98	-2173	0.86	-3129	0.93	-1967	0.71	-608	0.76	-338
N-2: CHIEF JO-MONROE 500 KV & CHIEF JO-SNOHOMS4 345 KV	0.86	-944	0.93	-2799	0.76	-1893	0.98	-2220	0.86	-3140	0.93	-1979	0.70	-620	0.76	-343

Appendix E - 16hs2a_2250idnw_solo Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: CHIEF JO-MONROE 500 KV & MONROE-SAMMAMSH 230 KV	0.86	-946	0.93	-2915	0.76	-1901	0.98	-2246	0.86	-3152	0.93	-1989	0.70	-624	0.76	-344
N-2: CHIEF JO-SICKLER 500 KV & CHIEF J3-SNOHOMS3 345 KV	0.86	-946	0.92	-2936	0.76	-1900	0.98	-2252	0.86	-3154	0.93	-1988	0.71	-617	0.76	-341
N-2: COULEE-CHIEF JO 500 KV & CHIEF J4-SNOHOMS4 345 KV	0.86	-948	0.91	-3021	0.76	-1904	0.98	-2264	0.85	-3172	0.93	-1992	0.70	-625	0.76	-345
N-2: COULEE-HANFORD & HANFORD-VANTAGE 500 KV	0.85	-919	0.91	-2381	0.77	-1891	0.99	-1958	0.88	-3030	0.93	-1854	0.74	-537	0.77	-307
N-2: COULEE-SCHULTZ #1 & #2 500 KV	0.85	-919	0.95	-1613	0.77	-1849	0.98	-1936	0.88	-2951	0.93	-1856	0.74	-541	0.77	-310
N-2: CUSTERW-ING500 & CUSTERW-MONROE 500 KV	0.86	-949	0.93	-2989	0.76	-1910	0.98	-2294	0.85	-3218	0.93	-2007	0.71	-617	0.76	-343
N-2: CUSTERW-MONROE #1 & #2 500 KV + RAS	0.85	-1080	0.90	-3892	0.74	-2234	0.97	-3208	0.80	-4227	0.92	-2466	0.70	-674	0.75	-395
N-2: DC-BIPOLE	0.86	-850	0.92	-3301	0.78	-1623	0.96	-2439	0.86	-2361	0.93	-1976	0.71	-596	0.76	-337
N-2: DOUBLE PALO VERDE	0.87	-490	0.95	-1007	0.80	-1565	0.99	-1222	0.94	-2112	0.95	-1445	0.76	-479	0.77	-284
N-2: ECHOLAKE-MAPLE VLY 500 KV & COVINGTON-MAPLE VLY 230 KV	0.86	-952	0.91	-3154	0.76	-1911	0.98	-2727	0.85	-3210	0.93	-2008	0.70	-631	0.76	-347
N-2: ECHOLAKE-MAPLE VLY 500 KV & ROCKY RH-MAPLE VLY 345 KV	0.86	-950	0.92	-2993	0.76	-1908	0.98	-2260	0.85	-3179	0.93	-1997	0.70	-630	0.76	-346
N-2: GARRISON-TAFT #1 & #2 500 KV + RAS	0.86	-997	0.91	-3323	0.75	-2023	0.98	-2541	0.84	-3514	0.93	-2120	0.76	-556	0.74	-451
N-2: GRIZZLY-MALIN & GRIZZLY-CAPTAIN JACK 500 KV + RAS	0.85	-965	0.91	-3533	0.76	-1912	0.98	-2443	0.79	-3027	0.93	-1927	0.70	-657	0.75	-387
N-2: GRIZZLY-MALIN & GRIZZLY-SUMMER LAKE 500 KV + RAS	0.86	-927	0.91	-3578	0.76	-1853	0.98	-2501	0.78	-3253	0.93	-2015	0.70	-643	0.76	-376
N-2: GRIZZLY-MALIN & MALIN-SUMMER LAKE 500 KV + RAS	0.85	-1068	0.87	-4404	0.74	-2007	0.98	-2721	0.77	-3130	0.93	-2063	0.70	-682	0.75	-405
N-2: HANFORD-ASHE & HANFORD-LOW MON 500 KV	0.86	-950	0.89	-2236	0.76	-1907	0.98	-2219	0.86	-3138	0.93	-1972	0.71	-614	0.76	-341
N-2: HANFORD-WAUTOMA #1 & #2 500 KV	0.86	-913	0.89	-2723	0.77	-1843	0.98	-2042	0.87	-3017	0.93	-1880	0.71	-613	0.76	-333
N-2: JOHN DAY-BIG EDDY #1 & #2 500 KV	0.86	-968	0.94	-2897	0.76	-1906	0.93	-2151	0.86	-2994	0.93	-1798	0.70	-641	0.76	-355
N-2: JOHN DAY-BIG EDDY & JOHN DAY-MARION 500 KV	0.85	-937	0.93	-3037	0.76	-1861	0.97	-2479	0.87	-2929	0.93	-1588	0.70	-628	0.76	-346
N-2: JOHN DAY-GRIZZLY #1 & #2 500 KV + RAS	0.86	-899	0.93	-3107	0.78	-1815	0.98	-2011	0.84	-2908	0.93	-1730	0.70	-629	0.76	-361
N-2: JOHN DAY-GRIZZLY #2 & BUCKLEY-GRIZZLY 500 KV + RAS	0.85	-997	0.91	-3417	0.75	-2048	0.98	-2903	0.80	-3591	0.93	-2076	0.70	-657	0.75	-384
N-2: JOHN DAY-MARION & BUCKLEY-MARION 500 KV	0.86	-925	0.93	-2872	0.76	-1820	0.98	-1844	0.87	-2724	0.93	-1145	0.70	-625	0.76	-345
N-2: JOHN DAY-MARION & MARION-PEARL 500 KV	0.86	-911	0.92	-2869	0.77	-1791	0.98	-1825	0.89	-2450	0.92	-925	0.71	-615	0.76	-338
N-2: JOHN DAY-ROCK CREEK 500 KV & MCNARY-ROSS 345 KV	0.86	-889	0.92	-2670	0.78	-1805	0.99	-2127	0.89	-2804	0.93	-1729	0.71	-597	0.76	-323
N-2: KNIGHT-OSTRANDER & OSTRANDER-BIG EDDY 500 KV	0.85	-939	0.93	-3035	0.76	-1869	0.99	-1895	0.86	-2929	0.94	-1634	0.70	-629	0.76	-346
N-2: KNIGHT-OSTRANDER 500 KV & MCNARY-ROSS 345 KV	0.85	-928	0.93	-3017	0.77	-1860	0.99	-1937	0.86	-2953	0.93	-1796	0.70	-628	0.76	-345
N-2: KNIGHT-OSTRANDER 500 KV & MIDWAY-BONNEVILLE 230 KV	0.85	-932	0.92	-3020	0.77	-1861	0.98	-2051	0.86	-2975	0.93	-1845	0.70	-624	0.76	-342
N-2: LOWER GRANITE-CENTRAL FERRY #1 & #2 500 + RAS	0.85	-974	0.91	-3296	0.76	-2038	0.98	-2632	0.83	-3643	0.93	-2163	0.70	-740	0.77	-387
N-2: MALIN-ROUND MTN #1 & #2 500 KV	0.85	-1002	0.90	-3935	0.76	-1899	0.97	-2974	0.80	-2351	0.93	-2276	0.70	-667	0.75	-379
N-2: MCNARY-JOHN DAY & ROCK CREEK-JOHN DAY 500 KV	0.86	-836	0.93	-2335	0.79	-1704	0.99	-1765	0.91	-2473	0.94	-1516	0.72	-583	0.77	-314
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-HORSE HEAVEN 230 KV	0.85	-886	0.92	-2859	0.78	-1797	0.98	-1849	0.87	-2873	0.93	-1804	0.70	-622	0.76	-340
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-ROSS 345 KV	0.85	-885	0.93	-2830	0.78	-1794	0.98	-1807	0.88	-2817	0.93	-1780	0.70	-622	0.76	-341
N-2: MCNARY-ROSS 345 KV & MCNARY-HORSE HEAVEN 230 KV	0.86	-925	0.92	-3129	0.77	-1871	0.98	-2145	0.86	-3073	0.93	-1925	0.70	-629	0.76	-345
N-2: MIDPOINT-HEMINGWAY 500 KV & MIDPOINT-KING 230 KV	0.89	-663	0.92	-3187	0.78	-1303	0.98	-2179	0.86	-2702	0.93	-1925	0.75	-460	0.79	-227
N-2: MONROE-CUSTERW & CHIEF JO-MONROE 500 KV	0.85	-945	0.93	-2698	0.76	-1900	0.98	-2648	0.86	-3149	0.93	-1981	0.71	-614	0.76	-341
N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV + RAS	0.85	-976	0.95	-1502	0.77	-2002	1.00	-1134	0.94	-2595	0.96	-1289	0.72	-576	0.76	-356
N-2: PAUL-NAPAVINE & PAUL-ALLSTON #2 500 KV + RAS	0.85	-976	0.95	-1495	0.77	-2003	1.00	-1149	0.94	-2624	0.96	-1312	0.72	-575	0.76	-356
N-2: PAUL-RAVER & RAVER-COVINGT4 500 KV	0.86	-920	0.93	-2577	0.77	-1848	0.98	-1981	0.86	-2976	0.93	-1903	0.71	-606	0.76	-333
N-2: PEARL-KEELER 500 KV & PEARL-SHERWOOD 230 KV + RAS	0.85	-994	0.93	-2891	0.76	-2028	0.98	-2258	0.85	-3351	0.93	-1901	0.70	-631	0.76	-361
N-2: PEARL-OSTRANDER 500 KV & BIG EDDY-MCLOUGLN 230 KV	0.86	-948	0.91	-3227	0.76	-1899	0.99	-2086	0.86	-3159	0.93	-1946	0.70	-630	0.76	-346
N-2: PEARL-OSTRANDER 500 KV & OSTRANDER-MCLOUGLN 230 KV	0.86	-948	0.92	-3229	0.76	-1899	0.98	-2217	0.86	-3144	0.93	-1889	0.70	-631	0.76	-346
N-2: RAVER-COVINGTON #1 & #2 500 KV	0.86	-953	0.91	-3219	0.76	-1914	0.98	-2322	0.85	-3224	0.93	-2018	0.70	-633	0.76	-347
N-2: RAVER-ECHO LAKE & RAVER-SCHULTZ 500 KV	0.86	-945	0.92	-3033	0.76	-1898	0.98	-2243	0.86	-3150	0.93	-1992	0.70	-624	0.76	-344
N-2: RAVER-PAUL & NAPAVINE-PAUL 500 KV	0.85	-918	0.93	-2603	0.77	-1844	0.98	-1960	0.87	-2932	0.93	-1880	0.71	-604	0.76	-332
N-2: RAVER-PAUL 500 KV & COULEE-OLYMPIA 300 KV	0.85	-959	0.95	-2304	0.76	-1950	0.98	-2118	0.86	-3242	0.93	-2017	0.71	-612	0.76	-347
N-2: RAVER-PAUL 500 KV & TACOMA A-CHEHALIS 230 KV	0.85	-958	0.94	-2470	0.76	-1947	0.98	-2143	0.85	-3266	0.93	-2022	0.70	-615	0.76	-348
N-2: RAVER-SCHULTZ #1 & #2 500 KV	0.85	-938	0.93	-2679	0.76	-1876	0.98	-2116	0.85	-3056	0.93	-1952	0.71	-619	0.76	-342
N-2: RAVER-TACOMA & RAVER-COVINGT4 500 KV	0.86	-950	0.92	-3130	0.76	-1908	0.98	-2284	0.85	-3194	0.93	-2002	0.70	-630	0.76	-346
N-2: RAVER-TACOMA 500 KV & TACOMA-CHRISTOP-COVINGTON 230 KV	0.86	-949	0.91	-3169	0.76	-1906	0.98	-2287	0.85	-3181	0.93	-1999	0.70	-629	0.76	-346
N-2: ROUND MTN-TABLE MTN #1 & #2 500 KV + RAS	0.85	-1045	0.88	-4321	0.75	-2010	0.97	-3383	0.79	-2765	0.92	-2559	0.70	-680	0.75	-385
N-2: SCHULTZ-WAUTOMA & VANTAGE-SCHULTZ 500 KV + RAS	0.84	-1115	0.88	-3505	0.73	-2326	0.97	-3312	0.80	-4454	0.92	-2507	0.70	-665	0.75	-398
N-2: SICKLER-SCHULTZ & SCHULTZ-VANTAGE 500 KV + RAS	0.85	-1010	0.91	-3194	0.75	-2058	0.98	-2604	0.83	-3630	0.93	-2159	0.70	-641	0.76	-365

Appendix E - 16hs2a_2250idnw_solo Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: TABLE MTN-TESLA & TABLE MTN-VACA DIXON 500 KV	0.85	-1063	0.93	-2931	0.74	-2191	0.98	-2771	0.82	-3513	0.93	-2237	0.70	-654	0.75	-398
N-2: TAFT-BELL 500 KV & BELL-LANCASTER 230 KV	0.8547	-949	0.92	-3129	0.76	-1908	0.98	-2733	0.85	-3209	0.93	-2004	0.74	-546	0.76	-342
N-2: TAFT-BELL 500KV & BELL-BOUNDARY #3 230KV	0.8551	-955	0.92	-3075	0.76	-1917	0.98	-2293	0.85	-3181	0.93	-1997	0.72	-593	0.76	-358
N-2: TAFT-BELL 500KV & BELL-LANCASTER 230KV	0.8547	-949	0.92	-3129	0.76	-1908	0.98	-2300	0.85	-3209	0.93	-2004	0.74	-546	0.76	-342
N-2: TAFT-BELL 500KV & BELL-TRENTWOOD #2 115KV	0.8549	-953	0.92	-3150	0.76	-1912	0.98	-2288	0.85	-3173	0.93	-1995	0.72	-592	0.76	-356
N-2: TAFT-BELL 500KV & LANCASTER-NOXON 230KV	0.8549	-952	0.92	-3155	0.76	-1911	0.98	-2290	0.85	-3174	0.93	-1996	0.73	-580	0.76	-354
N-2: TAFT-DWORSHAK & GARRISON-TAFT #1 500KV	0.8569	-979	0.92	-2926	0.76	-1935	0.98	-2298	0.85	-3216	0.93	-2000	0.75	-509	0.78	-279
N-2: WAUTOMA-ROCK CK 500 KV & MIDWAY-BIG EDDY 230 KV	0.8511	-888	0.92	-2546	0.78	-1802	0.98	-1786	0.89	-2803	0.93	-1733	0.72	-583	0.77	-317
N-2: WAUTOMA-ROCK CK 500 KV & SPRINGCREEK-BIG EDDY 230 KV	0.8511	-888	0.92	-2546	0.78	-1802	0.98	-1786	0.89	-2803	0.93	-1733	0.72	-583	0.77	-317
N-3: SCHULTZ-RAVER #1 & #2 & #3 500 KV	0.8539	-934	0.93	-2512	0.77	-1868	0.98	-2060	0.87	-3024	0.93	-1935	0.71	-615	0.76	-341

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

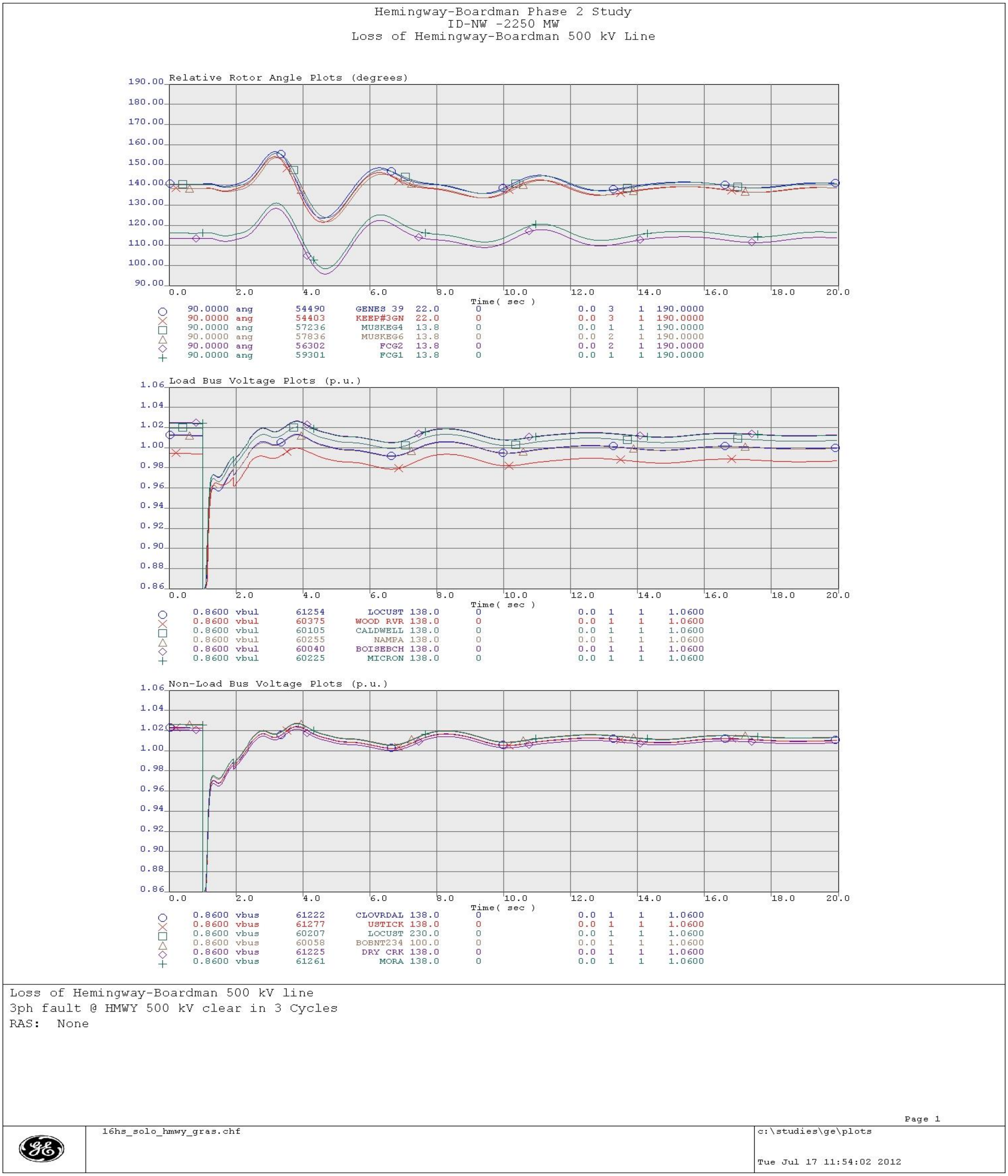


Figure E11: N-1 Loss of Hemingway-Boardman 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

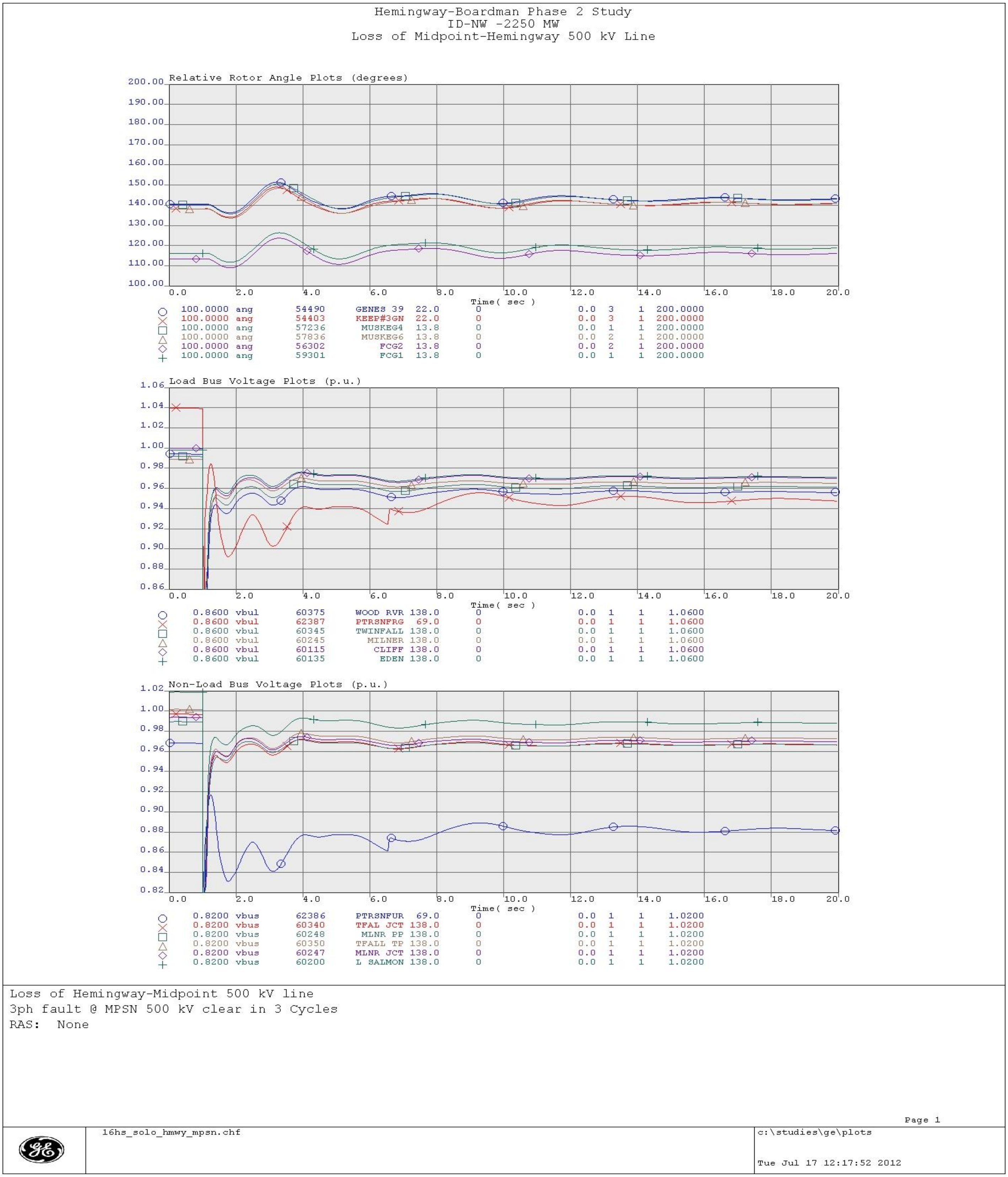


Figure E12: N-1 Loss of Hemingway-Midpoint 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

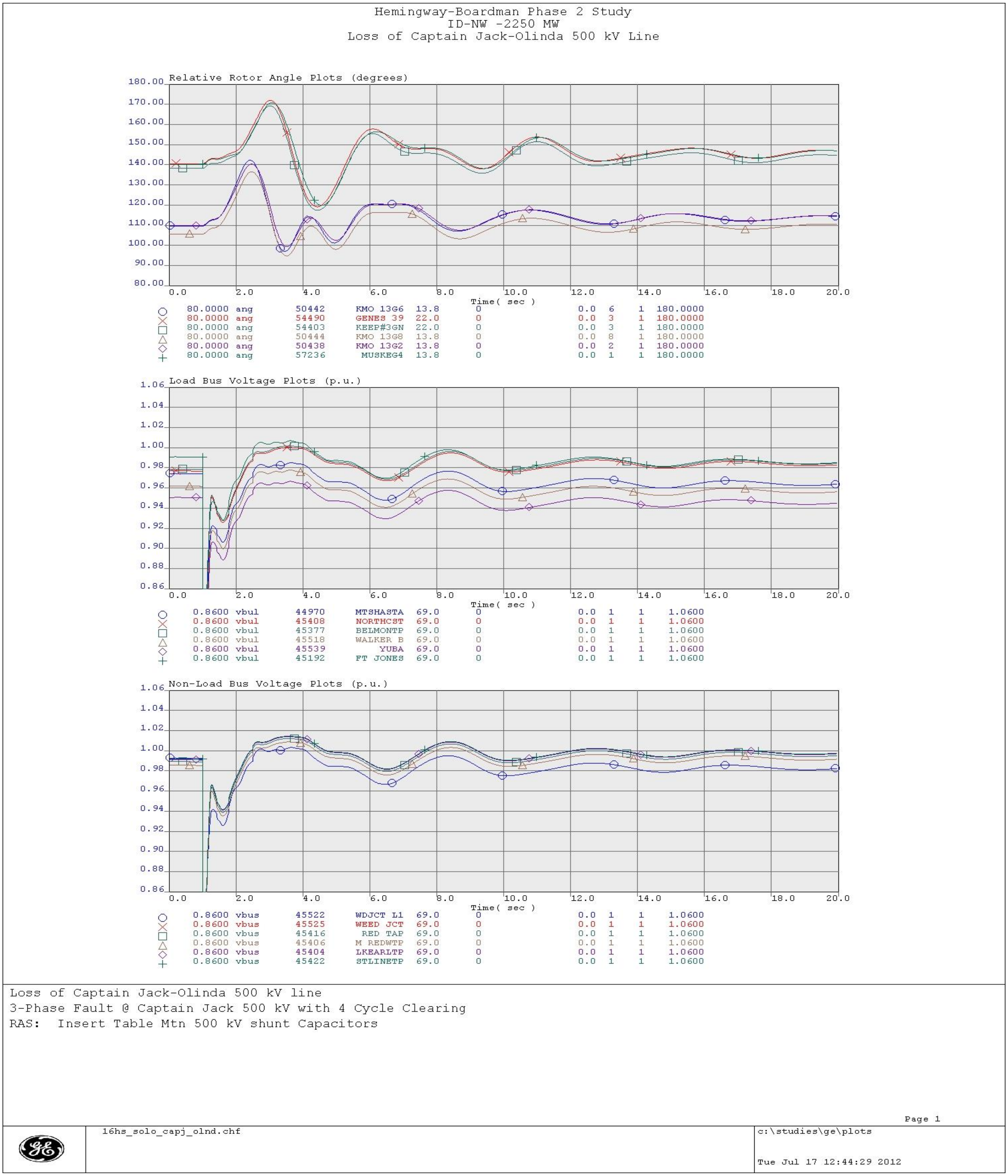
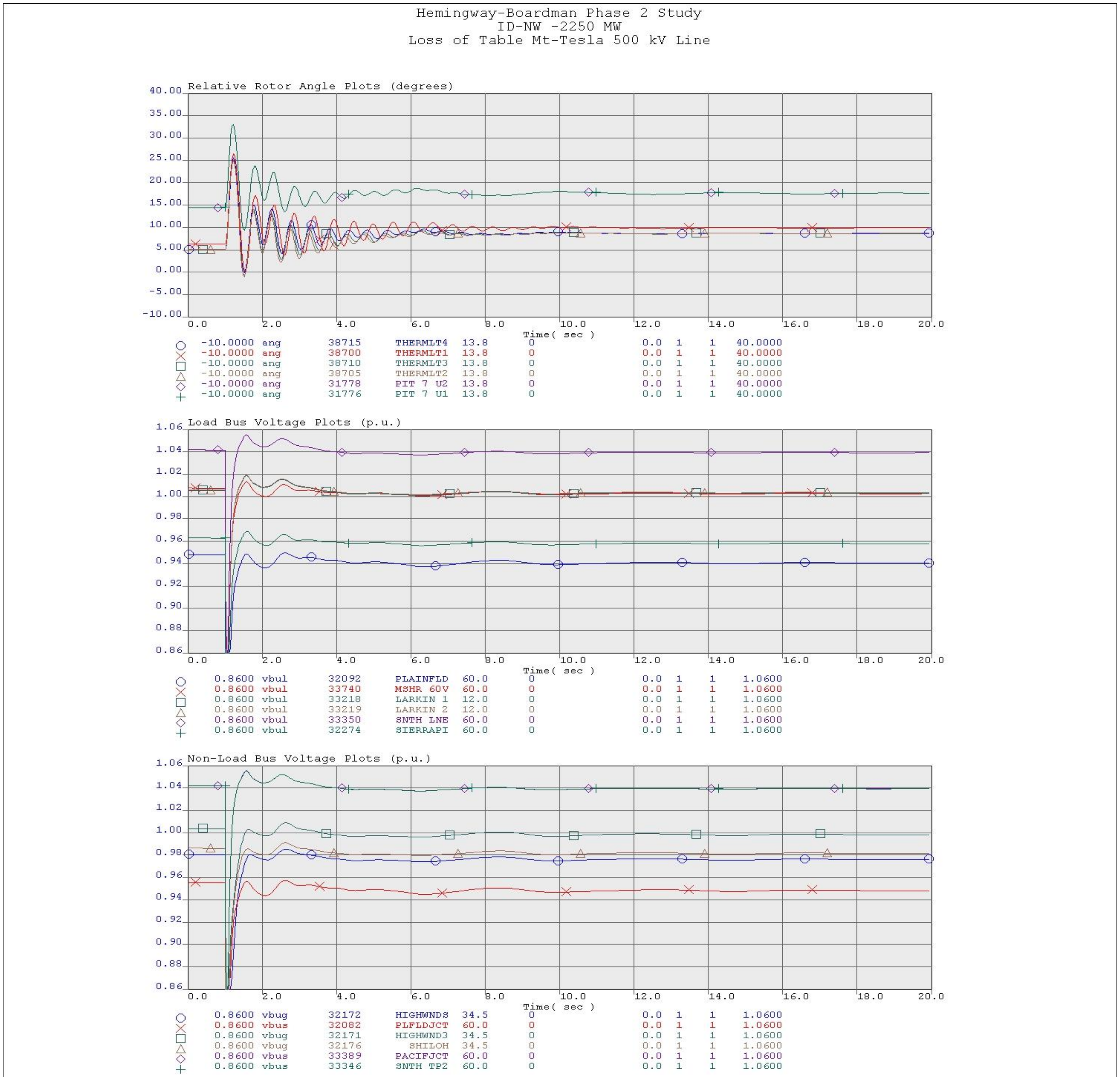


Figure E13: N-1 Loss of Captain Jack-Olinda 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots



Outage of Table Mtn-Tesla 500 kV Line
3-Phase Fault @ Table Mtn 500 kV with 4 Cycle Clearing
RAS: None

Page 1

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Figure E14: N-1 Loss of Table Mtn-Tesla 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

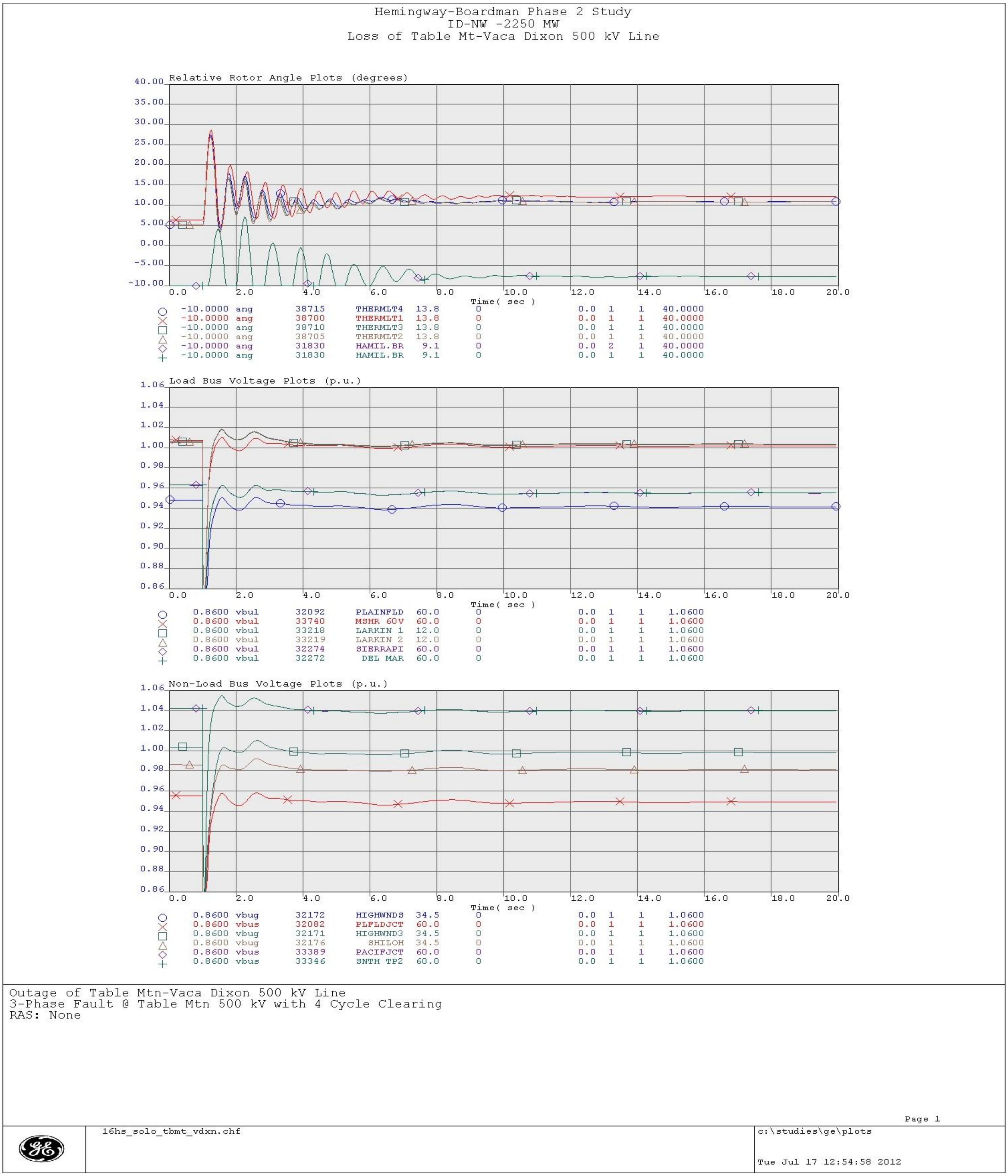
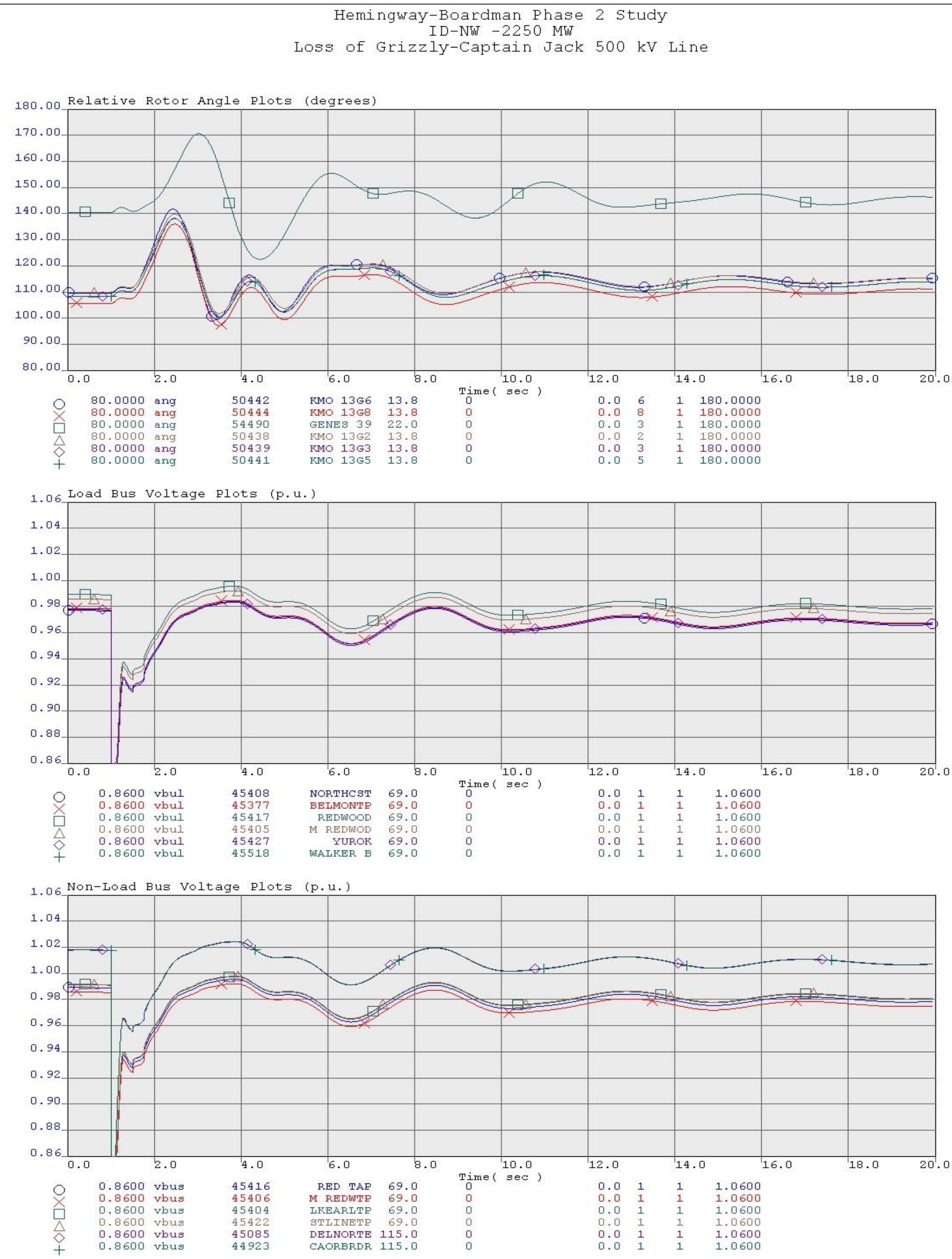


Figure E15: N-1 Loss of Table Mt-Vaca Dixon 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots



Loss of Captain Jack-Grizzly 500 kV line
3-Phase Fault @ Captain Jack 500 kV with 4 Cycle Clearing
RAS: None

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Figure E16: N-1 Loss of Grizzly-Captain Jack 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

Figure E17: N-1 Loss of John Day-Grizzly #1 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

Loss of Buckley-Grizzly 500 kV line
3-Phase Fault @ Buckley 500 kV with 4 Cycle Clearing
RAS: None

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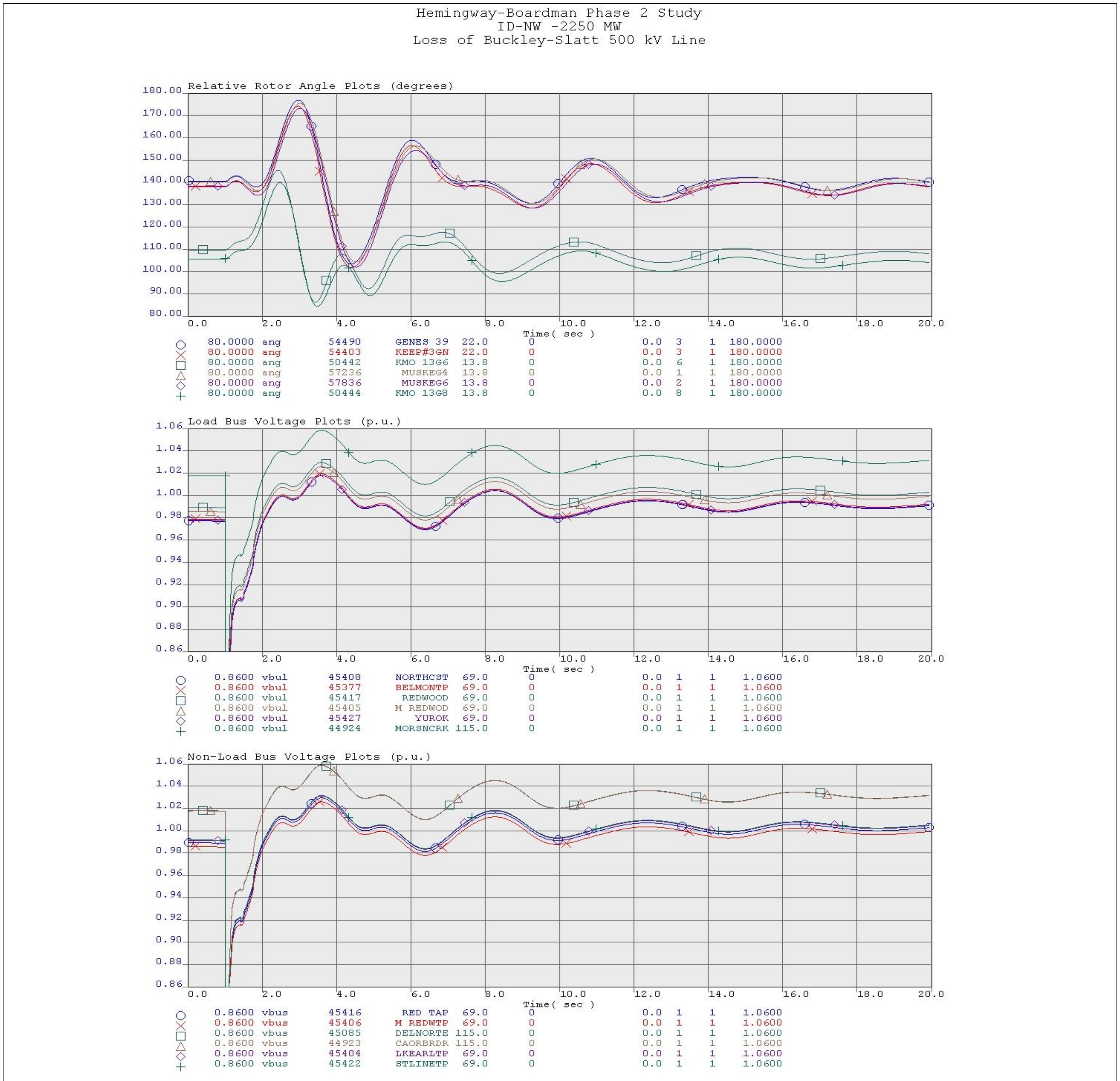
Figure E18: N-1 Loss of Buckley-Grizzly 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots



Loss of Slatt-Buckley 500 kV line
3-Phase Fault @ Slatt 500 kV with 4 Cycle Clearing
RAS: None

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Figure E19: N-1 Loss of Buckley-Slatt 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

Figure E20: N-1 Loss of Ashe-Slatt 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

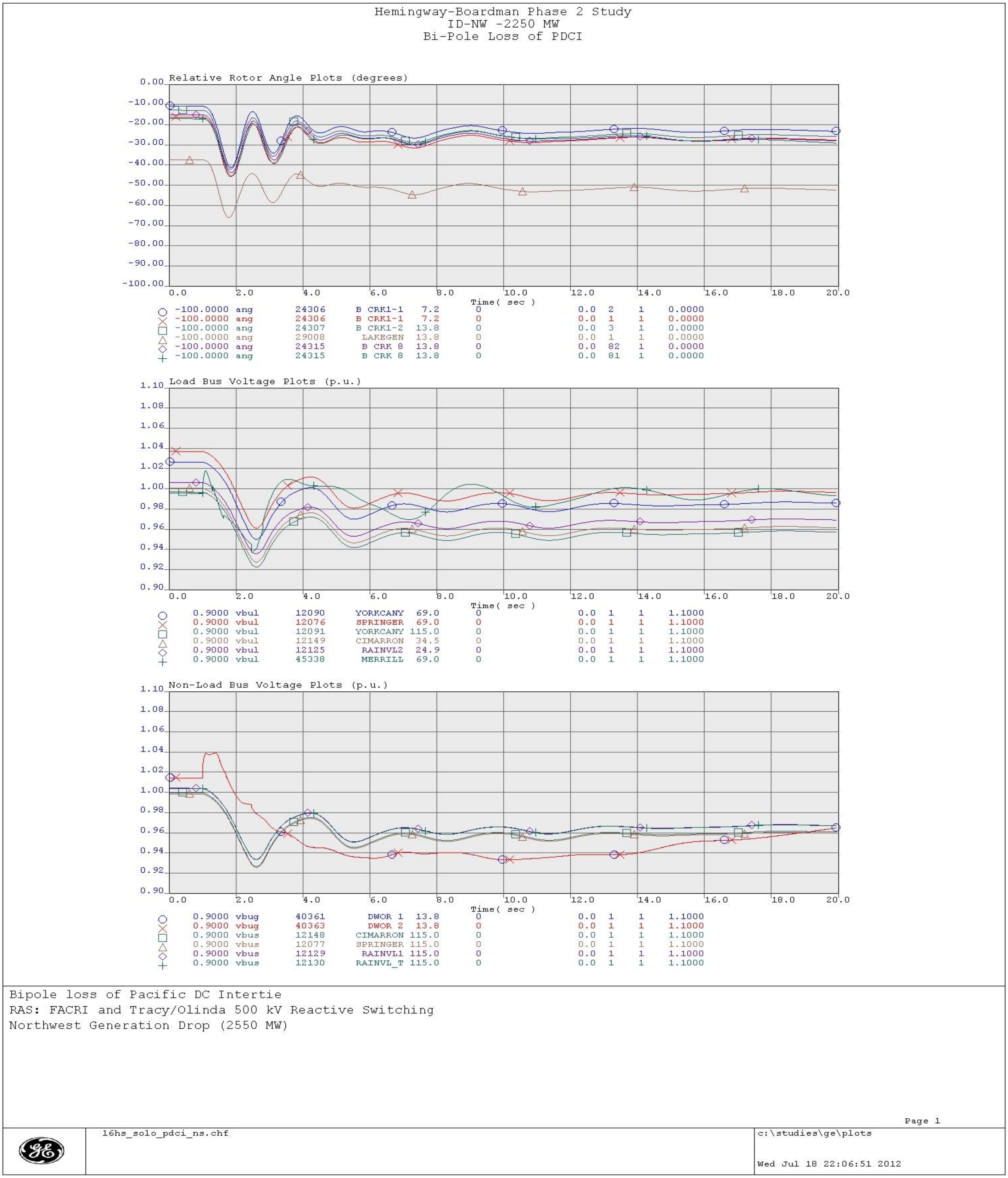
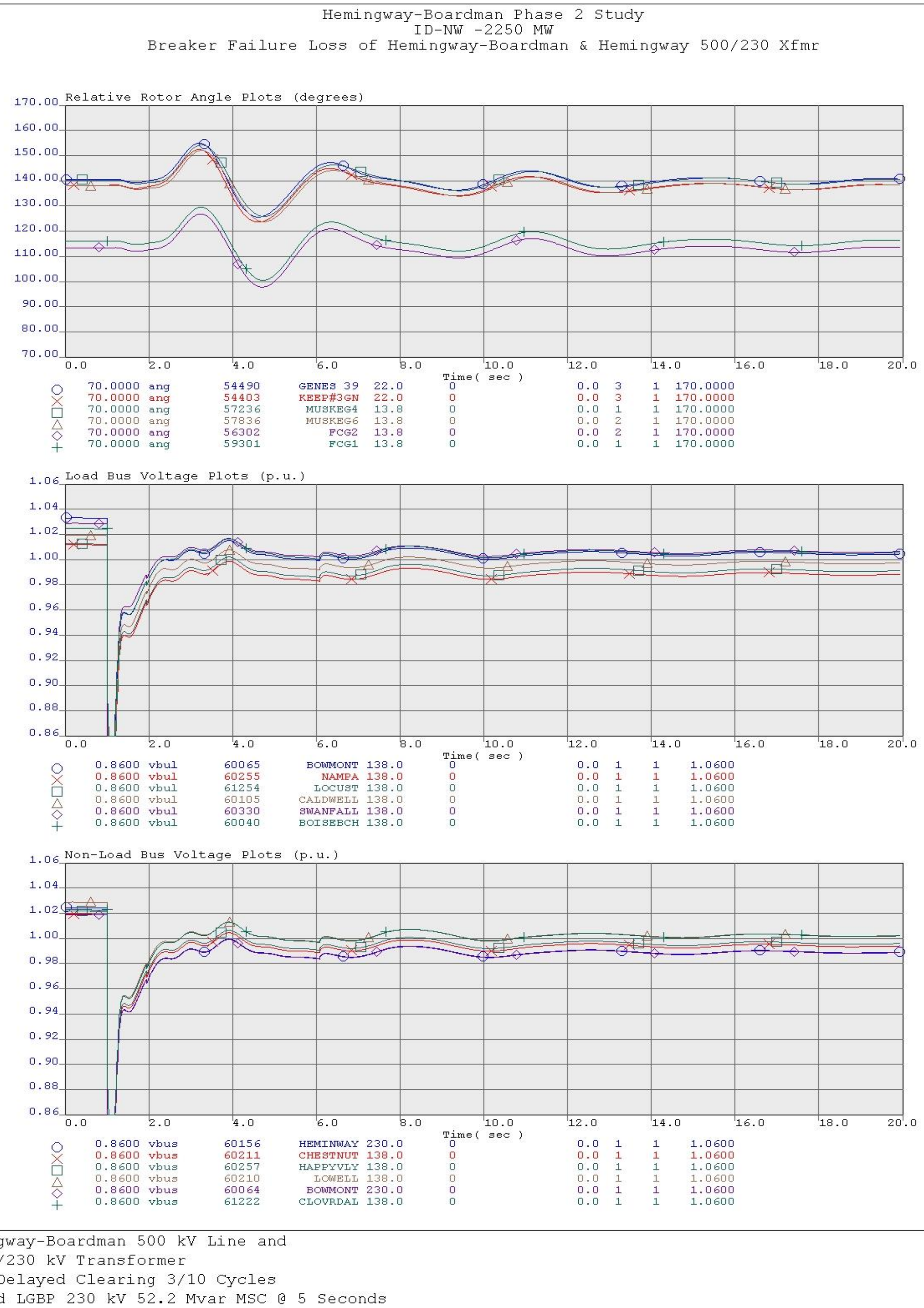


Figure E21: Bi-Pole Block - Pacific DC Intertie (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots



Loss of Hemingway-Boardman 500 kV Line and
Hemingway 500/230 kV Transformer
SLG Fault W/ Delayed Clearing 3/10 Cycles
RAS: Inserted LGBP 230 kV 52.2 Mvar MSC @ 5 Seconds
Inserted PTSN 230 kV 31.7 Mvar MSC @ 5 Seconds

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Figure E22: Breaker Failure Loss of Hemingway-Boardman & Hemingway 500/230 Xfmr (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

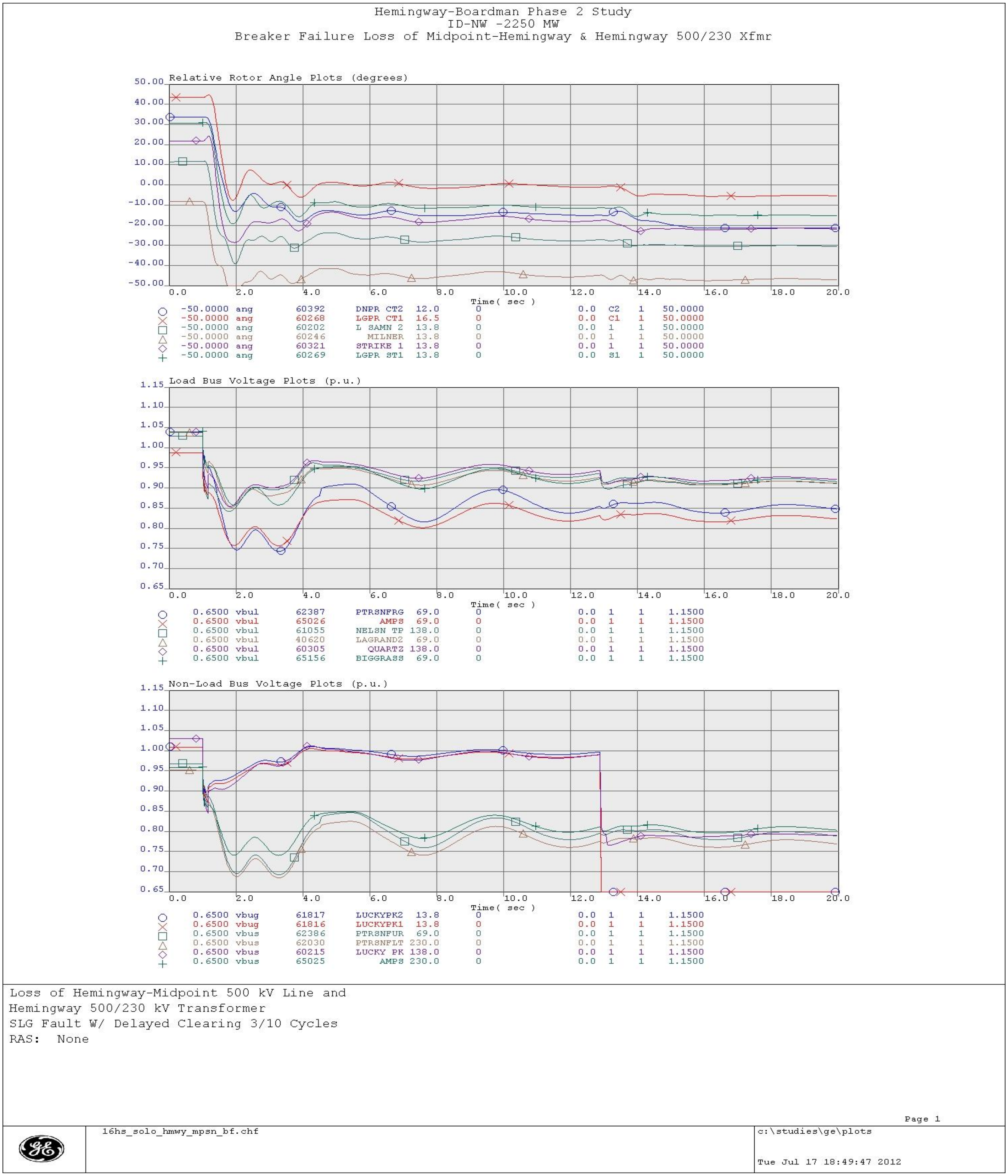
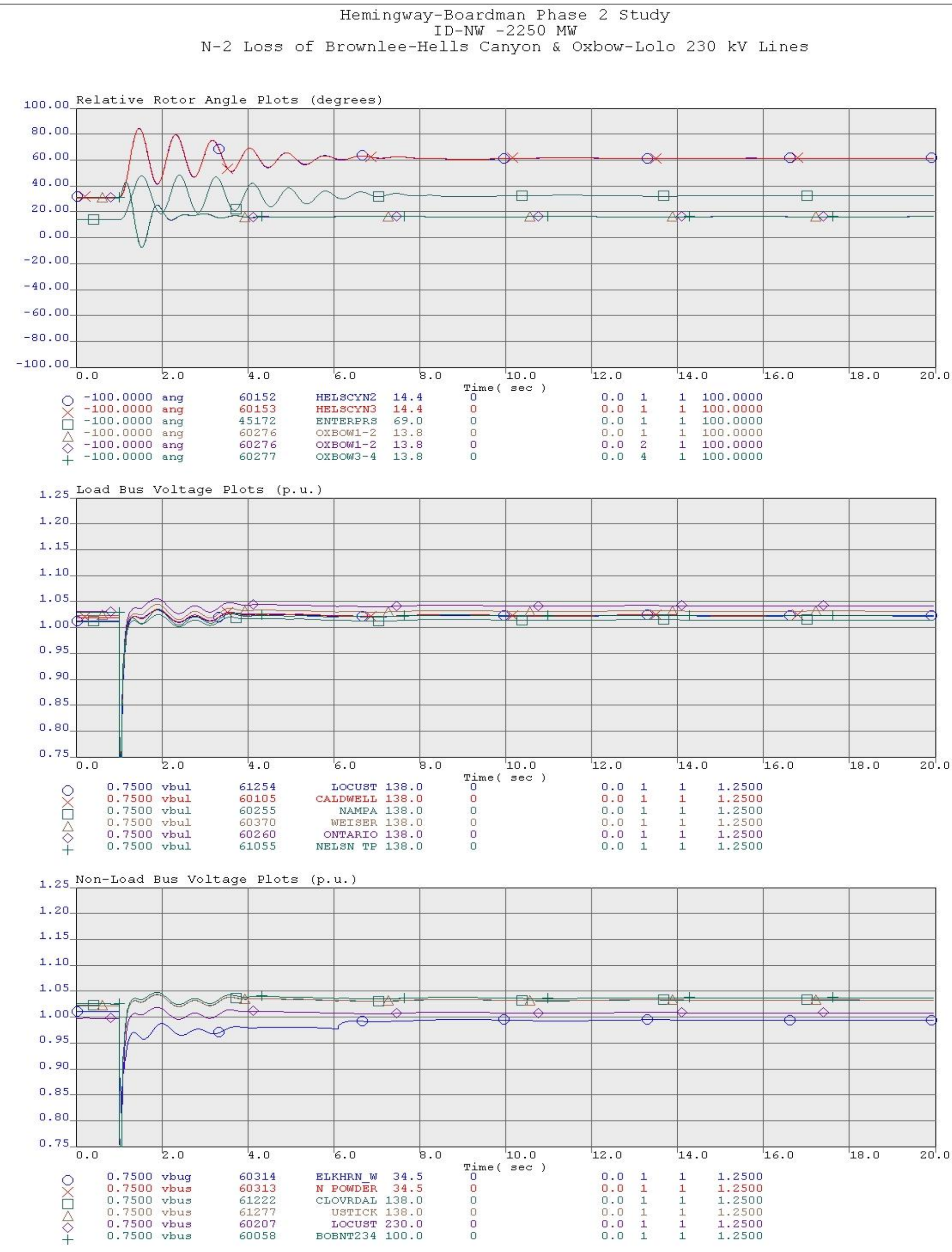


Figure E23: Breaker Failure Loss of Midpoint-Hemingway & Hemingway 500/230 Xfmr (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots



Outage of Brownlee-Hells Canyon 230 and Oxbow-Lolo 230 Lines
LLG fault @ OBPR 230 kV clear in 4 cycles
RAS: Trip 1 HellsCyn Unit @ 5 cyc (95 MW)
Inserted PTSN 230 kV 31.7 Mvar MSC @ 5 Seconds

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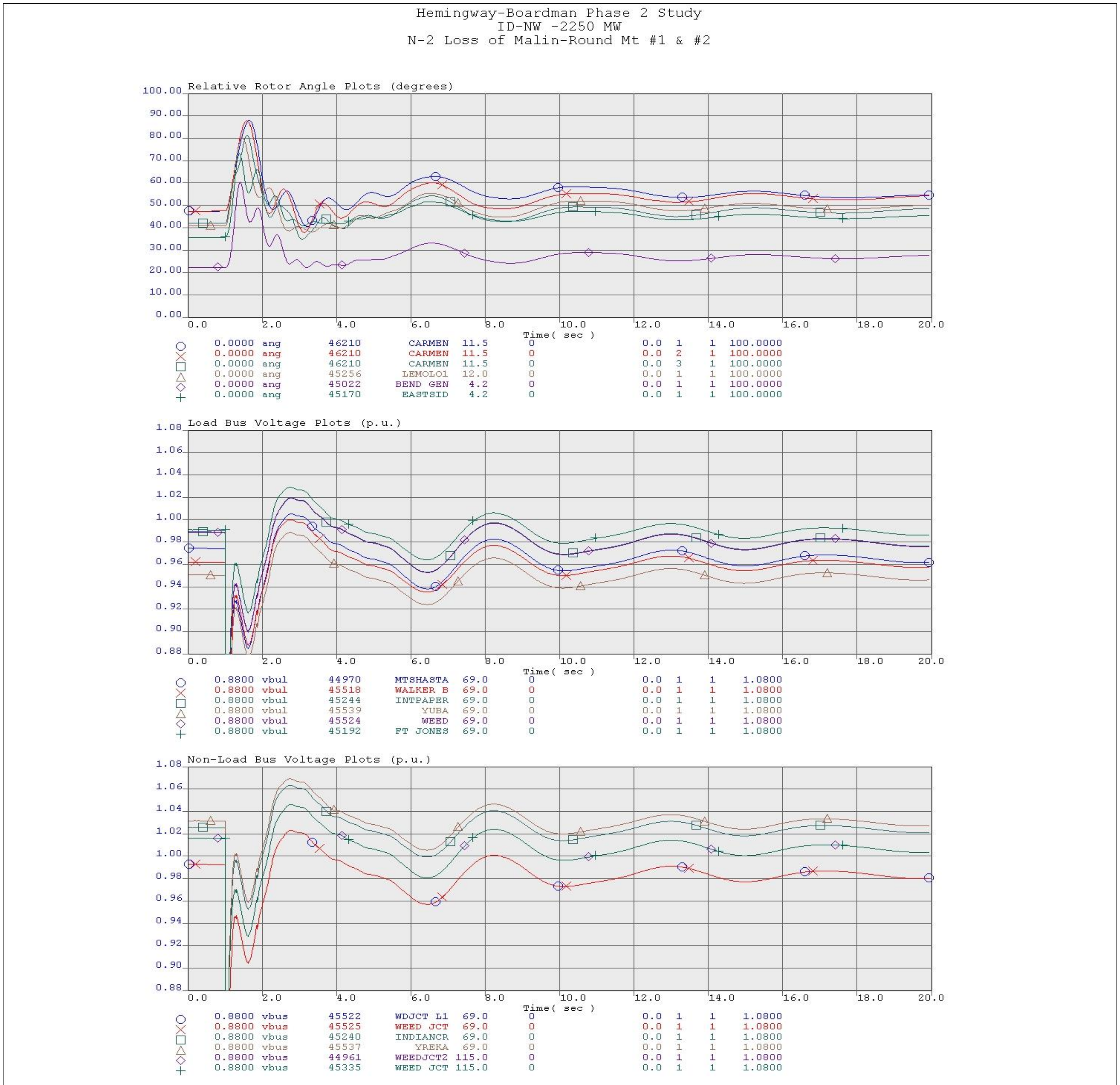
Figure E24: N-2 Loss of Brownlee-Hells Canyon & Oxbow-Lolo 230 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots



3-Phase Fault @ Malin 500 kV with 4 Cycle Clearing
Loss of Malin-Round Mtn #1 & #2 500 kV Lines
Opens Round Mtn-Table Mtn #2 500 kV Line
RAS: FACRI and Tracy/Olinda 500 kV Reactive Switching
NW Gen Drop 2400 MW

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Figure E25: N-2 Loss of Malin-Round Mt #1 & #2 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

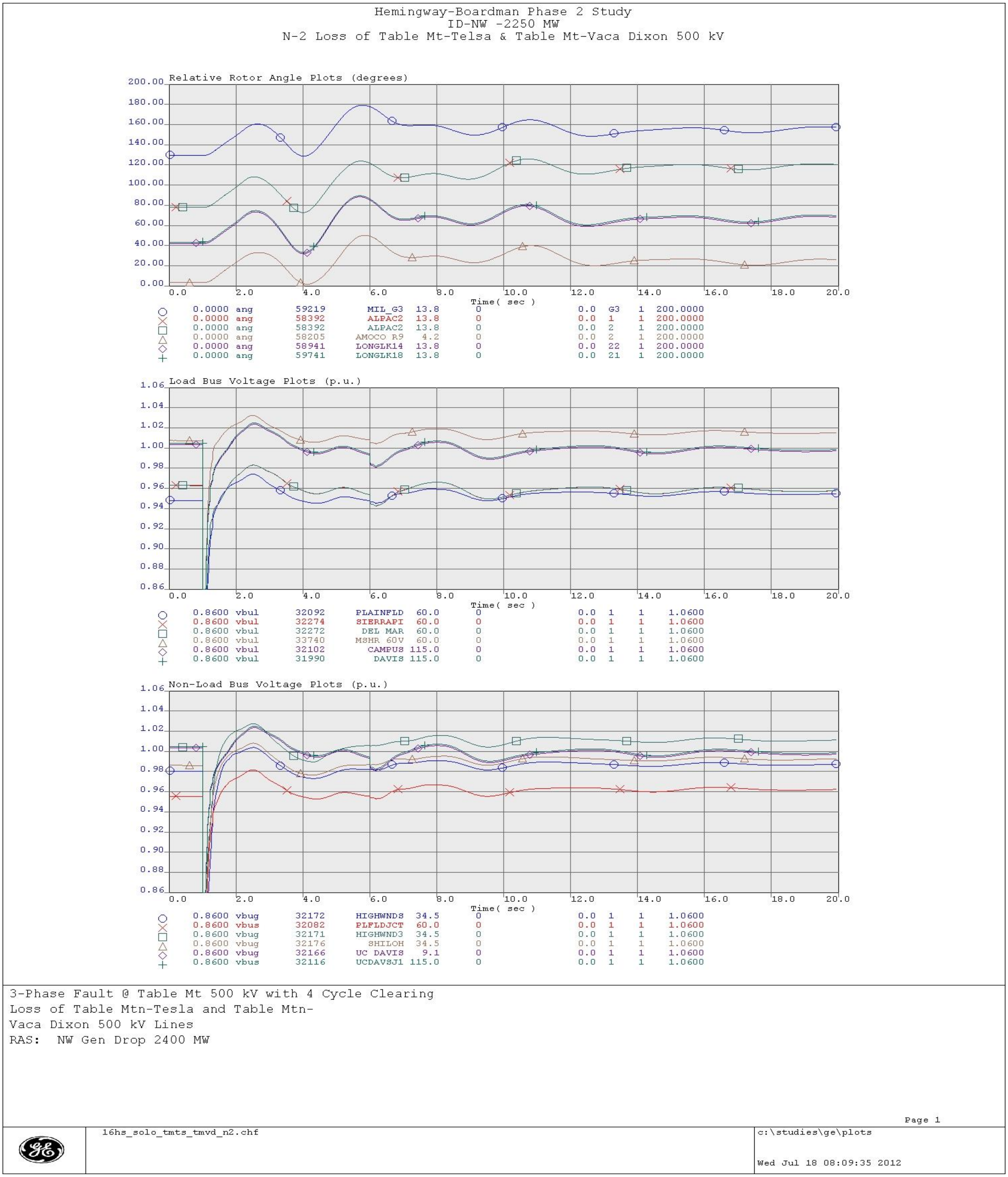

Figure E26: N-2 Loss of Table Mt-Tesla & Table Mt-Vaca Dixon 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

3-Phase Fault @ Grizzly 500 kV with 4 Cycle Clearing
Loss of Grizzly-Captain Jack and
Grizzly-Malin 500 kV Lines
RAS: NW Gen Drop 2400 MW

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Figure E27: N-2 Loss of Grizzly-Captain Jack & Grizzly-Malin 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

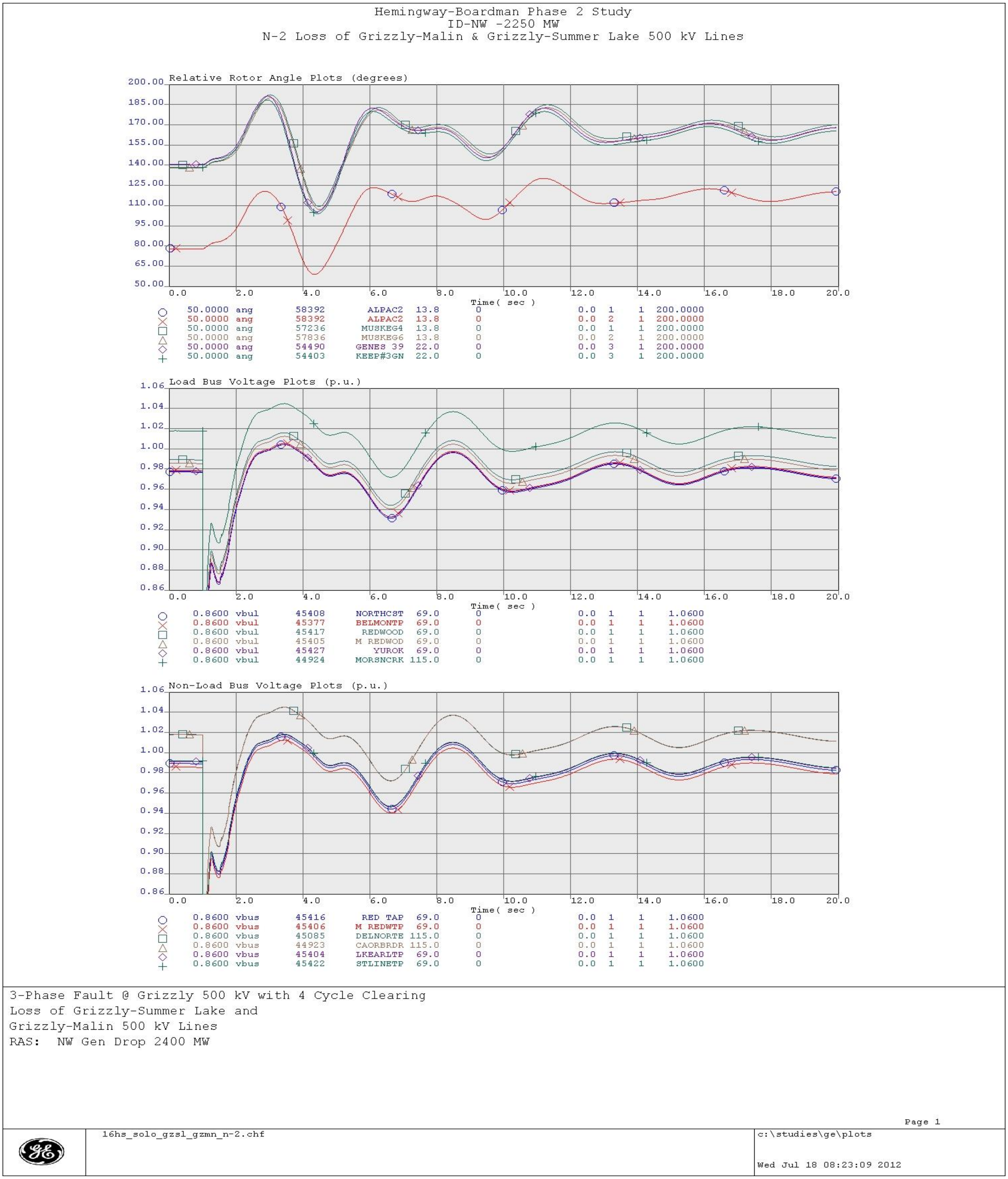
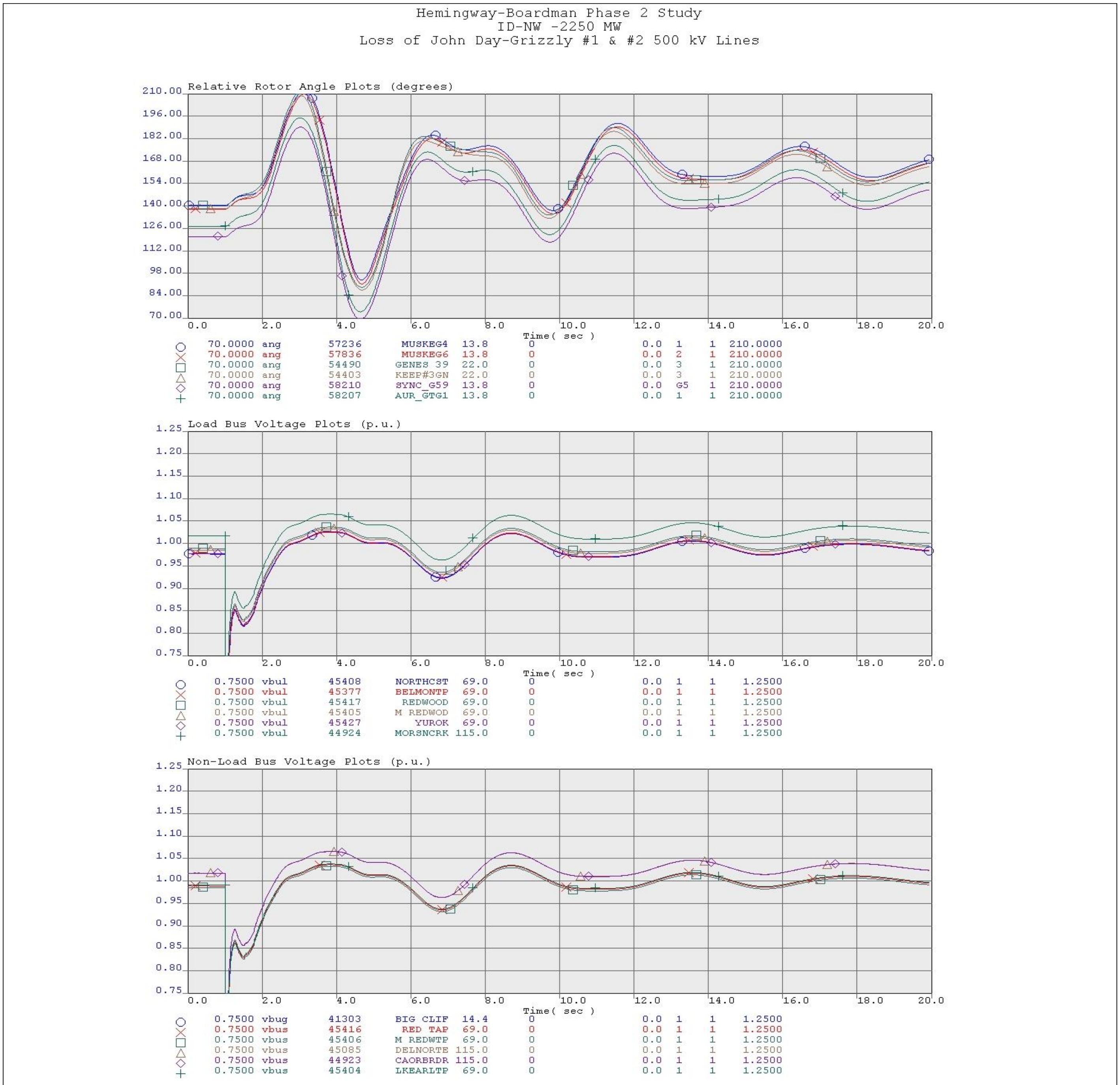


Figure E28: N-2 Loss of Grizzly-Malin & Grizzly-Summer Lake 500 kV Lines (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots



3-Phase Fault @ John Day 500 kV with 4 Cycle Clearing
Loss of John Day-Grizzly #1 and
John Day-Grizzly #2 500 kV Lines
RAS: NW Gen Drop 2400 MW

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Figure E29: N-2 Loss of John Day-Grizzly #1 & #2 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

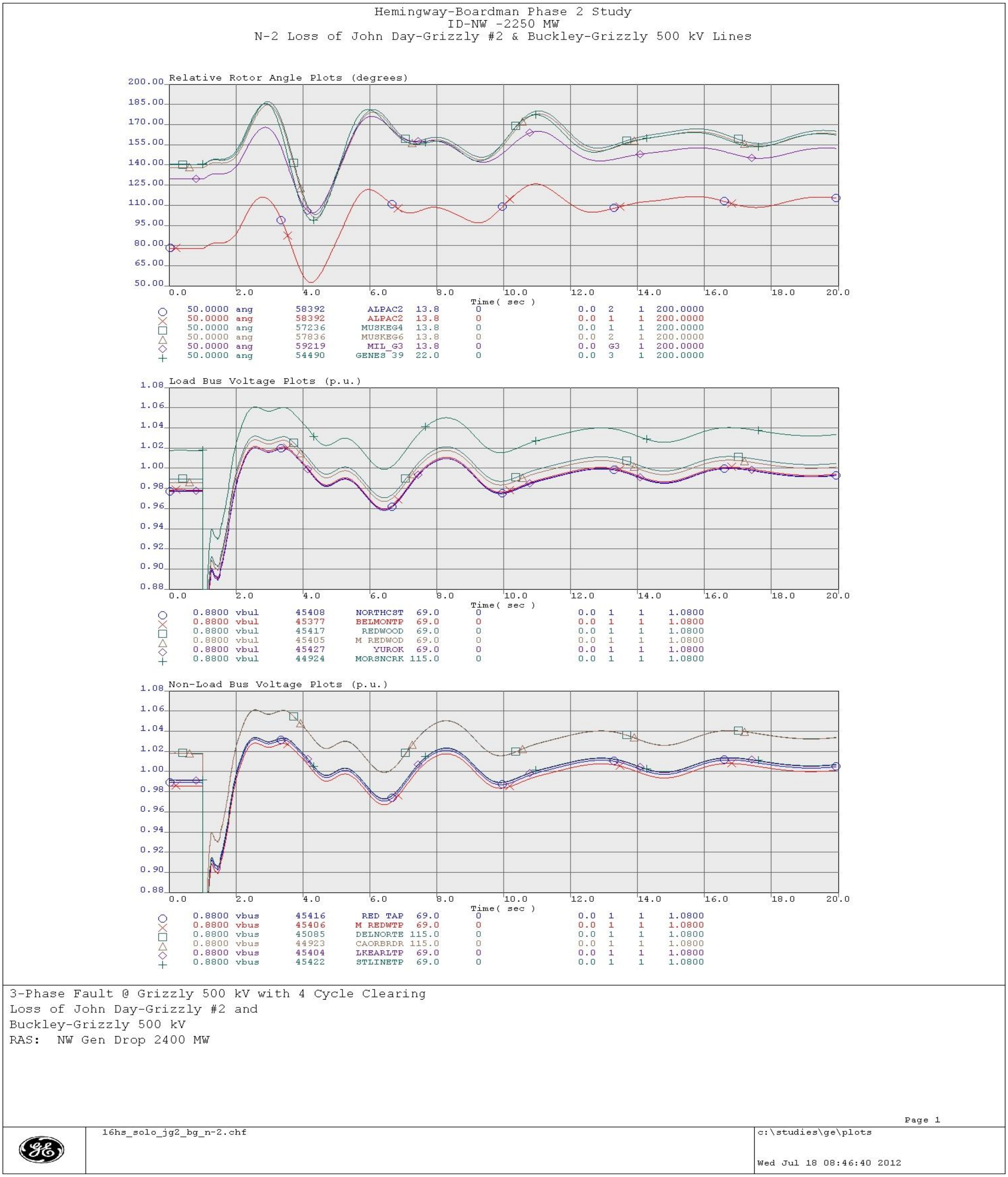


Figure E30: N-2 Loss of John Day-Grizzly #2 & Buckley-Grizzly 500 kV Lines (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

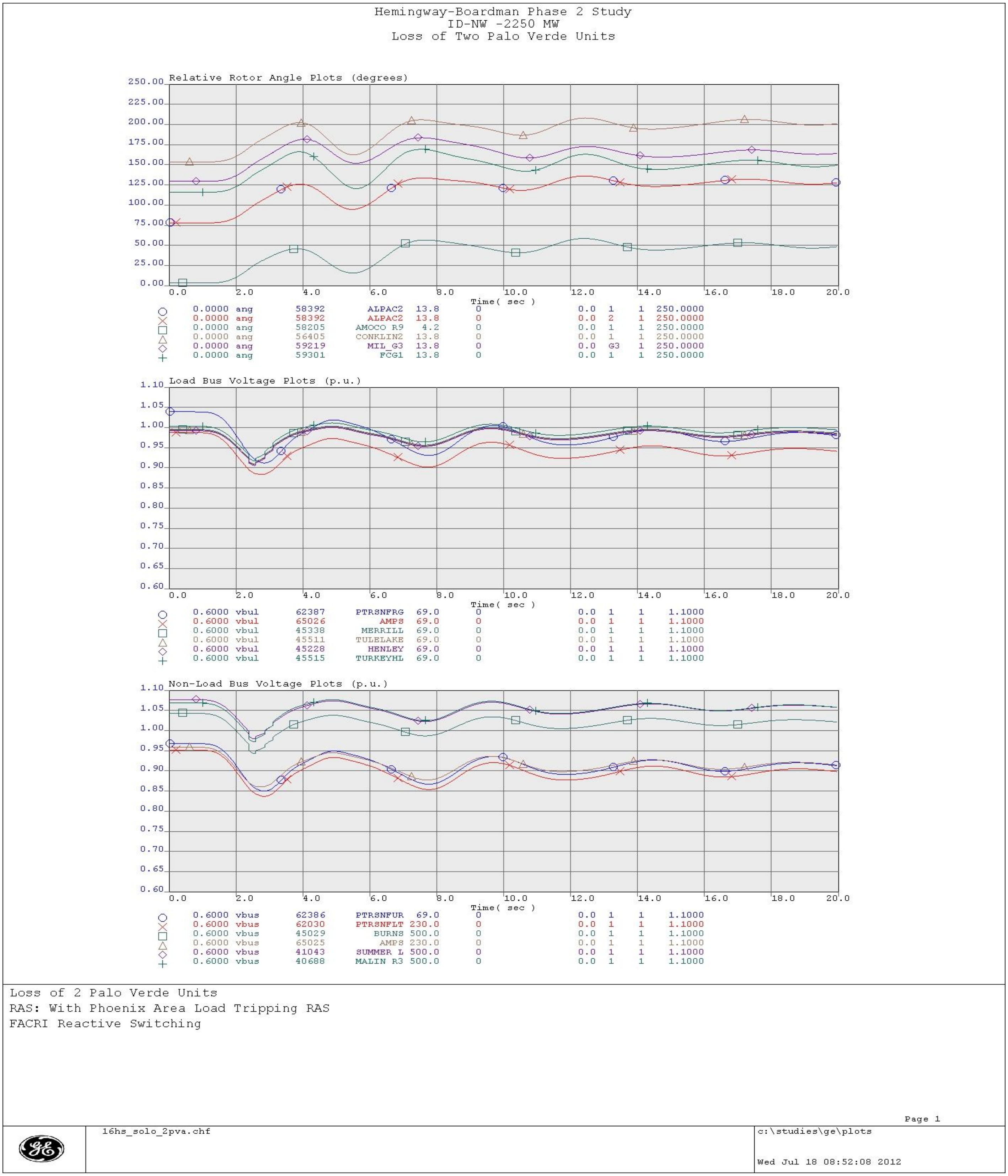
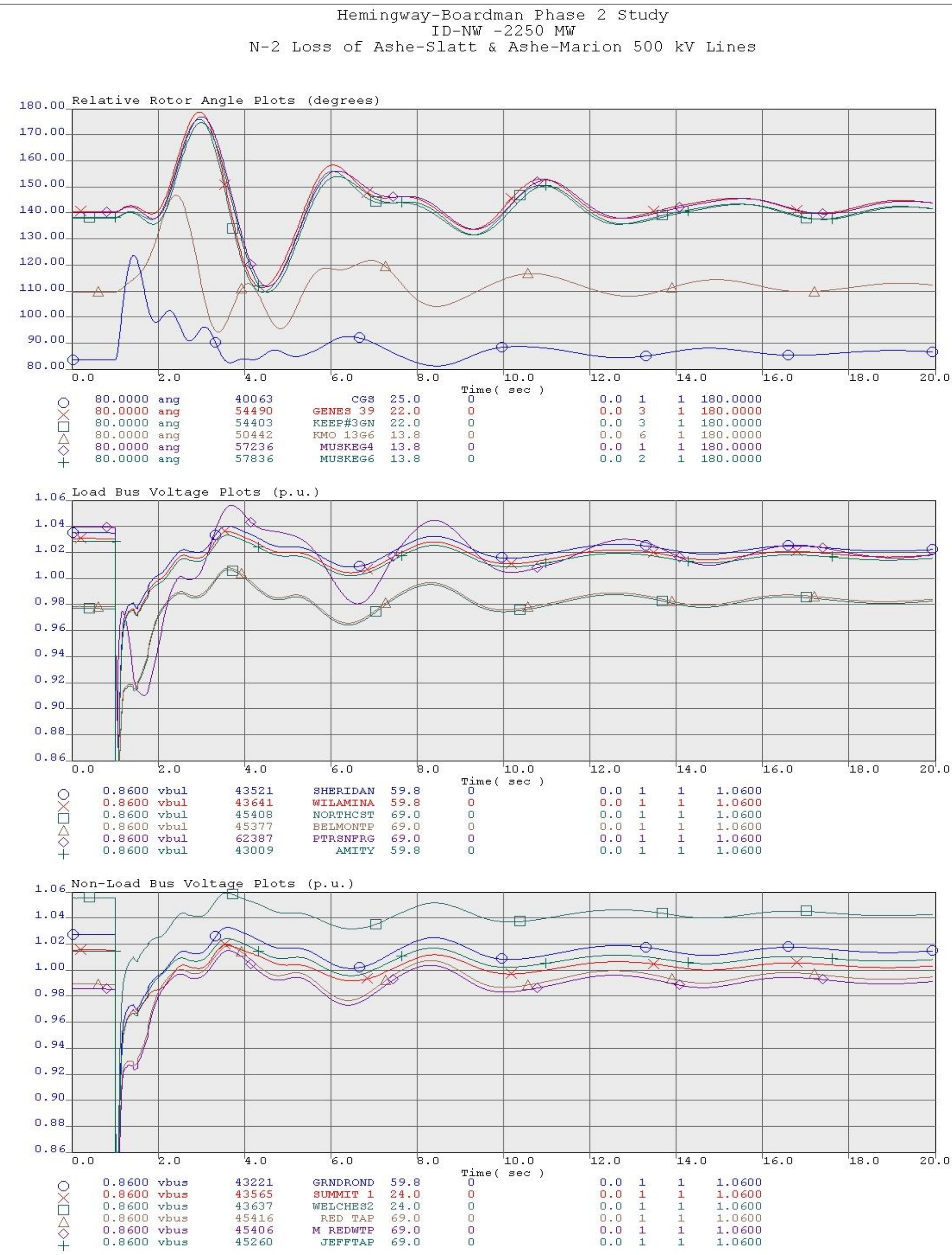


Figure E31: N-2 Loss of Two Palo Verde Units (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots



Loss of Ashe-Slatt and
Slatt-Longhorn 500 kV Lines
3-Phase Fault @ Ashe 500 kV with 4 Cycle Clearing
RAS: None

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Figure E32: N-2 Loss of Ashe-Slatt & Ashe-Marion 500 kV (Angle & Voltage Plots)

Appendix E – 16hs2a_2250idnw_solo Base Case Transient Stability Plots

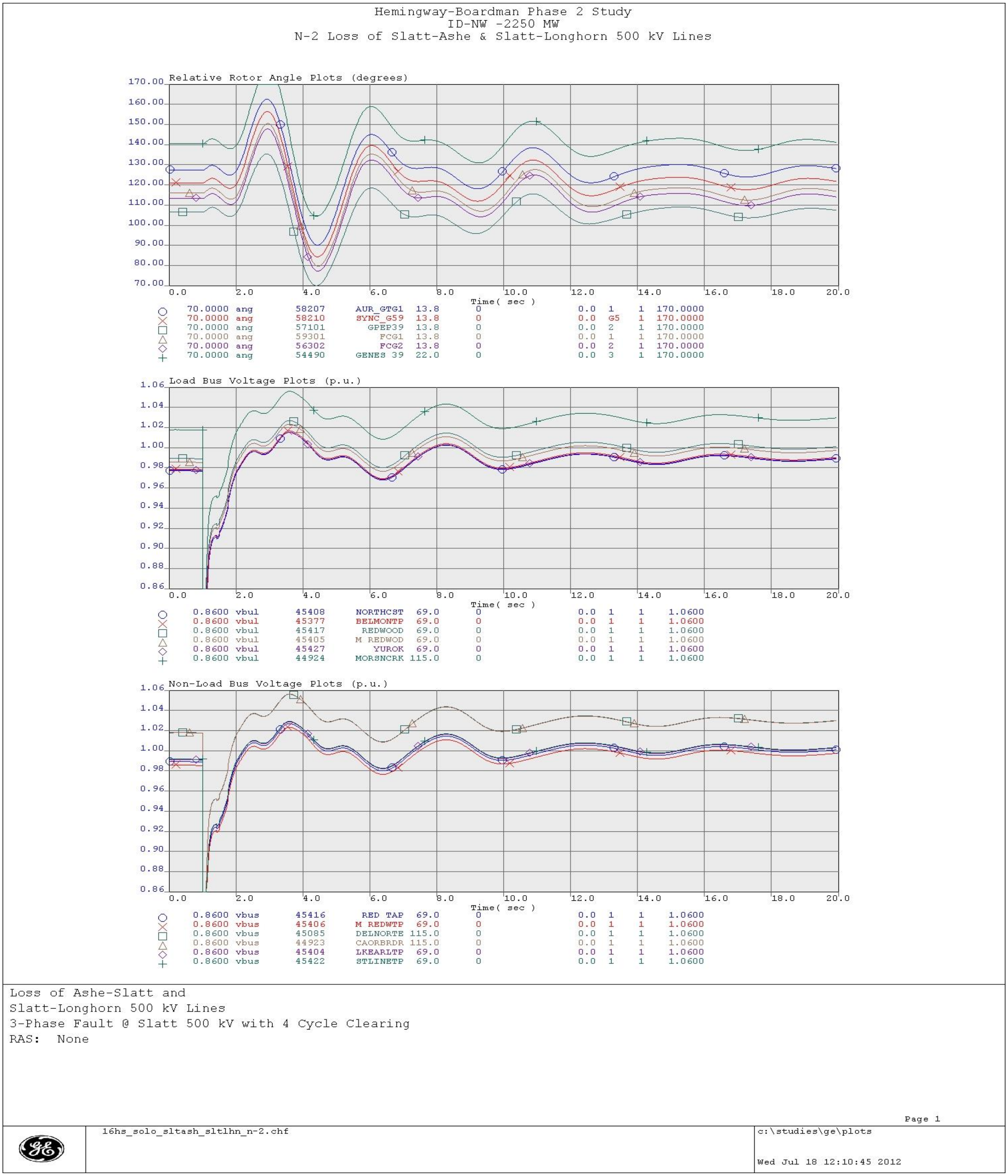

Figure E33: N-2 Loss of Slatt-Ashe & Slatt-McNary 500 kV Lines (Angle & Voltage Plots)

Appendix E - 16hs2a_2250idnw_solo Base Case Transient Stability Results

Fault	Disturbance/Outage	RAS Actions		Largest Swing Voltage Bus	Lowest Swing Voltage Bus	Largest Swing Voltage Load Bus	Lowest Load Bus Frequency	Comments
		Cycles	Remedial Action	(% change)	(absolute value)	(% change)	(Hz)	
N-1 3 Cy 3PH Hemingway 500 kV	Hemingway-Grassland 500 kV	Var	FACRI insertion of Ft Rock Series Caps and Malin Shunt Cap C1	Locust 138 13.0%	Ptrsnflt 230 0.849	Locust 138 13.0%	Bridger2 22.0 59.874	Stable & Damped
N-1 3 Cy 3PH Hemingway 500 kV	Hemingway-Midpoint 500 kV		None	Wood Rvr 138 15.4%	Ptrsnflt 230 0.819	Wood Rvr 138 15.4%	Bridger3 22.0 59.828	Stable & Damped
N-1 4 Cy 3PH Capt Jack 500 kV	Captain Jack-Olinda 500 kV	Var 90	FACRI insertion of Ft Rock Series Caps and Malin Shunt Cap C1 Insert Table Rock C1&C2	Mtshasta 69 16.4%	Yuba 69 0.794	Mtshasta 69 16.4%	Kmo 13g6 13.8 59.834	Stable & Damped
N-1 4 Cy 3PH Table Mt 500 kV	Table Mt-Tesla 500 kV		None	Highwnds 34.5 9.9%	Plainfld 60 0.817	Plainfld 60 13.8%	Honeylke 9.1 59.805	Stable & Damped
N-1 4 Cy 3PH Table Mt 500 kV	Table Mt-Vaca Dixon 500 kV		None	Highwnds 34.5 14.4%	Plainfld 60 0.817	Plainfld 60 13.8%	Honeylke 9.1 59.791	Stable & Damped
N-1 4 Cy 3PH Capt Jack 500 kV	Grizzly-Captain Jack 500 kV	Var	FACRI insertion of Malin Shunt Cap C1 & Capt Jack Shunt Cap C1	Northcst 69 18.1%	Yuba 69 0.786	Northcst 69 18.1%	Boyle 1 11.0 59.850	Stable & Damped
N-1 4 Cy 3PH John Day 500 kV	John Day-Grizzly #1 500 kV	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1&C2 & Capt Jack Shunt Cap C1	Northcst 69 24.4%	Northcst 69 0.739 Less Than 20 cycles	Northcst 69 24.4%	Kmo 13g6 13.8 59.732	Stable & Damped
N-1 4 Cy 3PH Buckley 500 kV	Buckley-Grizzly 500 kV	Var	FACRI insertion of Ft Rock Series Caps	Northcst 69 13.7%	Goldhill 69 0.831	Northcst 69 13.7%	Kmo 13g6 13.8 59.849	Stable & Damped
N-1 4 Cy 3PH Slatt 500 kV	Slatt-Buckley 500 kV	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1 , & Capt Jack Shunt Cap C1	Northcst 69 17.9%	Goldhill 69 0.794	Northcst 69 17.9%	Kmo 13g6 13.8 59.780	Stable & Damped
N-1 4 Cy 3PH Ashe 500 kV	Ashe-Slatt 500 kV	Var	FACRI insertion of Ft Rock Series Caps and Malin Shunt Cap C1	Northcst 69 13.1%	Goldhill 69 0.834	Northcst 69 13.1%	Kmo 13g6 13.8 59.814	Stable & Damped

Appendix E - 16hs2a_2250idnw_solo Base Case Transient Stability Results

Fault	Disturbance/Outage	RAS Actions		Largest Swing Voltage Bus (% change)	Lowest Swing Voltage Bus (absolute value)	Largest Swing Voltage Load Bus (% change)	Lowest Load Bus Frequency (Hz)	Comments
		Cycles	Remedial Action					
Bi-pole Block	PDCI Bipole	Var	FACRI insertion of Ft Rock Series Caps and Malin Shunt Cap C1 Tracy&Olinda React Switching NW 2550 MW Gen Drop	Dwor 1 13.8 7.9%	Lwis Anm 69 0.829	Yorkcany 69 7.5%	Sync_g19 13.8 59.762	Stable & Damped
Breaker Failure 3/10 Cy SLG Hemingway 500 kV	Hemingway-Grassland 500 kV Hemingway 500/230 Xfmr	Var	FACRI insertion of Ft Rock Series Caps	Bowmont 138 15.1%	Locust 138 0.852	Heminway 230 15.5%	Bridger2 22.0 59.872	Stable & Damped
Breaker Failure 3/10 Cy SLG Hemingway 500 kV	Hemingway-Midpoint 500 kV Hemingway 500/230 Xfmr		FACRI insertion of Ft Rock Series Caps & Malin C1 **NOT A CREDIBLE CONTINGENCY**	Luckypk2 13.8 51.5%	Luckypk2 13.8 0.490	Ptrsnfrg 69.0 28.6%	Luckypk1 13.8 59.782	Stable & Damped
N-2 4 Cy LLG Oxbow 230 kV	Brownlee-Hells Canyon 230 kV Oxbow-Lolo 230 kV	5	Tripped 1 Hells Cyn Unit (110 MW)	Locust 138 10.0%	Ptrsnflt 0.892	Elkhrn_w 34.5 11.3%	Oxbow1-2 13.8 59.753	Stable & Damped
N-2 4 Cy 3PH Malin 500 kV	Malin-Round Mt #1 500 kV Malin-Round Mt #2 500 kV Round Mt-Table Mt #2 500 kV	Var	Chief Jo Braking Resistor Tracy&Olinda React Switching NW 2400 MW Gen Drop Flash Malin-Round Mt S-Caps	Mtshasta 69 15.8%	Yuba 0.805	Mtshasta 69 15.8%	Kmo 13g6 13.8 59.750	Stable & Damped
N-2 4 Cy 3PH Table Mt 500 kV	Table Mt-Tesla 500 kV Table Mt-Vaca Dixon 500 kV		FACRI insert Ft Rock Series Caps Chief Jo Braking Resistor Tracy&Olinda React Switching NW 2400 MW Gen Drop	Plainfld 60 14.0%	Plainfld 60 0.815	Highwnds 34.5 15.1%	Honeylke 9.1 59.610	Stable & Damped
N-2 4 Cy 3PH Grizzly 500 kV	Grizzly-CaptJack 500 kV Grizzly-Malin 500 kV	Var	FACRI insertion of Malin C1 and CaptJack C1 Shunt Capacitors NW 2400 MW Gen Drop	Northcst 69 20.7%	Goldhill 69 0.771 Less Than 40 cycles	Northcst 69 20.7%	Kmo 13g6 13.8 59.672	Stable & Damped
N-2 4 Cy 3PH Grizzly 500 kV	Grizzly-Malin 500 kV Grizzly-Summer Lake 500 kV	Var	FACRI insertion of Malin C1 and CaptJack C1 Shunt Capacitors NW 2400 MW Gen Drop	Northcst 69 20.4%	Goldhill 69 0.774 Less Than 40 cycles	Northcst 69 20.4%	Kmo 13g6 13.8 59.662	Stable & Damped

Appendix E - 16hs2a_2250idnw_solo Base Case Transient Stability Results

Fault	Disturbance/Outage	RAS Actions		Largest Swing Voltage Bus	Lowest Swing Voltage Bus	Largest Swing Voltage Load Bus	Lowest Load Bus Frequency	Comments
		Cycles	Remedial Action	(% change)	(absolute value)	(% change)	(Hz)	
N-2 4 Cy 3PH John Day 500 kV	John Day-Grizzly #1&#2 500 kV	Var	FACRI insert Ft Rock Series Caps, Malin C1&C2, CaptJack C1 NW 2400 MW Gen Drop	Northcst 69 24.3%	Big Clif 14.4 0.701 Less Than 40 cycles	Big Clif 14.4 29.8%	Sync_g19 13.8 59.581	Stable & Damped
N-2 4 Cy 3PH Grizzly 500 kV	John Day-Grizzly #2 500 kV Buckley-Grizzly 500 kV	Var	FACRI insert Ft Rock Series Caps, Malin C1, CaptJack C1 NW 2400 MW Gen Drop	Northcst 69 19.7%	Goldhill 69 0.781	Northcst 69 19.7%	Kmo 13g6 13.8 59.632	Stable & Damped
N-2	Loss of 2 Palo Verde units	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1&C2 & CaptJack Sh Cap C1	Ptrsnfrg 69 12.3%	Ptrsnflt 230 0.837	Ptrsnfrg 69 12.3%	Sync_g19 13.8 59.755	Stable & Damped
N-2 4 Cy 3PH Ashe 500 kV	Ashe-Slatt 500 kV Ashe-Marion 500 kV	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1 & CaptJack Sh Cap C1	Sheridan 59.8 12.9%	Stayton 69 0.825	Sheridan 59.8 12.9%	Kmo 13g6 13.8 59.806	Stable & Damped
N-2 4 Cy 3PH Slatt 500 kV	Slatt-Ashe 500 kV Slatt-McNary 500 kV	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1 & CaptJack Sh Cap C1	Northcst 69 17.9%	Goldhill 69 0.794	Northcst 69 17.9%	Kmo 13g6 13.8 59.780	Stable & Damped

Appendix E - 16hs2a_2250idnw_solo Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Shunt HANFORD_500.0 (40499) #s
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Bus MALIN R3_500.0 (40688)
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Bus HOT SPR_500.0 (40553)
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
BF 4231 McNary-Coyote-Slatt 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4231 McNary-Coyote-Slatt 500 kV & McNary 500/230 kV Xfmr	OPEN Bus COYOTE_500.0 (43123)
BF 4231 McNary-Coyote-Slatt 500 kV & McNary 500/230 kV Xfmr	OPEN Bus COYO S1_ 13.8 (43119)
BF 4231 McNary-Coyote-Slatt 500 kV & McNary 500/230 kV Xfmr	OPEN Bus COYO G1_ 18.0 (43111)
BF 4231 McNary-Coyote-Slatt 500 kV & McNary 500/230 kV Xfmr	OPEN Bus COYO M2_ 1.0 (48519)
BF 4231 McNary-Coyote-Slatt 500 kV & McNary 500/230 kV Xfmr	OPEN Bus COYO S2_ 13.8 (48518)
BF 4231 McNary-Coyote-Slatt 500 kV & McNary 500/230 kV Xfmr	OPEN Bus COYO G2_ 18.0 (48516)
BF 4234 McNary-Coyote-Slatt & McNary-Hermcalp 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 4234 McNary-Coyote-Slatt & McNary-Hermcalp 500 kV	OPEN Bus HPP S1_ 18.0 (47641)
BF 4234 McNary-Coyote-Slatt & McNary-Hermcalp 500 kV	OPEN Bus HPP G2_ 18.0 (47640)
BF 4234 McNary-Coyote-Slatt & McNary-Hermcalp 500 kV	OPEN Bus HPP G1_ 18.0 (47639)
BF 4234 McNary-Coyote-Slatt & McNary-Hermcalp 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 4234 McNary-Coyote-Slatt & McNary-Hermcalp 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 4234 McNary-Coyote-Slatt & McNary-Hermcalp 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 4234 McNary-Coyote-Slatt & McNary-Hermcalp 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 4234 McNary-Coyote-Slatt & McNary-Hermcalp 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 4234 McNary-Coyote-Slatt & McNary-Hermcalp 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 2
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1

Appendix E - 16hs2a_2250idnw_solo Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN Bus ASHE R1_500.0 (40062)
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Bus SANTIAM_500.0 (40941)
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Shunt SANTIAM_230.0 (40939) #s
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOK TAP_500.0 (41001)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOKING_500.0 (41007)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt MONROE_500.0 (40749) #s
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR G2_ 20.0 (47744)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2AX_ 4.2 (47746)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2FG_ 13.8 (47747)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR G1_ 20.0 (47740)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1AX_ 4.2 (47742)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1FG_ 13.8 (47743)
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Transformer TONO_115.0 (42806) TO PAUL_500.0 (40821) CKT 1

Appendix E - 16hs2a_2250idnw_solo Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN Shunt MONROE_500.0 (40749) #s
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Transformer ALLSTON_500.0 (40045) TO ALLSTN E_230.0 (40043) CKT 2
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Bus HATWAI_500.0 (40521)
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Bus HATWAI_230.0 (40519)
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line NPULLMAN_115.0 (48291) TO SHAWNEE_115.0 (48383) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line MOSCITYT_115.0 (48245) TO SPULLMAN_115.0 (48413) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS HOT SPR_500.0 (40553) TO -148.3 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	CLOSE Line LEON_115.0 (48183) TO MOSCCITY_115.0 (48243) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line MOSCCITY_115.0 (48243) TO MOSCITYT_115.0 (48245) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS N LEWIST_115.0 (48253) TO 44.4 MVR
BF 4708 Hatwai 500 kV Bus	OPEN Bus HATWAI_500.0 (40521)
BF 4708 Hatwai 500 kV Bus	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4708 Hatwai 500 kV Bus	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4708 Hatwai 500 kV Bus	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Transformer CHIEF JO_500.0 (40233) TO CHIEF J2_230.0 (40232) CKT 3
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN InjectionGroup RAS Lower Granite Gen Drop
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Transformer BIG EDDY_500.0 (40111) TO BIGEDDY1_230.0 (41341) CKT 2
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Bus CGS_ 25.0 (40063)
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN Bus BURNS_500.0 (45029)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R3_500.0 (40688)
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF 5006 Slatt-Coyote-McNary & Slatt-Grassland 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Coyote-McNary & Slatt-Grassland 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5006 Slatt-Coyote-McNary & Slatt-Grassland 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5006 Slatt-Coyote-McNary & Slatt-Grassland 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5006 Slatt-Coyote-McNary & Slatt-Grassland 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5006 Slatt-Coyote-McNary & Slatt-Grassland 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5006 Slatt-Coyote-McNary & Slatt-Grassland 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Coyote-McNary 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1

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Contingency Studied	Actions Taken in the Contingency
BF 5021 Slatt-John Day & Slatt-Coyote-McNary 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5021 Slatt-John Day & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5021 Slatt-John Day & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5021 Slatt-John Day & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5021 Slatt-John Day & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5021 Slatt-John Day & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN Bus ROUND BU_500.0 (43485)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Bus MAPLE VL_500.0 (40693)
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G1_ 18.0 (47639) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G2_ 18.0 (47640) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP S1_ 18.0 (47641) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
BF 5266 Slatt-Buckly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Bus BURNS_500.0 (45029)
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF Lolo 230kV	OPEN Bus LOLO_230.0 (48197)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1G_ 18.0 (45454)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1S_ 13.8 (45455)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2G_ 18.0 (45456)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2S_ 13.8 (45457)
BF McNary 230 kV SECT 1	OPEN Bus MCN 01_ 13.8 (44101)
BF McNary 230 kV SECT 1	OPEN Bus MCN 02_ 13.8 (44102)
BF McNary 230 kV SECT 1	OPEN Bus MCN 03_ 13.8 (44103)
BF McNary 230 kV SECT 1	OPEN Bus MCN 04_ 13.8 (44104)
BF McNary 230 kV SECT 1	OPEN Bus BOARD T1_230.0 (40121)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_230.0 (40129)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_115.0 (40127)
BF McNary 230 kV SECT 1	OPEN Bus MORROW 1_115.0 (47334)
BF McNary 230 kV SECT 1	OPEN Bus PORT MOR_115.0 (47335)
BF McNary 230 kV SECT 1	OPEN Bus MORRO G1_ 13.8 (47658)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN T_ 69.0 (40608)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN_ 69.0 (47332)
BF McNary 230 kV SECT 1	OPEN Bus KINZ WW_ 12.5 (47331)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_ 69.0 (40125)
BF McNary 230 kV SECT 1	OPEN Bus IONE_ 69.0 (40575)
BF McNary 230 kV SECT 1	OPEN Bus TOWER RD_115.0 (41324)
BF McNary 230 kV SECT 1	OPEN Bus ALKALI C_115.0 (41319)
BF McNary 230 kV SECT 1	OPEN Bus HERMISTN_230.0 (45137)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH1_230.0 (44122)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH2_230.0 (44123)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX1_100.0 (44115)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX2_100.0 (44116)

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Contingency Studied	Actions Taken in the Contingency
BF McNary 230 kV SECT 2	OPEN Bus MCNRY S2_230.0 (41352)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH34_230.0 (44125)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH3_230.0 (44124)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH4_230.0 (44126)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX3_100.0 (44117)
BF McNary 230 kV SECT 2	OPEN Bus MCN 05_ 13.8 (44105)
BF McNary 230 kV SECT 2	OPEN Bus MCN 06_ 13.8 (44106)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX4_100.0 (44118)
BF McNary 230 kV SECT 2	OPEN Bus MCN 07_ 13.8 (44107)
BF McNary 230 kV SECT 2	OPEN Bus MCN 08_ 13.8 (44108)
BF McNary 230 kV SECT 2	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 52.2 MVR
BF McNary 230 kV SECT 3	OPEN Bus MCNRY S3_230.0 (41353)
BF McNary 230 kV SECT 3	OPEN Bus MCN PH5_230.0 (44127)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX5_100.0 (44119)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX6_100.0 (44120)
BF McNary 230 kV SECT 3	OPEN Bus MCN 09_ 13.8 (44109)
BF McNary 230 kV SECT 3	OPEN Bus MCN 10_ 13.8 (44110)
BF McNary 230 kV SECT 3	OPEN Bus MCN 11_ 13.8 (44111)
BF McNary 230 kV SECT 3	OPEN Bus MCN 12_ 13.8 (44112)
BF McNary 230 kV SECT 3	OPEN Bus MCNARY_345.0 (40721)
BF McNary 230 kV SECT 3	SET SWITCHED SHUNT AT BUS ECHO OWF_ 34.5 (44890) TO 6 MVR
BF McNary 230 kV SECT 3	CLOSE Shunt 9CWIND 2_ 34.5 (47316) #ZS
BF McNary 230 kV SECT 3	SET SWITCHED SHUNT AT BUS 9CWIND 2_ 34.5 (47316) TO 10.6 MVR
BF McNary 230 kV SECT 3	CLOSE Shunt 9CWIND 1_ 34.5 (47315) #ZS
BF McNary 230 kV SECT 3	SET SWITCHED SHUNT AT BUS 9CWIND 1_ 34.5 (47315) TO 10.6 MVR
Bus: Alvey 500 kV + RAS	OPEN Bus ALVEY_500.0 (40051)
Bus: Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
Bus: Bell BPA 500 kV	OPEN Bus BELL BPA_500.0 (40091)
Bus: Bell BPA 500 kV	OPEN Bus COULE R1_500.0 (40288)
Bus: Bell BPA 500 kV	OPEN Bus BELL SC_500.0 (40096)
Bus: Buckley 500 kV	OPEN Bus BUCKLEY_500.0 (40155)
Bus: Dixonville 500 kV	OPEN Bus DIXONVLE_500.0 (45095)
Bus: Hot Springs 500 kV	OPEN Bus HOT SPR_500.0 (40553)
Bus: Keeler 500 kV + RAS	OPEN Bus KEELER_500.0 (40601)
Bus: Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
Bus: Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
Bus: Sickler 500 kV	OPEN Bus SICKLER_500.0 (40973)
Bus: Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
Bus: Summer Lake 500 kV	OPEN Bus SUMMER L_500.0 (41043)
Bus: Summer Lake 500 kV	OPEN Bus BURNS_500.0 (45029)
Bus: Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-1: Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
N-1: Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
N-1: Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
N-1: Allston-Napavine 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-1: Allston-Paul #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-1: Alvery-Dixonville 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO DIXONVLE_500.0 (45095) CKT 1
N-1: Alvey-Marion 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
N-1: Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-1: Ashe-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
N-1: Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-1: Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-1: Bell-Coulee 500 kV	OPEN Bus COULE R1_500.0 (40288)
N-1: Bell-Taft 500 kV	OPEN Bus BELL SC_500.0 (40096)
N-1: Big Eddy-Celilo 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO CELILO1_500.0 (41311) CKT 1
N-1: Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-1: Big Eddy-Knight 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO KNIGHT_500.0 (41450) CKT 1
N-1: Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-1: Boise Bench-Brownlee #3 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-1: Brady-Antelope 230 kV	OPEN Line BRADY_230.0 (60073) TO ANTLOPE_230.0 (65075) CKT 1
N-1: Broadview-Garrison #1 500 kV	OPEN Bus GAR1EAST_500.0 (40451)
N-1: Broadview-Garrison #1 500 kV	OPEN Bus TOWN1_500.0 (62013)
N-1: Brownlee-Ontario 230 kV	OPEN MultiSectionLine BROWNLEE_230.0 (60095) TO ONTARIO_230.0 (60265) CKT 1
N-1: Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-1: Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-1: Buckley-Slatt 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-1: Captain Jack-Olinda 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO OLINDA_500.0 (30020) CKT 1
N-1: CaptJack-Kfalls 500 kV	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
N-1: Chief Jo-Coulee 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-1: Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1

Appendix E - 16hs2a_2250idnw_solo Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-1: Coulee-Hanford 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-1: Coulee-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Covington4-Raver 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-1: Covington5-Raver 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
N-1: CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-1: Dixonville-Meridian 500 kV	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
N-1: Drycreek-Lolo 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO LOLO_230.0 (48197) CKT 1
N-1: Drycreek-N Lewiston 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO N LEWIST_230.0 (48255) CKT 1
N-1: Drycreek-Wala Ava 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO WALA AVA_230.0 (48451) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Dworshak-Taft 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-1: Echo Lake-Maple Valley 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO MAPLE VL_500.0 (40693) CKT 1
N-1: Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-1: Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Echo Lake-Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
N-1: Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSHE1_115.0 (32229)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSESHE_115.0 (32230)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTL1_115.0 (32233)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_115.0 (32234)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_ 13.2 (32460)
N-1: Goldhill-Placer 115 kV	OPEN Bus FLINT1_115.0 (32236)
N-1: Grassland-Coyote 500 kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-1: Grassland-Slatt 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
N-1: Grizzly-John Day #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-1: Grizzly-Malin 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN MultiSectionLine PONDROSA_500.0 (40837) TO SUMMER L_500.0 (41043) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZ R3_500.0 (40488) TO PONDROSA_500.0 (40837) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO GRIZZ R3_500.0 (40488) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Grizzly-Round Bu 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO ROUND BU_500.0 (43485) CKT 1
N-1: Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-1: Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-1: Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Transformer HATWAI_500.0 (40521) TO HATWAI_230.0 (40519) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 67.1 MVR
N-1: Hatwai-Lolo 230 kV	OPEN Line HATWAI_230.0 (40519) TO LOLO_230.0 (48197) CKT 1
N-1: Hatwai-Low Gran 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Hatwai-N Lewiston 230 kV	OPEN Line HATWAI_230.0 (40519) TO N LEWIST_230.0 (48255) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO HURICANE_230.0 (45103) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN MultiSectionLine HURICANE_230.0 (45103) TO WALAWALA_230.0 (45327) CKT 1
N-1: Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt MALIN_500.0 (40687) #s
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt MALIN_500.0 (40687) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt CAPTJACK_500.0 (45035) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt CAPTJACK_500.0 (45035) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt MALIN_500.0 (40687) #c1
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1

Appendix E - 16hs2a_2250idnw_solo Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Hemingway-Summer Lake 500 kV	OPEN Line HEMINWAY_500.0 (60155) TO BURNS_500.0 (45029) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN MultiSectionLine BURNS_500.0 (45029) TO SUMMER L_500.0 (41043) CKT 1
N-1: Hill Top 345/230 Xfmr	OPEN Transformer HIL TOP_230.0 (40537) TO HIL TOP_345.0 (64058) CKT 1
N-1: Horse Hv-McNary 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-1: Horse Hv-McNary 230 kV	SET SWITCHED SHUNT AT BUS HARVALUM_230.0 (40511) TO 40.7 MVR
N-1: Hot Springs-Taft 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line COYOTECR_345.0 (64032) TO HUMBOLDT_345.0 (64059) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line MAGGIECR_120.0 (64070) TO CARLIN_120.0 (64169) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt EIGHTMFK_120.0 (64457) #b
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO &1_345.0 (67582)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO_345.0 (66225)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #2_ 99.0 (65014)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #3_ 99.0 (65017)
N-1: Ing500-CusterW 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-1: John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-1: John Day-Rock Ck 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-1: John Day-Slatt 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-1: Kfalls-Meridian 500 kV	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
N-1: Knight-Wautoma 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
N-1: LaGrande-North Powder 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO N POWDER_230.0 (60312) CKT 1
N-1: Lanes-Marion 500 kV	OPEN Line LANE_500.0 (40629) TO MARION_500.0 (40699) CKT 1
N-1: Lit Goose-Central Ferry 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
N-1: Lit Goose-Low Mon 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
N-1: Low Gran-Central Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Low Mon-Sac Tap 500 kV	OPEN Line LOW MON_500.0 (40683) TO SACJWA T_500.0 (40917) CKT 1
N-1: Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
N-1: Malin-Hilltop 230 kV	OPEN Line CANBYTAP_230.0 (40171) TO HIL TOP_230.0 (40537) CKT 1
N-1: Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-1: Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-1: Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-1: Maple Vly-Rocky RH 345 kV	OPEN MultiSectionLine MAPLE VL_345.0 (40691) TO ROCKY RH_345.0 (40891) CKT 1
N-1: Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Line MARION_500.0 (40699) TO SANTIAM_500.0 (40941) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Shunt SANTIAM_230.0 (40939) #s
N-1: McLouglin-Ostrander 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-1: McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary S2-McNary S3 230 kV	OPEN Line MCNRY S2_230.0 (41352) TO MCNRY S3_230.0 (41353) CKT 1
N-1: McNary-Board T1 230 kV	OPEN Line BOARD T1_230.0 (40121) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-1: McNary-Coyote-Slatt 500 kV	OPEN Bus COYOTE_500.0 (43123)
N-1: McNary-Coyote-Slatt 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
N-1: McNary-Coyote-Slatt 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
N-1: McNary-Coyote-Slatt 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
N-1: McNary-Coyote-Slatt 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
N-1: McNary-Coyote-Slatt 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
N-1: McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-1: McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-1: McNary-Roundup 230 kV	OPEN Line MCNRY S1_230.0 (41351) TO ROUNDUP_230.0 (40905) CKT 1
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJWA T_500.0 (40917)
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
N-1: McNary-Sac Tap-Low Mon 500 kV	CLOSE Gen ICE H1-2_ 13.8 (40559) #1
N-1: Midpoint-Hemingway 500 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS OREBASIN_ 34.5 (66146) TO 20 MVR
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS OREBASIN_ 34.5 (66146) TO 20 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA Shunt	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA Shunt	SET SWITCHED SHUNT AT BUS OREBASIN_ 34.5 (66146) TO 20 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA Shunt	CLOSE Shunt BORAH_345.0 (60060) #1
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA Shunt	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA & MLCK Shunt	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA & MLCK Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA & MLCK Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR

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Contingency Studied	Actions Taken in the Contingency
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA & MLCK Shunt	CLOSE Shunt MILLCKT2_ 13.8 (62333) #1
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA & MLCK Shunt	CLOSE Shunt MILLCKT1_ 13.8 (62332) #1
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA & MLCK Shunt	SET SWITCHED SHUNT AT BUS OREBASIN_ 34.5 (66146) TO 20 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA & MLCK Shunt	CLOSE Shunt BORAH_345.0 (60060) #1
N-1: Midpoint-Hemingway 500 kV + PTSN & BORA & MLCK Shunt	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	OPEN Line ADELAIDE_345.0 (60006) TO MIDPOINT_345.0 (60235) CKT 2
N-1: Midpoint-Humboldt 345 kV	OPEN Bus IDAHO-NV_345.0 (64061)
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS HIL TOP_230.0 (40537) TO 52.2 MVR
N-1: Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
N-1: Ontario-Caldwell 230 kV	OPEN MultiSectionLine CALDWELL_230.0 (60110) TO LANGLEY_230.0 (60266) CKT 1
N-1: Ostrander-Knight 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-1: Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-1: Ostrander-Troutdale 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO TROUTDAL_500.0 (41095) CKT 1
N-1: Oxbow-Brownlee #2 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 2
N-1: Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-1: Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-1: Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO SATSOP_500.0 (40949) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-1: Pinto-Four Corner 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Ponderosa A 500/230 kV Xfmr	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Ponderosa B 500/230 kV Xfmr	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Raver-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-1: Raver-Tacoma 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus H ALLEN_345.0 (18001)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus HA PS_345.0 (18002)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus UTAH-NEV_345.0 (67657)
N-1: Robinson-Harry Allen 500 kV	OPEN Line ROBINSON_500.0 (64895) TO H ALLEN_500.0 (18450) CKT 1
N-1: Rock Ck-Wautoma 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Round Mtn-Table Mtn 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-1: Roundup-Lagrande 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO ROUNDUP_230.0 (40905) CKT 1
N-1: Schultz-Sickler 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-1: Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-1: Schultz-Wautoma 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Sigurd-Glen Canyon 230 kV	OPEN Bus SIGURDPS_230.0 (66355)
N-1: Slatt 500/230 kV Xfmr	OPEN Transformer SLATT_500.0 (40989) TO SLATT_230.0 (40986) CKT 1
N-1: Snok Tap-Snoking 500 kV	OPEN Line SNOK TAP_500.0 (41001) TO SNOKING_500.0 (41007) CKT 1
N-1: Table Mtn-Tesla 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-1: Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-1: Vantage 500/230 kV Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
N-1: Vantage 500/230 kV Xfmr #2	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 2
N-1: Walla Walla-Talbot 230 kV	OPEN Line TALBOT_230.0 (44912) TO WALAWALA_230.0 (45327) CKT 1
N-1: Walla Walla-Wallula 230 kV	OPEN Line WALAWALA_230.0 (45327) TO WALLULA_230.0 (45331) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Coyote-McNary 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Coyote-McNary 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Coyote-McNary 500 kV	OPEN Bus COYOTE_500.0 (43123)
N-2: Ashe-Marion & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
N-2: Ashe-Marion & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
N-2: Ashe-Marion & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
N-2: Ashe-Marion & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
N-2: Ashe-Marion & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote-McNary 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1

Appendix E - 16hs2a_2250idnw_solo Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Ashe-Slatt & Slatt-Coyote-McNary 500 kV	OPEN Bus COYOTE_500.0 (43123)
N-2: Ashe-Slatt & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
N-2: Ashe-Slatt & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
N-2: Ashe-Slatt & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
N-2: Ashe-Slatt & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
N-2: Ashe-Slatt & Slatt-Coyote-McNary 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN MultiSectionLine BIGEDDY2_230.0 (41342) TO CHEMAWA_230.0 (40213) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Bus PARKDALE_230.0 (40813)
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 2
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIHOR41_230.0 (61995) CKT 4 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO HORSEFLT_230.0 (60102) CKT 4
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO11_230.0 (61998) CKT 1 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO21_230.0 (61997) CKT 2 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV + RAS	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 1
N-2: Bridger-Populus #1 & #2 345 kV + RAS	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #1 & #2 345 kV + RAS	OPEN Gen BRIDGER1_ 22.0 (60086) #1
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET LOAD AT BUS BRIDGER1_ 22.0 (60086) TO 60 % of present MW (cnst pf)
N-2: Bridger-Populus #1 & #2 345 kV + RAS	OPEN Gen BRIDGER2_ 22.0 (60087) #1
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET LOAD AT BUS BRIDGER2_ 22.0 (60087) TO 60 % of present MW (cnst pf)
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET SERIES CAP REACTANCE AT POPULUS_345.0 (67790) TO POPBRI21_345.0 (61967) CKT 2 TO -0.017307 pu
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET SERIES CAP REACTANCE AT POPULUS_345.0 (67790) TO POPBRI11_345.0 (61968) CKT 1 TO -0.017307 pu
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET SERIES CAP REACTANCE AT BRI3MI11_345.0 (61999) TO 3MIKNOLL_345.0 (60084) CKT 1 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV + RAS	CLOSE Shunt BORAH_345.0 (60060) #1
N-2: Bridger-Populus #1 & #2 345 kV + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	OPEN MultiSectionLine BRIDGER_345.0 (60085) TO 3MIKNOLL_345.0 (60084) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	OPEN Gen BRIDGER1_ 22.0 (60086) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET LOAD AT BUS BRIDGER1_ 22.0 (60086) TO 60 % of present MW (cnst pf)
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	OPEN Gen BRIDGER2_ 22.0 (60087) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET LOAD AT BUS BRIDGER2_ 22.0 (60087) TO 60 % of present MW (cnst pf)
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET SERIES CAP REACTANCE AT POPULUS_345.0 (67790) TO POPBRI21_345.0 (61967) CKT 2 TO -0.017307 pu
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET SERIES CAP REACTANCE AT POPULUS_345.0 (67790) TO POPBRI11_345.0 (61968) CKT 1 TO -0.017307 pu
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	SET SERIES CAP REACTANCE AT BRI3MI11_345.0 (61999) TO 3MIKNOLL_345.0 (60084) CKT 1 TO 50 % of present
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV + RAS	CLOSE Shunt BORAH_345.0 (60060) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Series Cap GAR1EAST_500.0 (40451) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line GAR1EAST_500.0 (40451) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Series Cap GAR2EAST_500.0 (40453) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line GAR2EAST_500.0 (40453) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Transformer HELLSCYN_230.0 (60150) TO HELSCYN1_ 14.4 (60151) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN Line MONROE_230.0 (40747) TO NOVELTY_230.0 (42304) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus CHIEF J3_345.0 (40223)

Appendix E - 16hs2a_2250idnw_solo Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus SNOHOMS3_345.0 (40993)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #I
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO3_ 13.8 (41216) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO4_ 13.8 (41217) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO5_ 13.8 (41218) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO6_ 13.8 (41219) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO7_ 13.8 (41220) #F
N-2: DC-BIPOLE	OPEN Shunt MALIN_500.0 (40687) #s
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: DC-BIPOLE	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: DC-BIPOLE	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: DC-BIPOLE	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: DC-BIPOLE	CHANGE INJECTION GROUP RAS PDCI Gen Drop Units BY 'PDCI_gen_drop_value_less300' MW in generator merit order by opening
N-2: DC-BIPOLE	OPEN Bus SYLMAR1_230.0 (26097)
N-2: DC-BIPOLE	OPEN Bus SYLMAR2_230.0 (26099)
N-2: DC-BIPOLE	OPEN Shunt SYLMAR S_230.0 (24147) #b
N-2: DC-BIPOLE	OPEN Shunt SYLMARLA_230.0 (26094) #b
N-2: DC-BIPOLE	OPEN Shunt BIGEDDY2_230.0 (41342) #s
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #b
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS ANTELOPE_230.0 (24401) TO 158.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt BARRE_230.0 (24016) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS BARRE_230.0 (24016) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt CHINO_230.0 (24025) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS CHINO_230.0 (24025) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt DEVERS_230.0 (24804) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS DEVERS_230.0 (24804) TO 316.8 MVR
N-2: DC-BIPOLE	CLOSE Shunt EL NIDO_230.0 (24040) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS EL NIDO_230.0 (24040) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt GOULD_230.0 (24059) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS GOULD_230.0 (24059) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LCIENEGA_230.0 (24082) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LCIENEGA_230.0 (24082) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LAGUBELL_230.0 (24076) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LAGUBELL_230.0 (24076) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOMW_230.0 (24093) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOMW_230.0 (24093) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOME_230.0 (25656) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOME_230.0 (25656) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRAGE_230.0 (24806) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRAGE_230.0 (24806) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MOORPARK_230.0 (24099) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MOORPARK_230.0 (24099) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_230.0 (24100) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS OLINDA_230.0 (24100) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt PADUA_230.0 (24112) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PADUA_230.0 (24112) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt PARDEE_230.0 (24114) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PARDEE_230.0 (24114) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt RIOHONDO_230.0 (24126) #ei

Appendix E - 16hs2a_2250idnw_solo Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS RIOHONDO_230.0 (24126) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt SANBRDNO_230.0 (24132) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS SANBRDNO_230.0 (24132) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt S.CLARA_230.0 (24128) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS S.CLARA_230.0 (24128) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #b
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #2
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VALLEYSC_115.0 (24160) TO 187.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt VILLA PK_230.0 (24154) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VILLA PK_230.0 (24154) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VINCENT_230.0 (24155) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VINCENT_230.0 (24155) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VSTA_230.0 (24901) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VSTA_230.0 (24901) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt WALNUT_230.0 (24158) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS WALNUT_230.0 (24158) TO 79.2 MVR
N-2: DC-BIPOLE	OPEN Bus CELILO4_230.0 (41314)
N-2: DC-BIPOLE	OPEN Bus CELILO3_230.0 (41313)
N-2: DC-BIPOLE	OPEN Bus CELILO2_500.0 (41312)
N-2: DC-BIPOLE	OPEN Bus CELILO1_500.0 (41311)
N-2: Double Palo Verde	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-2: Double Palo Verde	OPEN Shunt MALIN_500.0 (40687) #s
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: Double Palo Verde	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: Double Palo Verde	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: Double Palo Verde	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: Double Palo Verde	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: Double Palo Verde	OPEN Gen PALOVRD2_ 24.0 (14932) #1
N-2: Double Palo Verde	OPEN Gen PALOVRD1_ 24.0 (14931) #1
N-2: Double Palo Verde	CHANGE LOAD AT BUS AGUAFAPS_ 69.0 (14400) BY -120 MW (cnst pf)
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS SPRINGER_115.0 (12077) TO 20 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-2: Double Palo Verde	OPEN Shunt NIC 500_500.0 (50703) #v
N-2: Double Palo Verde	OPEN Shunt CKY 500_500.0 (50045) #v
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Line COVINGTN_230.0 (40303) TO MAPLEV12_230.0 (40692) CKT 2
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_345.0 (40691)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus ROCKY RH_345.0 (40891)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN Bus PONDROSB_500.0 (40834)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus PONDROSA_500.0 (40837)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus GRIZZ R3_500.0 (40488)
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2

Appendix E - 16hs2a_2250idnw_solo Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus ALFALFA_230.0 (40039)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus OUTLOOK_230.0 (45229)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Load MILCTYDC_230.0 (63010) #D1
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN InjectionGroup RAS Lower Granite Gen Drop
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #6
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG2_ 13.2 (38755) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #10
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #11
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine MCNARY_345.0 (40721) TO ROSS_345.0 (40901) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	OPEN Line KING_230.0 (60177) TO MIDPOINT_230.0 (60232) CKT 1
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1

Appendix E - 16hs2a_2250idnw_solo Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line PEARL #_230.0 (43773) TO SHERWOOD_230.0 (43527) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN MultiSectionLine BIGEDDY3_230.0 (41343) TO MCLOUGLN_230.0 (43313) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT5_500.0 (40306)
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus COULEE_300.0 (40285)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus OLYMPIA_300.0 (40795)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Bus CENTR SS_230.0 (47748)
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN Bus CHRISTOP_230.0 (42505)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 2
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Transformer ROUND MT_500.0 (30005) TO RD MT 1M_500.0 (30065) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_DLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1

Appendix E - 16hs2a_2250idnw_solo Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_SLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 1_ 12.5 (38825)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 2_ 12.5 (38830)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 3_ 12.5 (38835)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 4_ 12.5 (38840)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 5_ 12.5 (38845)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT1_ 13.8 (38700)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT2_ 13.8 (38705)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT3_ 13.8 (38710)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT4_ 13.8 (38715)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 4-5_ 13.8 (31782)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBOU2-3_ 11.5 (31808)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 1_ 11.5 (31810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 1_ 18.0 (34600)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 2_ 18.0 (34602)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 3_ 18.0 (34604)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Shunt NIC 500_500.0 (50703) #v
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus ADDY N_230.0 (40021)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Line BELL BPA_115.0 (40087) TO BIGELOW_115.0 (40113) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine LANCASTR_230.0 (40624) TO NOXONBPA_230.0 (40787) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF IPC Midpoint-Hem 500 kV & Hem 500/230 Xfmr	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Midpoint-Hem 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Transformer BOARD F_ 24.0 (43047) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Gen BOARD F_ 24.0 (43047) #1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR

Appendix F

16hs2a_2250idnw_nww Base Case (Walla Walla Area, 100% Wind)

Appendix F– 16hs2sa_2250idnw_N_nww Case Post-Transient Contingency Results

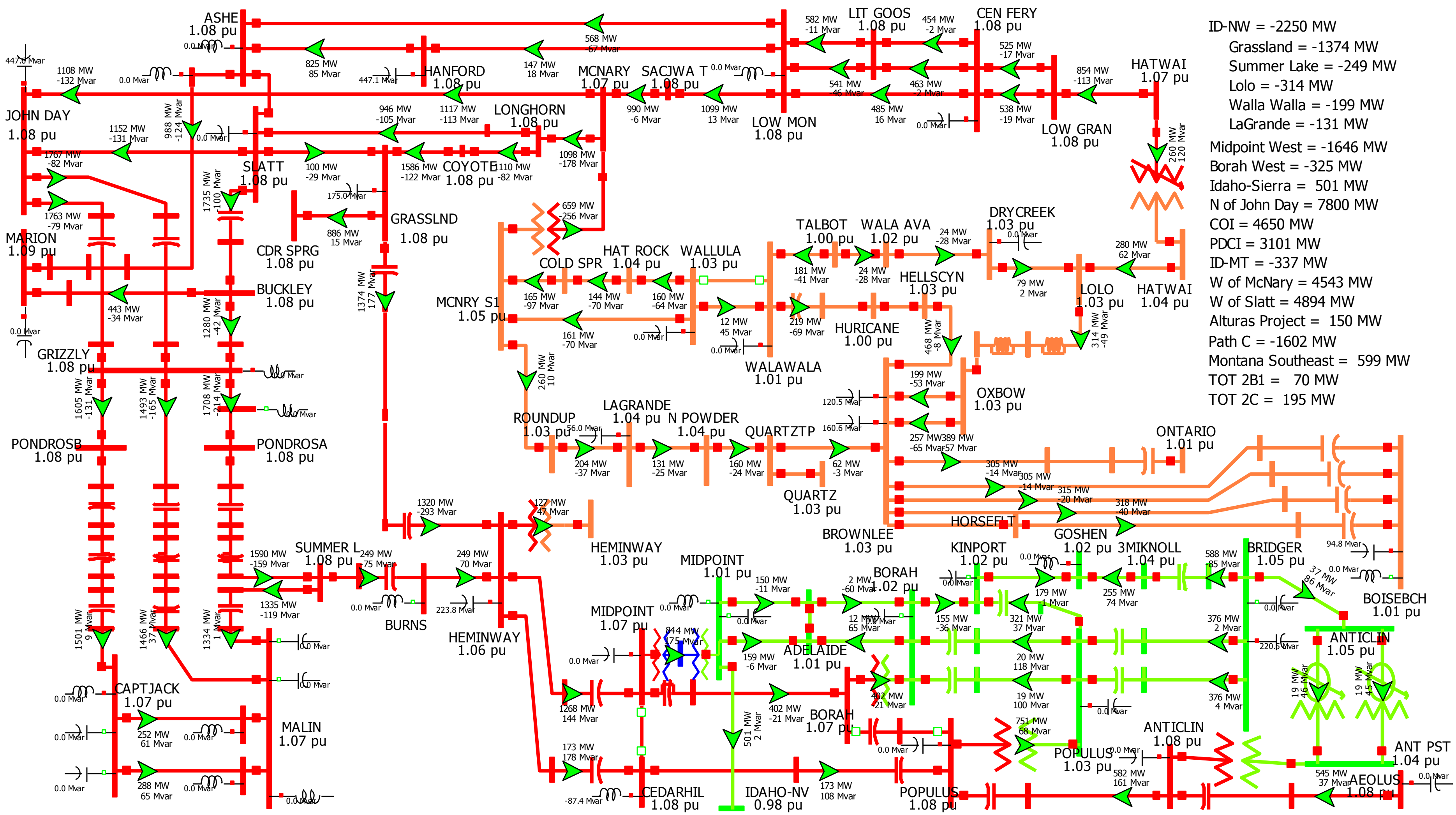

Figure F1: 16hs2sa_2250idnw_N_nww Case **Pre-Contingency**

Appendix F– 16hs2sa_2250idnw_N_nww Case Post-Transient Contingency Results

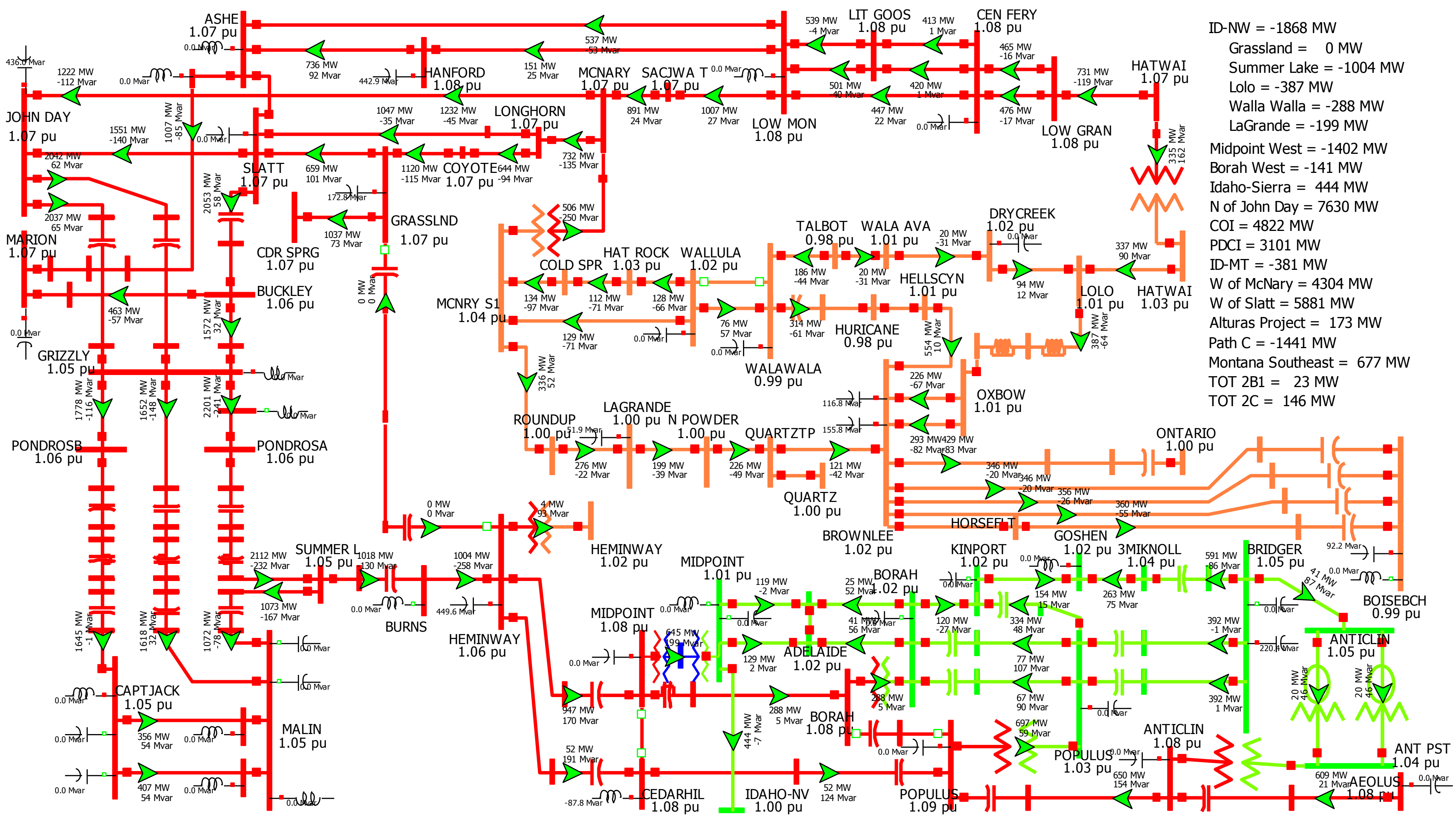

Figure F2: 16hs2sa_2250idnw_N_nww Case **N-1: Hemingway-Grassland 500 kV + PTSN Shunt**

Appendix F– 16hs2sa_2250idnw_N_nww Case Post-Transient Contingency Results

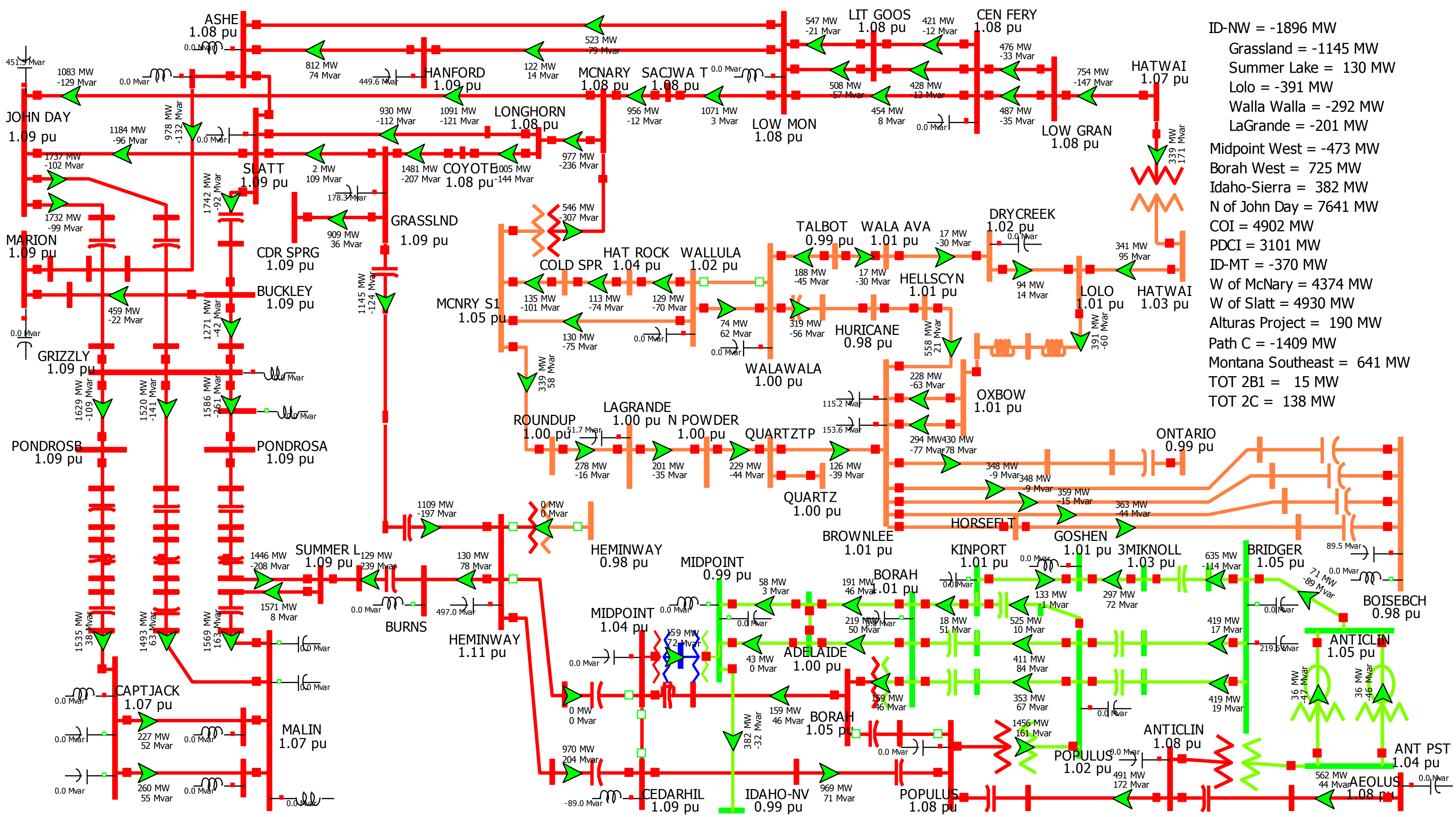

Figure F3: 16hs2sa_2250idnw_N_nww Case **BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr**

Appendix F– 16hs2sa_2250idnw_N_nww Case Post-Transient Contingency Results

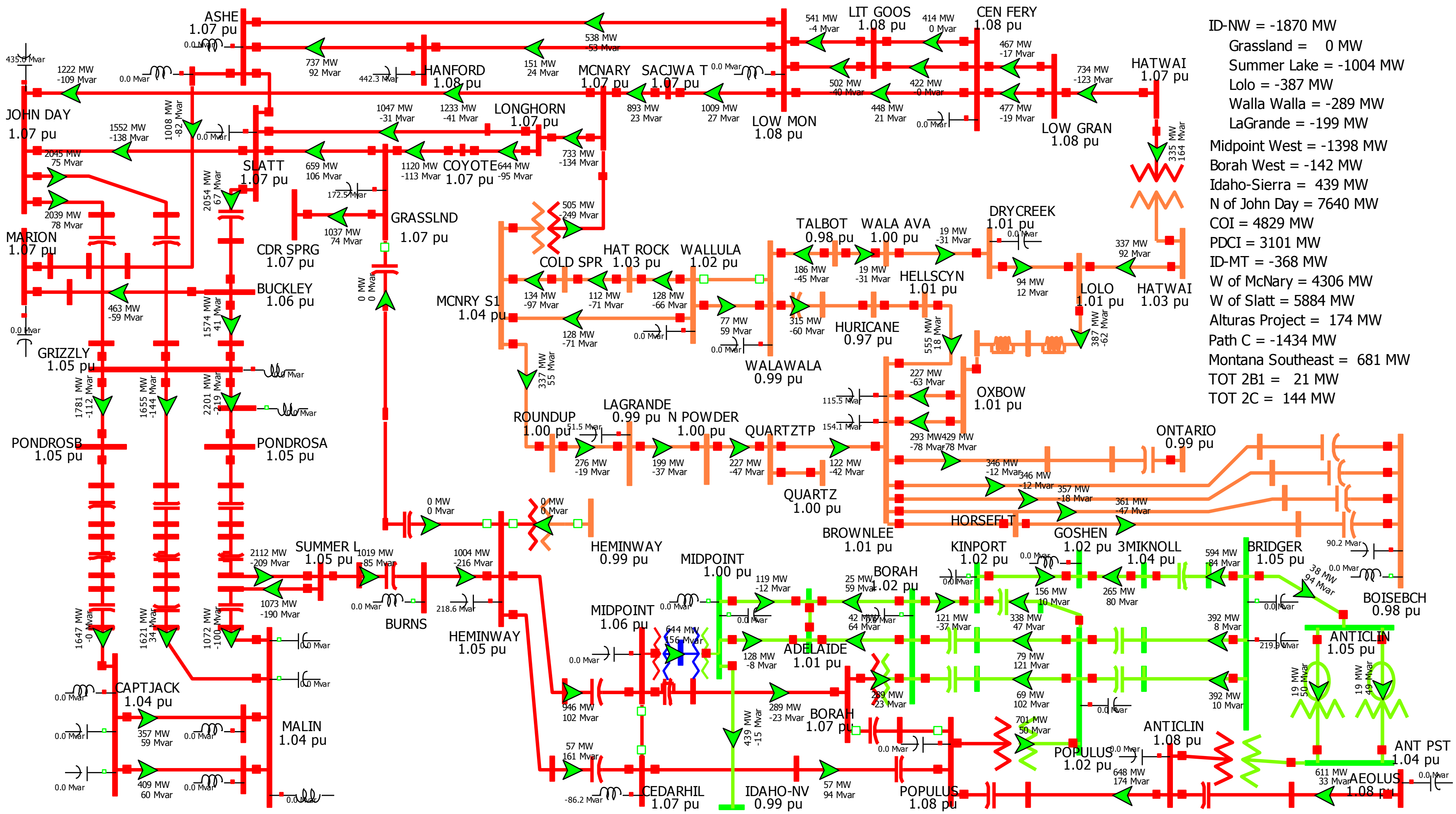

Figure F4: 16hs2sa_2250idnw_N_nww Case **BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr**

Appendix F– 16hs2sa_2250idnw_N_nww Case Post-Transient Contingency Results

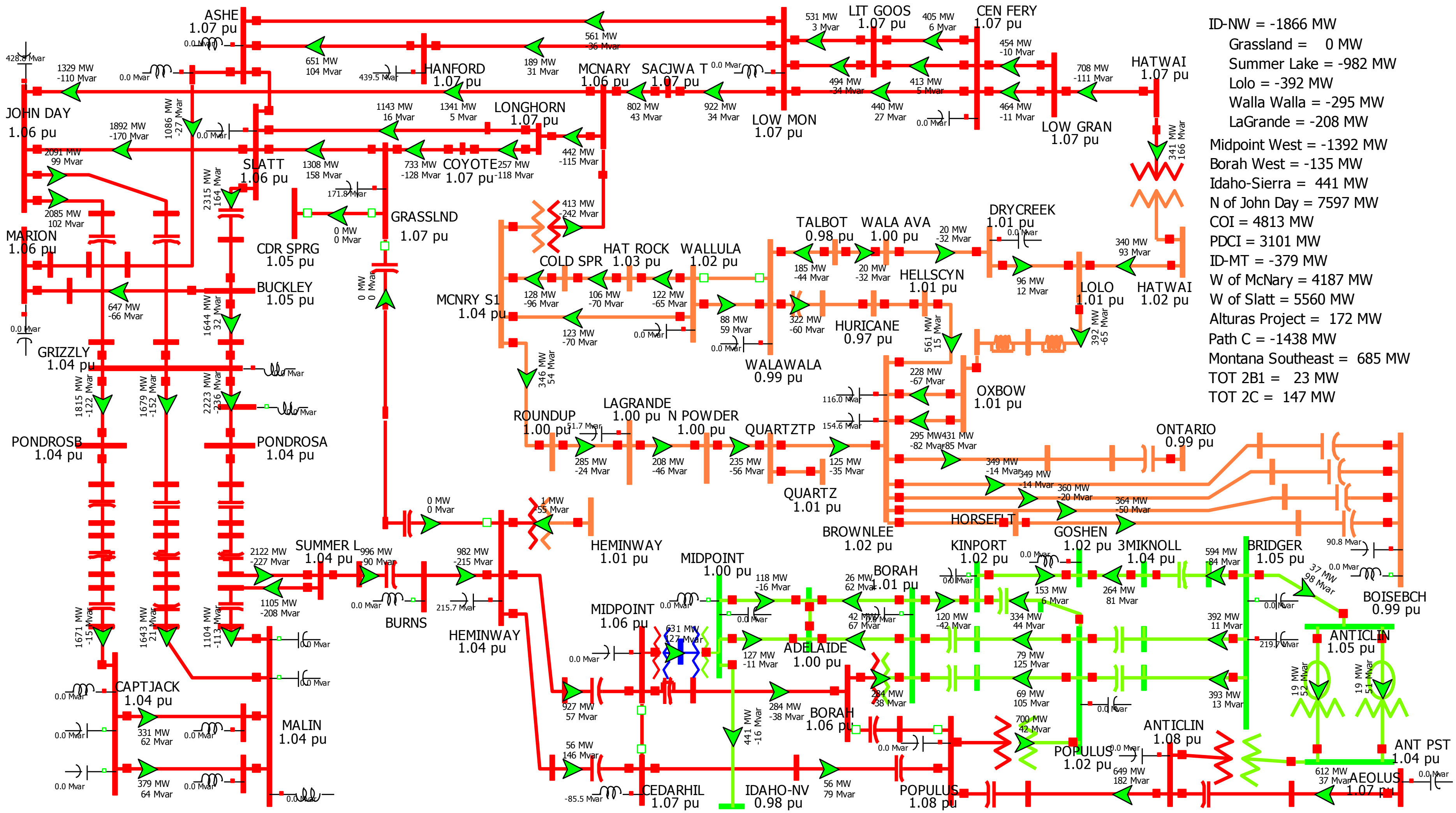

Figure F5: 16hs2sa_2250idnw_N_nww Case **BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV**

Appendix F– 16hs2sa_2250idnw_N_nww Case Post-Transient Contingency Results

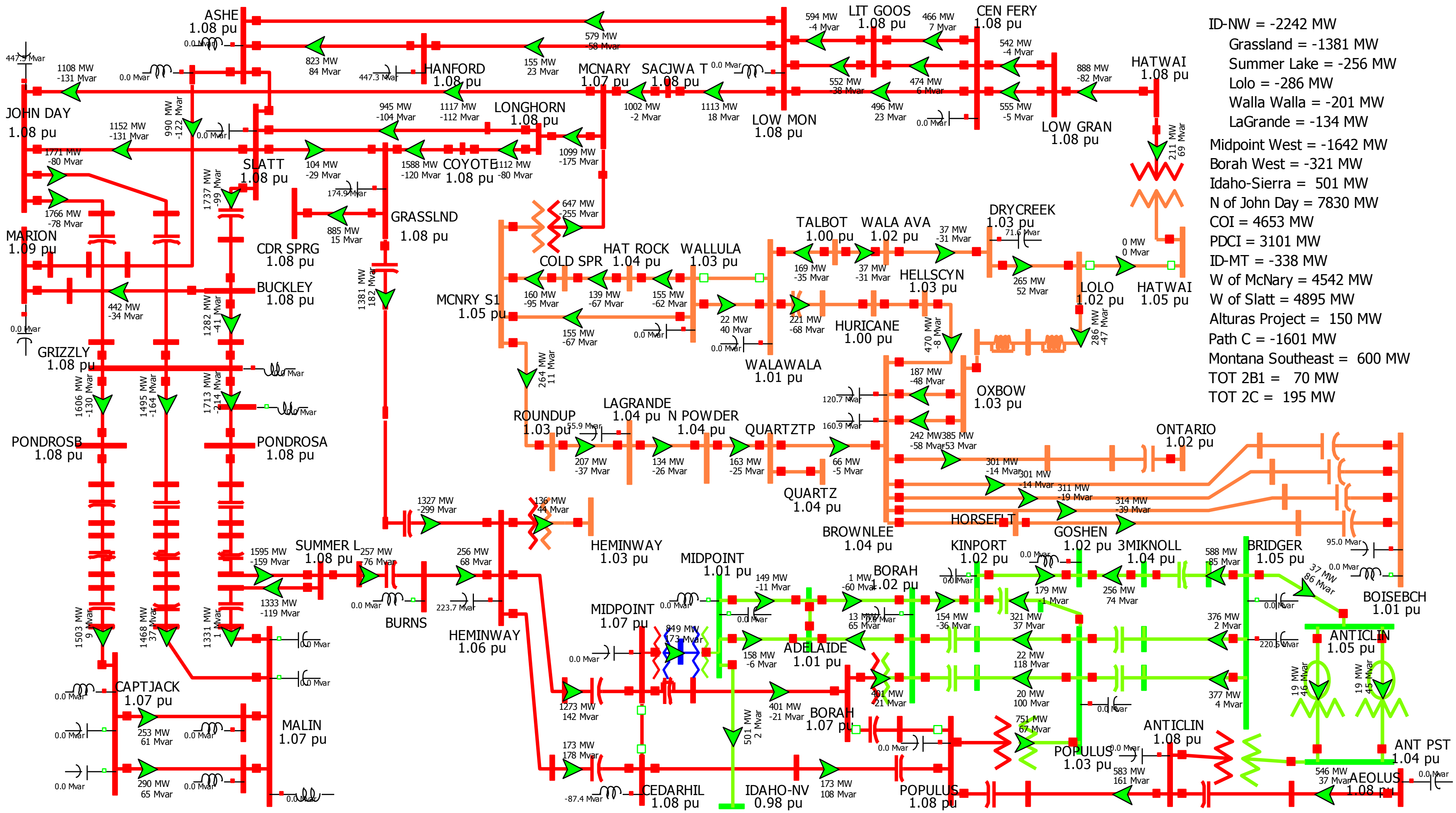

Figure F6: 16hs2sa_2250idnw_N_nww Case **N-1: Hatwai-Lolo 230 kV**

Appendix F– 16hs2sa_2250idnw_N_nww Case Post-Transient Contingency Results

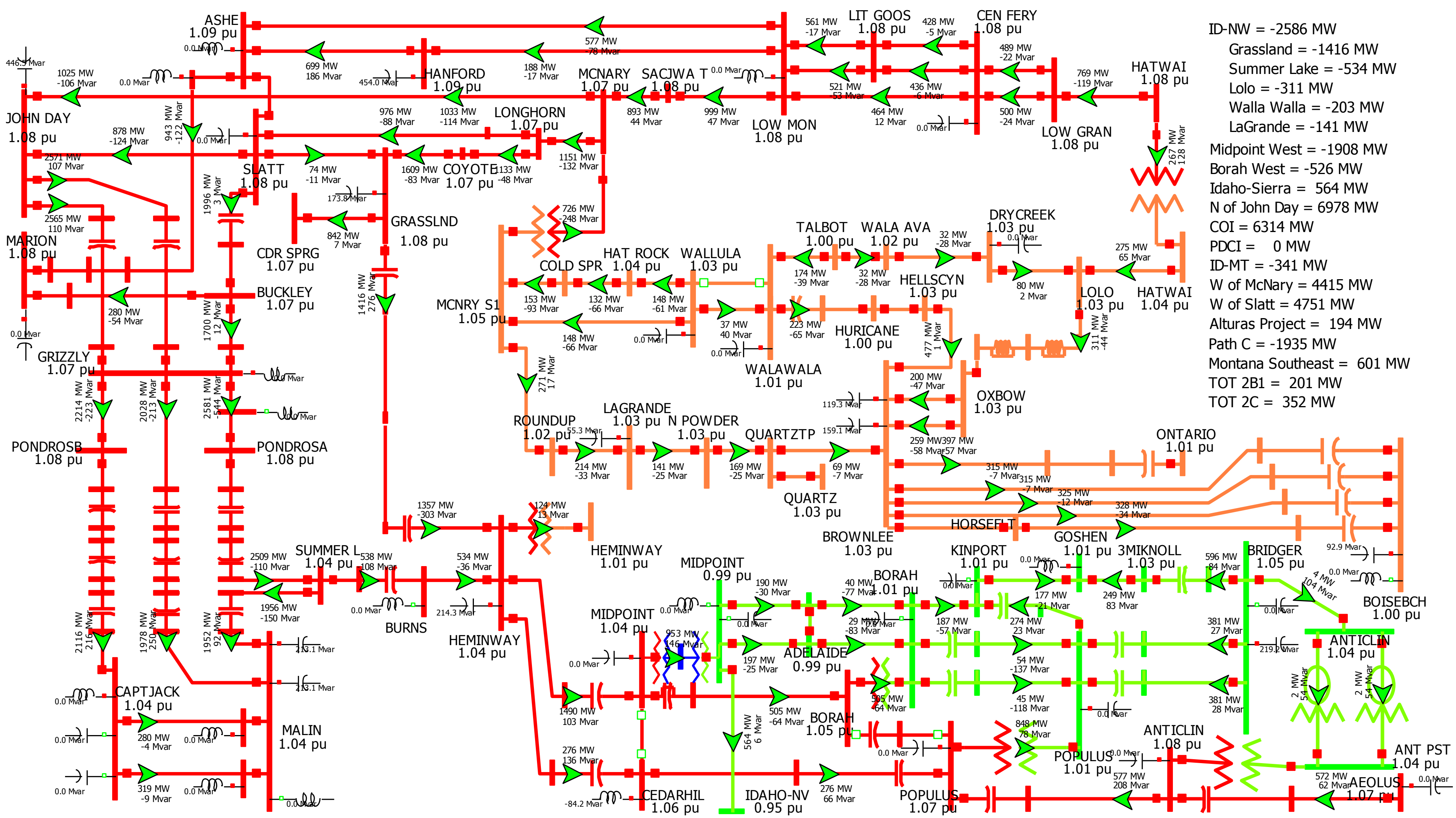

Figure F7: 16hs2sa_2250idnw_N_nww Case **N-2: DC-BIPOLE**

Appendix F– 16hs2sa_2250idnw_N_nww Case Post-Transient Contingency Results

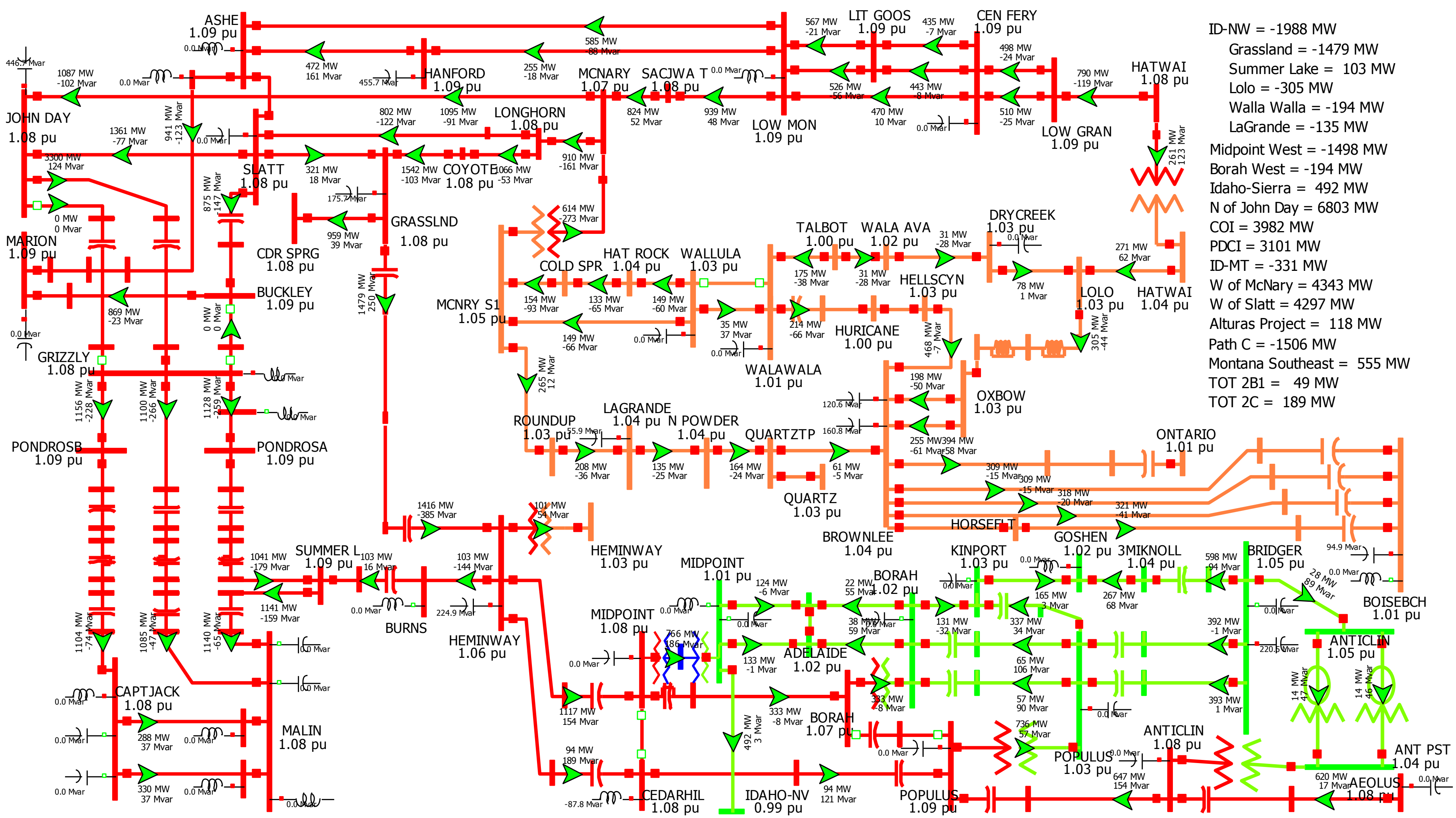

Figure F8: 16hs2sa_2250idnw_N_nww Case **N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS**

Appendix F - 16hs2a_2250idnw_nww Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	MERIDINP (45197) -> MERIDINP (45195) CKT 2 at MERIDINP	Branch MVA	370.6	685.8	650.0	105.5%	780.0	87.9%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	641.1	1208.3	979.0	123.4%	1287.7	93.8%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	GLENDL (45113) -> GRANT PS (45123) CKT 1 at GLENDL	Branch Amp	308.7	780.4	722.9	108.0%	1265.2	61.7%
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4028 Taft-Dworshak & Taft Reactor 500kV	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	No Violations							
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1648.6	2850.8	2442.0	116.7%	3235.5	88.1%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1648.6	2850.8	2199.9	129.6%	3235.5	88.1%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1648.0	2844.4	2666.9	106.7%	4000.0	71.1%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at ROUND MT	Branch Amp	1638.9	2833.2	2667.0	106.2%	4000.0	70.8%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALROU11	Branch Amp	1604.3	2772.0	2699.7	102.7%	4000.0	69.3%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1596.7	2755.9	2699.7	102.1%	4000.0	68.9%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	No Violations							
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	No Violations							
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	No Violations							
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations							
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1648.6	2907.0	2442.0	119.0%	3235.5	89.8%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1648.6	2907.0	2199.9	132.1%	3279.9	88.6%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1648.0	2900.0	2666.9	108.7%	4000.0	72.5%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1638.9	2889.5	2667.0	108.3%	4000.0	72.2%
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1248.5	1237.0	100.9%	1395.9	89.4%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	ATHENA (45015)	% Δ Volts	0.99	0.94				5.32%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	LAGRANDE (40619)	% Δ Volts	0.99	0.94				5.32%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	PILOT RK (45413)	% Δ Volts	0.99	0.94				5.32%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	BUCKAROO (45027)	% Δ Volts	1.00	0.95				5.26%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	MISSIONT (47191)	% Δ Volts	1.00	0.95				5.26%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	PENDLBPA (41247)	% Δ Volts	1.00	0.95				5.26%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	PENDLT T (41248)	% Δ Volts	1.00	0.95				5.26%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	PENDLTON (45235)	% Δ Volts	1.00	0.95				5.26%
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	No Violations							
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	268.2	343.2	320.0	107.2%	370.0	92.7%
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	653.0	1141.0	950.0	120.1%	1286.0	88.7%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	268.2	351.5	320.0	109.8%	370.0	95.0%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	653.0	1158.7	950.0	122.0%	1286.0	90.1%
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations							
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	902.8	1034.2	1009.1	102.5%	1285.2	80.5%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	No Violations							
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations							
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations							
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	No Violations							
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	No Violations							
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations							
BF 4542 Paul-Allston 500 kV & Center G2	No Violations							
BF 4542 Paul-Napavine 500 kV & Center G1	No Violations							
BF 4550 Olympia-Paul & Paul-Allston 500 kV	No Violations							
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	No Violations							
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1270.7	1237.0	102.7%	1395.9	91.0%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	ATHENA (45015)	% Δ Volts	0.99	0.93				6.45%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	PILOT RK (45413)	% Δ Volts	0.99	0.93				6.45%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	MISSIONT (47191)	% Δ Volts	1.00	0.94				6.38%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	PENDLTON (45235)	% Δ Volts	1.00	0.94				6.38%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	MCKAY (45322)	% Δ Volts	1.01	0.95				6.32%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	ICE HAR2 (40567)	% Δ Volts	1.03	0.97				6.19%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SACJAWEA (40911)	% Δ Volts	1.03	0.97				6.19%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SACJWA T (40915)	% Δ Volts	1.03	0.97				6.19%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	LAGRANDE (40619)	% Δ Volts	0.99	0.94				5.32%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	BUCKAROO (45027)	% Δ Volts	1.00	0.95				5.26%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	PENDLBPA (41247)	% Δ Volts	1.00	0.95				5.26%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	PENDLT T (41248)	% Δ Volts	1.00	0.95				5.26%
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	No Violations							
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4700 Hatwai 500kV & 230 kV + RAS	No Violations							
BF 4708 Hatwai 500 kV Bus	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	718.2	809.5	800.0	101.2%	1199.9	67.5%
BF 4708 Hatwai 500 kV Bus	PTRSNFLT (62030)	% Δ Volts	0.96	0.90				6.67%
BF 4708 Hatwai 500 kV Bus	PTRSNFUR (62386)	% Δ Volts	0.97	0.91				6.59%
BF 4708 Hatwai 500 kV Bus	AMPS (65025)	% Δ Volts	0.96	0.91				5.49%
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	795.5	933.2	920.0	101.4%	1046.8	89.1%
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	795.5	1008.2	920.0	109.6%	1046.8	96.3%
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations							
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	No Violations							
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	No Violations							
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	No Violations							
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	No Violations							
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations							
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	No Violations							
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1238.3	1237.0	100.1%	1395.9	88.7%
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations							
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations							
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations							
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	No Violations							
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 5214 Low Mon-McNary & Calpine PH 500 kV	No Violations							
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1376.2	1237.0	111.2%	1395.9	98.6%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	795.5	1022.1	920.0	111.1%	1046.8	97.6%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	718.2	826.2	800.0	103.3%	1199.9	68.9%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts	0.96	0.88				9.09%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	PTRSNFUR (62386)	% Δ Volts	0.97	0.90				7.78%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	AMPS (65025)	% Δ Volts	0.96	0.90				6.67%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1384.0	1237.0	111.9%	1395.9	99.1%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	795.5	1032.1	920.0	112.2%	1046.8	98.6%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	718.2	803.3	800.0	100.4%	1199.9	66.9%
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	No Violations							
BF Lolo 230kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1280.2	1237.0	103.5%	1395.9	91.7%
BF McNary 230 kV SECT 1	No Violations							
BF McNary 230 kV SECT 2	JONTMB11 (90164)	% Δ Volts	1.03	0.97				6.19%
BF McNary 230 kV SECT 3	FRANKLIN (40443)	% Δ Volts	1.00	0.94				6.38%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1394.1	1237.0	112.7%	1395.9	99.9%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	795.5	1038.4	920.0	112.9%	1046.8	99.2%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	902.8	1009.9	1009.1	100.1%	1285.2	78.6%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	718.2	833.0	800.0	104.1%	1199.9	69.4%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	PTRSNFLT (62030)	% Δ Volts	0.96	0.88				9.09%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	PTRSNFUR (62386)	% Δ Volts	0.97	0.89				8.99%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	AMPS (65025)	% Δ Volts	0.96	0.89				7.87%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	BIGGRASS (65155)	% Δ Volts	0.98	0.93				5.38%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	DILLON S (62084)	% Δ Volts	0.98	0.93				5.38%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1392.0	1237.0	112.5%	1395.9	99.7%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	795.5	1035.8	920.0	112.6%	1046.8	98.9%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	902.8	1009.6	1009.1	100.0%	1285.2	78.6%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	718.2	835.1	800.0	104.4%	1199.9	69.6%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	AMPS (65025)	% Δ Volts	0.96	0.91				5.49%
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	No Violations							
BF PGE Grassland-Slatt 500kV & Boardman Plant	No Violations							
Bus: Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	902.8	1015.5	1009.1	100.6%	1285.2	79.0%
Bus: Bell BPA 500 kV	No Violations							
Bus: Buckley 500 kV	No Violations							
Bus: Dixonville 500 kV	No Violations							
Bus: Hot Springs 500 kV	No Violations							
Bus: Keeler 500 kV + RAS	No Violations							
Bus: Rock Creek 500 kV	No Violations							
Bus: Sickler 500 kV	No Violations							
Bus: Summer Lake 500 kV	No Violations							
N-1: Allston-Keeler 500 kV + RAS	No Violations							
N-1: Allston-Napavine 500 kV	No Violations							
N-1: Allston-Paul #2 500 kV	No Violations							
N-1: Alvery-Dixonville 500 kV	No Violations							
N-1: Alvey-Marion 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	902.8	1080.8	1009.1	107.1%	1285.2	84.1%
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Bell-Coulee 500 kV	No Violations							
N-1: Bell-Taft 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV	No Violations							
N-1: Broadview-Garrison #1 500 kV	No Violations							
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 1 at COTWDWAP	Branch Amp	281.3	851.0	785.7	108.3%	926.3	91.9%
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 2 at COTWDWAP	Branch Amp	281.3	851.0	785.7	108.3%	926.3	91.9%
N-1: Captain Jack-Olinda 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1648.6	2530.5	2442.0	103.6%	3235.5	78.2%
N-1: Captain Jack-Olinda 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1648.6	2530.5	2199.9	115.0%	3279.9	77.2%
N-1: Captain Jack-Olinda 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1804.1	2433.4	2199.9	110.6%	3280.5	74.2%
N-1: Captain Jack-Olinda 500 kV	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1788.8	2412.8	2199.9	109.7%	3280.5	73.5%
N-1: Captain Jack-Olinda 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1974.9	2632.0	2477.9	106.2%	4000.0	65.8%
N-1: CaptJack-Kfalls 500 kV	No Violations							
N-1: Cascade Crossing 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	902.8	1019.1	1009.1	101.0%	1285.2	79.3%
N-1: Chief Jo-Coulee 500 kV	No Violations							
N-1: Chief Jo-Monroe 500 kV	No Violations							
N-1: Chief Jo-Sickler 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Covington4-Raver 500 kV	No Violations							
N-1: Covington5-Raver 500 kV	No Violations							
N-1: Coyote-Longhorn 500 kV	No Violations							
N-1: CusterW-Monroe 500 kV	No Violations							
N-1: Dixonville-Meridian 500 kV	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	641.1	1164.7	979.0	119.0%	1287.7	90.5%
N-1: Dixonville-Meridian 500 kV	GLENDL (45113) -> GRANT PS (45123) CKT 1 at GLENDL	Branch Amp	308.7	729.1	722.9	100.9%	1265.2	57.6%
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	718.2	811.4	800.0	101.4%	1199.9	67.6%
N-1: Dworshak-Hatwai 500 kV + RAS + PTSN	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	718.2	813.7	800.0	101.7%	1199.9	67.8%
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	No Violations							
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Echo Lake-Maple Valley 500 kV	No Violations							
N-1: Echo Lake-Raver 500 kV	No Violations							
N-1: Echo Lake-Schultz 500 kV	No Violations							
N-1: Echo Lake-Snok Tap 500 kV	No Violations							
N-1: Garrison-Taft #2 500 kV	No Violations							
N-1: Goldhill-Placer 115 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Grassland-Coyote 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	No Violations							
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Hatwai 500/230 kV Xfmr + RAS	CLARKSTN (40239) -> N LEWIST (48253) CKT 1 at CLARKSTN	Branch Amp	357.8	436.9	431.3	101.3%	464.9	94.0%
N-1: Hatwai-Lolo 230 kV	N LEWIST (48253) -> CLEARWTR (48075) CKT 1 at CLEARWTR	Branch Amp	415.8	615.4	569.8	108.0%	618.0	99.6%
N-1: Hatwai-Low Gran 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	795.5	1007.8	920.0	109.5%	1046.8	96.3%
N-1: Hatwai-N Lewiston 230 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	795.5	1006.7	920.0	109.4%	1046.8	96.2%
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Grassland 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1375.5	1237.0	111.2%	1395.9	98.5%
N-1: Hemingway-Grassland 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	795.5	1022.1	920.0	111.1%	1046.8	97.6%
N-1: Hemingway-Grassland 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	718.2	825.7	800.0	103.2%	1199.9	68.8%
N-1: Hemingway-Grassland 500 kV	PTRSNFLT (62030)	% Δ Volts	0.96	0.89				7.87%
N-1: Hemingway-Grassland 500 kV	PTRSNFUR (62386)	% Δ Volts	0.97	0.90				7.78%
N-1: Hemingway-Grassland 500 kV	AMPS (65025)	% Δ Volts	0.96	0.90				6.67%
N-1: Hemingway-Grassland 500 kV + FACRI	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1250.9	1237.0	101.1%	1395.9	89.6%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1722.3	2886.9	2400.0	120.3%	3799.0	76.0%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1716.1	2867.9	2400.0	119.5%	3799.0	75.5%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1370.4	1237.0	110.8%	1395.9	98.2%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	795.5	1017.5	920.0	110.6%	1046.8	97.2%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	718.2	827.2	800.0	103.4%	1199.9	68.9%
N-1: Hemingway-Summer Lake 500 kV	No Violations							
N-1: Hill Top 345/230 Xfmr	No Violations							
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: Hot Springs-Taft 500 kV	No Violations							
N-1: Humboldt-Coyote Ck 345 kV	No Violations							
N-1: Huntington-Pinto-Four Corners 345 kV	No Violations							
N-1: Ing500-CusterW 500 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Kfalls-Meridian 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	No Violations							
N-1: Lanes-Marion 500 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-Sac Tap 500 kV	No Violations							
N-1: Malin 500/230 Xfmr	No Violations							
N-1: Malin-Hilltop 230 kV	No Violations							
N-1: Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1648.6	2852.9	2442.0	116.8%	3235.5	88.2%
N-1: Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1648.6	2852.9	2199.9	129.7%	3279.9	87.0%
N-1: Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALROU21	Branch Amp	1648.0	2846.3	2666.9	106.7%	4000.0	71.2%
N-1: Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1638.9	2835.7	2667.0	106.3%	4000.0	70.9%
N-1: Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1604.3	2826.7	2699.7	104.7%	4000.0	70.7%
N-1: Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1596.7	2813.5	2699.7	104.2%	4000.0	70.3%
N-1: Malin-Summer Lake 500 kV	No Violations							
N-1: Maple Vly-Rocky RH 345 kV	No Violations							
N-1: Marion-Pearl 500 kV	No Violations							
N-1: Marion-Santiam 500 kV	No Violations							
N-1: McLouglin-Ostrander 230 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary S2-McNary S3 230 kV	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Longhorn 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1247.0	1237.0	100.8%	1395.9	89.3%
N-1: McNary-Sac Tap-Low Mon 500 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV	PTRSNFLT (62030)	% Δ Volts	0.96	0.91				5.49%
N-1: Midpoint-Hemingway 500 kV	PTRSNFUR (62386)	% Δ Volts	0.97	0.92				5.43%
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	No Violations							
N-1: Midpoint-Humboldt 345 kV	No Violations							
N-1: Napavine-Paul 500 kV	No Violations							
N-1: Olympia-Paul 500 kV	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1283.0	1237.0	103.7%	1395.9	91.9%
N-1: Paul-Satsop 500 kV	No Violations							
N-1: Pearl-Keeler 500 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	268.2	343.3	320.0	107.3%	370.0	92.8%
N-1: Pearl-Keeler 500 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	653.0	1141.4	950.0	120.1%	1286.0	88.8%
N-1: Pearl-Keeler 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	268.2	343.3	320.0	107.3%	370.0	92.8%
N-1: Pearl-Keeler 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	653.0	1141.4	950.0	120.1%	1286.0	88.8%
N-1: Pinto-Four Corner 345 kV	No Violations							
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Raver-Paul 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Raver-Tacoma 500 kV	No Violations							
N-1: Red Butte-Harry Allen 345 kV	No Violations							
N-1: Robinson-Harry Allen 500 kV	No Violations							
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1804.1	3245.9	2199.9	147.5%	3280.5	98.9%
N-1: Round Mtn-Table Mtn 500 kV	ROUND MT (30005) -> ROUTAB21 (30018) CKT 2 at ROUND MT	Branch Amp	1804.1	3245.9	2667.0	121.7%	4000.0	81.1%
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB22 (30019) -> TABLE MT (30015) CKT 2 at ROUTAB22	Branch Amp	1794.2	3232.3	2667.0	121.2%	4000.0	80.8%
N-1: Roundup-Lagrande 230 kV	No Violations							
N-1: Schultz-Sickler 500 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Sigurd-Glen Canyon 230 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Slatt-Longhorn 500 kV	No Violations							
N-1: Snok Tap-Snoking 500 kV	No Violations							
N-1: Table Mtn-Tesla 500 kV	TABLE MT (30015) -> TABVAC11 (30031) CKT 1 at TABLE MT	Branch Amp	1974.9	2956.1	2667.0	110.8%	4000.0	73.9%
N-1: Table Mtn-Tesla 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1974.9	2956.1	2477.9	119.3%	4000.0	73.9%
N-1: Table Mtn-Tesla 500 kV	TABVAC12 (30032) -> VACA-DIX (30030) CKT 1 at TABVAC12	Branch Amp	1948.9	2935.9	2667.0	110.1%	4000.0	73.4%
N-1: Table Mtn-Tesla 500 kV	VACTES11 (30044) -> TESLA (30040) CKT 1 at VACTES11	Branch Amp	1382.9	2291.6	2230.0	102.8%	3555.9	64.4%
N-1: Table Mtn-Vaca Dixon 500 kV	TABTES11 (30041) -> TABTES12 (30043) CKT 1 at TABTES11	Branch Amp	1501.4	2665.9	2230.0	119.5%	3555.9	75.0%
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	795.5	920.2	920.0	100.0%	1046.8	87.9%
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	718.2	813.1	800.0	101.6%	1199.9	67.8%
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	PTRSNFLT (62030)	% Δ Volts	0.96	0.90				6.67%
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	PTRSNFUR (62386)	% Δ Volts	0.97	0.91				6.59%
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	AMPS (65025)	% Δ Volts	0.96	0.91				5.49%
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	No Violations							
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	902.8	1036.5	1009.1	102.7%	1285.2	80.7%
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	902.8	1018.8	1009.1	101.0%	1285.2	79.3%
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	BROONT12 (61981) -> ONTARIO (60265) CKT 1 at BROONT12	Branch Amp	954.7	1593.3	1590.0	100.2%	2328.0	68.4%
N-2: Bridger-Populus #1 & #2 345 kV	No Violations							
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	POPBRI11 (61968)	% Δ Volts	1.00	1.05				4.76%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	AMPS (65025)	% Δ Volts	0.96	1.01				4.95%
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	No Violations							
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	795.5	978.7	920.0	106.4%	1046.8	93.5%
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations							
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations							
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations							
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	No Violations							
N-2: DC-BIPOLE	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1804.1	2427.9	2199.9	110.4%	3280.5	74.0%
N-2: DC-BIPOLE	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	1722.3	2794.0	2400.0	116.4%	3799.0	73.5%
N-2: DC-BIPOLE	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1788.8	2407.3	2199.9	109.4%	3280.5	73.4%
N-2: DC-BIPOLE	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1716.1	2780.1	2400.0	115.8%	3799.0	73.2%
N-2: DC-BIPOLE	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1648.6	2324.3	2199.9	105.7%	3279.9	70.9%
N-2: DC-BIPOLE	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1974.9	2592.6	2477.9	104.6%	4000.0	64.8%
N-2: DC-BIPOLE	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1552.8	2260.7	2134.0	105.9%	3499.9	64.6%
N-2: DC-BIPOLE	MIDWAY (30060) -> MIDVIN11 (30061) CKT 1 at MIDWAY	Branch Amp	1532.9	2228.5	2134.0	104.4%	3499.9	63.7%
N-2: DC-BIPOLE	MIDVIN12 (30062) -> VINCENT (24156) CKT 1 at MIDVIN12	Branch Amp	1511.1	2199.5	2134.0	103.1%	3499.9	62.8%
N-2: Double Palo Verde	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1722.3	2586.0	2400.0	107.7%	3799.0	68.1%
N-2: Double Palo Verde	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1804.1	2223.8	2199.9	101.1%	3280.5	67.8%
N-2: Double Palo Verde	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM14	Branch Amp	1716.1	2567.8	2400.0	107.0%	3799.0	67.6%
N-2: Double Palo Verde	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1788.8	2205.0	2199.9	100.2%	3280.5	67.2%
N-2: Double Palo Verde	PTRSNFLT (62030)	% Δ Volts	0.96	0.90				6.67%
N-2: Double Palo Verde	PTRSNFUR (62386)	% Δ Volts	0.97	0.91				6.59%
N-2: Double Palo Verde	AMPS (65025)	% Δ Volts	0.96	0.91				5.49%
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations							
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations							
N-2: Garrison-Taft #1 & #2 500 kV + RAS	PTRSNFUR (62386)	% Δ Volts	0.97	1.03				5.83%
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	No Violations							
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1140.0	1263.4	1237.0	102.1%	1395.9	90.5%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1722.3	3327.5	2400.0	138.6%	3799.0	87.6%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM11	Branch Amp	1434.1	3238.7	2700.0	119.9%	4000.0	81.0%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON16	Branch Amp	1632.0	3154.9	2400.0	131.5%	4099.2	77.0%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1617.7	3141.6	2400.0	130.9%	4099.2	76.6%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON16	Branch Amp	1632.0	3191.9	2400.0	133.0%	4099.2	77.9%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1617.7	3181.4	2400.0	132.6%	4099.2	77.6%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations							
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							

Appendix F - 16hs2a_2250idnw_nww Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at SLATT	Branch Amp	1858.7	3164.7	2900.0	109.1%	4350.0	72.8%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	JOHN DAY (40585) -> GRIJOH12 (90065) CKT 1 at JOHN DAY	Branch Amp	1884.6	3521.1	3500.0	100.6%	3500.01	100.6%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH11 (90064) -> GRIZZLY (40489) CKT 1 at GRIJOH11	Branch Amp	1876.4	3513.7	3500.0	100.4%	3500.0	100.4%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH12	Branch Amp	1876.4	3513.7	3000.0	117.1%	4050.0	86.8%
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	268.2	339.8	320.0	106.2%	370.0	91.8%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	653.0	1141.8	950.0	120.2%	1286.0	88.8%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	77.6	94.3	94.0	100.3%	139.0	67.8%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	CARLTON (40181)	% Δ Volts	1.03	0.97				6.19%
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	795.5	942.5	920.0	102.4%	1046.8	90.0%
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	No Violations							
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1815.9	3730.1	2667.4	139.8%	4099.2	91.0%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI11	Branch Amp	1782.9	3622.5	2667.4	135.8%	4099.2	88.4%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPTJACK	Branch Amp	1782.9	3622.5	2667.4	135.8%	4099.2	88.4%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	1971.4	3204.2	2993.0	107.1%	4514.9	71.0%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	1971.4	3204.2	2993.0	107.1%	4514.9	71.0%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at OLIMAX12	Branch Amp	1941.7	3171.7	2993.0	106.0%	4514.9	70.2%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	1941.7	3171.7	2993.0	106.0%	4514.9	70.2%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	1920.4	3134.6	2993.0	104.7%	4514.9	69.4%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXWELL (30025)	% Δ Volts	1.04	0.98				6.12%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	AMPS (65025)	% Δ Volts	0.96	0.91				5.49%
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	PTRSNFLT (62030)	% Δ Volts	0.96	0.91				5.49%
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	PTRSNFUR (62386)	% Δ Volts	0.97	0.92				5.43%
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations							
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	No Violations							
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	No Violations							
N-2: Paul-Raver & Raver-Covingt4 500 kV	No Violations							
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	268.2	344.9	320.0	107.8%	370.0	93.2%
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	653.0	1146.0	950.0	120.6%	1286.0	89.1%
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	No Violations							
N-2: Raver-Covington #1 & #2 500 kV	No Violations							
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations							
N-2: Raver-Paul & Napavine-Paul 500 kV	No Violations							
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations							

Appendix F - 16hs2a_2250idnw_nww Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations							
N-2: Raver-Schultz #1 & #2 500 kV	No Violations							
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations							
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations							
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	DELEVN (30114) -> CORTINA (30450) CKT 1 at CORTINA	Branch Amp	690.1	911.4	830.9	109.7%	953.9	95.5%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	BRDGVLLE (31110) -> FRUTLDJT (31120) CKT 1 at BRDGVLLE	Branch Amp	290.4	330.8	328.1	100.8%	371.4	89.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1815.9	3451.6	2667.4	129.4%	4099.2	84.2%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI12	Branch Amp	1782.9	3358.6	2667.4	125.9%	4099.2	81.9%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPTJACK	Branch Amp	1782.9	3346.2	2667.4	125.5%	4099.2	81.6%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	1971.4	3503.0	2993.0	117.0%	4514.9	77.6%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	1971.4	3503.0	2993.0	117.0%	4514.9	77.6%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at OLIMAX12	Branch Amp	1941.7	3484.4	2993.0	116.4%	4514.9	77.2%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	1941.7	3484.4	2993.0	116.4%	4514.9	77.2%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	1920.4	3452.0	2993.0	115.3%	4514.9	76.5%
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	No Violations							
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	No Violations							
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHE (30790) -> MCMULLN1 (30825) CKT 1 at MCMULLN1	Branch Amp	285.4	921.2	825.9	111.5%	976.5	94.3%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	MCMULLN1 (30825) -> KEARNEY (30830) CKT 1 at MCMULLN1	Branch Amp	232.3	862.7	825.1	104.6%	975.0	88.5%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHEJ (34159) -> HAMMONDS (34160) CKT 1 at HAMMONDS	Branch Amp	389.6	467.0	462.9	100.9%	579.9	80.5%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1974.9	2545.1	2477.9	102.7%	4000.0	63.6%
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	No Violations							
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	No Violations							
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations							

Appendix F - 16hs2a_2250idnw_nww Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 11L12 MERIDIAN-KLAM FALLS 500 KV+KFGEN2+ST	0.83	-1072	0.89	-3830	0.75	-2488	0.97	-2862	0.80	-3200	0.91	-1646	0.75	-592	0.75	-351
BF 11L22 CAPT JACK-KLAM FALLS 500 KV+KFGEN2+ST	0.83	-1057	0.88	-3975	0.76	-2446	0.97	-2964	0.76	-3249	0.89	-2073	0.75	-586	0.75	-346
BF 11R1 MERIDIAN-KLAM FALLS 500 KV & MERIDIAN 500/230 KV XFMR	0.82	-1090	0.88	-4081	0.75	-2531	0.97	-2384	0.81	-3323	0.93	-1578	0.75	-603	0.75	-353
BF 11R6 MERIDIAN-DIXONVILLE 500 KV & MERIDIAN 500/230 KV XFMR	0.83	-1048	0.88	-4041	0.76	-2408	0.97	-2245	0.87	-2488	0.85	-2309	0.75	-585	0.75	-340
BF 4003 HANFORD-VANTAGE & HANFORD CAPS	0.82	-1081	0.84	-3646	0.75	-2532	0.98	-2171	0.83	-3266	0.86	-2379	0.76	-582	0.75	-346
BF 4019 CAPTJACK-MALIN #2 & MALIN 500/230 XFMR	0.82	-1089	0.87	-4221	0.75	-2519	0.97	-2505	0.82	-3312	0.85	-2493	0.75	-604	0.75	-354
BF 4028 TAFT-DWORSHAK & TAFT REACTOR 500KV	0.82	-1132	0.87	-4106	0.76	-2587	0.97	-2597	0.81	-3502	0.84	-2645	0.77	-541	0.76	-301
BF 4046 JOHN DAY-GRIZZLY #2 & GRIZZLY-MALIN #2 500 KV	0.84	-969	0.90	-3525	0.77	-2200	0.98	-1693	0.84	-2493	0.88	-1924	0.77	-551	0.76	-318
BF 4064 CAPTJACK-MALIN & MALIN-ROUND MTN #1 500 KV	0.83	-1069	0.88	-4097	0.76	-2438	0.97	-2331	0.82	-2837	0.86	-2404	0.75	-595	0.75	-346
BF 4072 GRIZZLY-MALIN #2 & MALIN-ROUND MTN #2 500 KV	0.84	-1006	0.89	-3770	0.76	-2250	0.98	-1928	0.82	-2375	0.87	-2100	0.76	-570	0.76	-328
BF 4095 LOW MON-HANFORD & HANFORD-WAUTOMA 500 KV	0.82	-1095	0.85	-3942	0.75	-2559	0.97	-2485	0.81	-3405	0.85	-2559	0.75	-602	0.75	-353
BF 4104 ASHE-HANFORD & HANFORD-WAUTOMA 500 KV	0.82	-1096	0.84	-3782	0.75	-2564	0.97	-2458	0.82	-3385	0.85	-2526	0.75	-595	0.75	-349
BF 4111 HOT SPRINGS-TAFT & TAFT-DWORSHAK 500 KV	0.82	-1130	0.87	-4027	0.76	-2582	0.97	-3245	0.81	-3491	0.84	-2626	0.77	-535	0.76	-300
BF 4114 GARRISON-TAFT #1 +TAFT REACTOR 500KV	0.82	-1113	0.87	-4385	0.75	-2591	0.97	-2622	0.82	-3493	0.84	-2670	0.75	-614	0.75	-354
BF 4119 GARRISON-TAFT #1 & TAFT-BELL 500 KV	0.82	-1109	0.87	-4156	0.75	-2584	0.97	-2567	0.81	-3454	0.84	-2616	0.78	-537	0.75	-351
BF 4131 SLATT-JOHN DAY & JOHN DAY-GRIZZLY #2 500 KV	0.83	-1019	0.89	-3753	0.76	-2329	0.97	-1778	0.84	-2841	0.86	-2146	0.76	-577	0.75	-335
BF 4143 (OR 4134) JOHN DAY-GRIZZLY #1 & JOHN DAY CAPS 500 KV	0.83	-1013	0.91	-3510	0.76	-2331	0.97	-1686	0.85	-2671	0.88	-1994	0.76	-571	0.76	-331
BF 4148 HOT SPRINGS-TAFT & GARRISON-TAFT #2 500 KV	0.82	-1107	0.87	-4243	0.75	-2575	0.97	-3248	0.81	-3470	0.84	-2642	0.77	-545	0.75	-337
BF 4170 JOHN DAY-MARION & JOHN DAY CAPS 500 KV	0.83	-1076	0.89	-3788	0.75	-2487	0.97	-1958	0.84	-3021	0.84	-2073	0.75	-599	0.75	-352
BF 4186 (OR 4582) MALIN-ROUND MTN 500 KV & MALIN 500/230 XFMR	0.83	-1053	0.88	-4028	0.76	-2378	0.97	-2252	0.83	-2678	0.86	-2262	0.75	-590	0.75	-344
BF 4194 ROCK CK-JOHN DAY & BIG EDDY-JOHN DAY 500 KV	0.83	-1062	0.88	-3696	0.76	-2495	0.97	-2714	0.84	-3180	0.87	-2274	0.76	-575	0.75	-333
BF 4197 JOHN DAY-BIG EDDY #1 & JOHN DAY CAPS 500 KV	0.82	-1090	0.88	-3981	0.75	-2524	0.96	-2231	0.83	-3196	0.86	-2391	0.75	-604	0.75	-355
BF 4202 JOHN DAY-BIG EDDY#2 & BIG EDDY-OSTRANDER 500 KV	0.82	-1104	0.87	-4163	0.75	-2563	0.97	-3016	0.83	-3352	0.84	-2501	0.74	-609	0.75	-358
BF 4231 MCNARY-LONGHORN 500 KV & MCNARY 500/230 KV XFMR	0.82	-983	0.89	-3979	0.76	-2517	0.98	-2412	0.81	-3428	0.85	-2519	0.75	-597	0.75	-348
BF 4234 MCNARY-LONGHORN & MCNARY-HERMCALP 500 KV	0.82	-1088	0.88	-3855	0.75	-2642	0.97	-2463	0.82	-3544	0.85	-2567	0.75	-594	0.75	-356
BF 4247 LIT GOOS-LOW MON #2 & LOW MON-MCNARY 500 KV	0.82	-1084	0.87	-3732	0.76	-2547	0.98	-2927	0.82	-3333	0.85	-2454	0.76	-577	0.76	-332
BF 4259 LIT GOOS-LOW MON #2 & LOW MON-HANFORD 500 KV	0.82	-1097	0.86	-4011	0.75	-2565	0.97	-2509	0.82	-3429	0.84	-2582	0.75	-602	0.75	-353
BF 4268 MONROE-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.82	-1104	0.88	-4104	0.75	-2580	0.97	-2566	0.81	-3467	0.84	-2616	0.75	-599	0.75	-354
BF 4276 ING500-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.82	-1104	0.87	-4218	0.75	-2578	0.97	-2572	0.81	-3457	0.84	-2619	0.75	-604	0.75	-355
BF 4280 KEELER-PEARL & PEARL-MARION 500 KV + RAS	0.83	-1085	0.88	-3915	0.75	-2505	0.98	-2076	0.85	-2963	0.81	-1813	0.75	-594	0.75	-348
BF 4280 KEELER-PEARL & PEARL-OSTRANDER 500 KV + RAS	0.82	-1089	0.88	-3986	0.75	-2533	0.98	-2151	0.84	-3211	0.85	-2185	0.75	-595	0.75	-349
BF 4287 PEARL-OSTRANDER 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.82	-1096	0.88	-4057	0.75	-2548	0.98	-2230	0.83	-3269	0.84	-2384	0.75	-605	0.75	-355
BF 4293 SCHULTZ-RAVER & RAVER COVINGTON5 500 KV	0.82	-1104	0.87	-4131	0.75	-2576	0.97	-2534	0.82	-3447	0.84	-2598	0.75	-607	0.75	-356
BF 4336 CHIEF JO-SICKLER 500 KV & SICKLER 500/230 XFMR	0.82	-1102	0.88	-3947	0.75	-2577	0.97	-2538	0.82	-3457	0.84	-2595	0.75	-600	0.75	-353
BF 4336 SICKLER-SCHULTZ 500 KV & SICKLER 500/230 XFMR	0.82	-1101	0.88	-3944	0.75	-2576	0.97	-2525	0.82	-3452	0.84	-2587	0.75	-600	0.75	-353
BF 4377 ASHE-MARION & MARION-ALVEY 500 KV + RAS	0.82	-1078	0.88	-3882	0.75	-2562	0.98	-2130	0.86	-2912	0.83	-2219	0.74	-613	0.75	-372
BF 4386 BUCKLEY-MARION & MARION-SANTIAM 500 KV	0.83	-1094	0.88	-4085	0.75	-2531	0.98	-2265	0.82	-3279	0.81	-2210	0.75	-606	0.75	-356
BF 4432 OSTRANDER-TROUTDALE & SPLIT OSTRANDER 500 KV	0.82	-1097	0.88	-4074	0.75	-2551	0.98	-2187	0.83	-3312	0.84	-2394	0.75	-606	0.75	-356
BF 4439 BIG EDDY-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.82	-1104	0.87	-4190	0.75	-2572	0.98	-2339	0.82	-3385	0.84	-2499	0.74	-609	0.75	-357
BF 4442 BIG EDDY-OSTRANDER 500 KV & OSTRANDER-MCLOUGHLIN 230 KV	0.82	-1102	0.87	-4205	0.75	-2568	0.98	-2340	0.82	-3378	0.84	-2508	0.74	-607	0.75	-357
BF 4448 KNIGHT-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.82	-1098	0.88	-4103	0.75	-2556	0.98	-2281	0.82	-3330	0.85	-2417	0.75	-606	0.75	-356
BF 4450 KNIGHT-OSTRANDER & OSTRANDER-PEARL 500 KV	0.82	-1097	0.88	-4123	0.75	-2552	0.98	-2211	0.83	-3333	0.84	-2443	0.75	-605	0.75	-355
BF 4502 PAUL-ALLSTON & ALLSTON-KEELER 500 KV + RAS	0.81	-1146	0.91	-3476	0.75	-2817	0.98	-2638	0.82	-4039	0.85	-2533	0.73	-626	0.74	-395
BF 4510 PEARL-MARION 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.83	-1089	0.88	-3960	0.75	-2513	0.98	-2121	0.85	-2995	0.81	-1818	0.75	-601	0.75	-352
BF 4526 CUSTERW-MONROE & MONROE-ECHO LAKE 500 KV + RAS	0.81	-1164	0.88	-4176	0.74	-2822	0.97	-2846	0.80	-4120	0.83	-2961	0.72	-654	0.74	-408
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV	0.83	-1074	0.89	-3596	0.75	-2508	0.98	-2092	0.83	-3223	0.86	-2361	0.76	-579	0.75	-341
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV + RAS	0.81	-1137	0.89	-3830	0.75	-2744	0.97	-2767	0.80	-3931	0.83	-2829	0.73	-625	0.74	-384
BF 4540 PAUL-NAPAVINE & PAUL-SATSOP 500 KV	0.82	-1098	0.88	-4123	0.75	-2563	0.97	-2468	0.82	-3390	0.85	-2540	0.75	-602	0.75	-353
BF 4542 PAUL-ALLSTON 500 KV & CENTER G2	0.82	-1110	0.88	-3920	0.75	-2628	0.98	-2403	0.82	-3535	0.85	-2516	0.74	-604	0.75	-363
BF 4542 PAUL-NAPAVINE 500 KV & CENTER G1	0.82	-1116	0.88	-4002	0.75	-2641	0.97	-2600	0.81	-3614	0.84	-2632	0.74	-608	0.75	-365
BF 4550 OLYMPIA-PAUL & PAUL-ALLSTON 500 KV	0.82	-1095	0.87	-4096	0.75	-2557	0.97	-2397	0.82	-3355	0.85	-2455	0.75	-600	0.75	-352
BF 4554 OLYMPIA-PAUL 500 KV & TONO 500/115 XFMR	0.82	-1108	0.87	-4343	0.75	-2587	0.97	-3291	0.82	-3494	0.84	-2674	0.74	-610	0.75	-358

Appendix F - 16hs2a_2250idnw_nww Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 4572 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.83	-964	0.88	-3627	0.77	-2494	0.98	-2990	0.82	-3405	0.85	-2434	0.76	-575	0.76	-330
BF 4630 CEN FERRY-LIT GOOS #1 & LIT GOOS-LOW MON #1 500 KV	0.82	-1100	0.87	-4213	0.75	-2572	0.97	-2546	0.82	-3447	0.84	-2606	0.75	-603	0.75	-353
BF 4652 TAFT-DWORSHAK & TAFT-HATWAI 500 KV + RAS	0.81	-1184	0.87	-4294	0.74	-2762	0.97	-2976	0.80	-3954	0.82	-2928	0.77	-568	0.75	-360
BF 4672 MONROE-CHIEF JO 500 KV & MONROE CAPS	0.82	-1098	0.89	-3683	0.75	-2563	0.97	-2417	0.82	-3378	0.85	-2520	0.75	-598	0.75	-353
BF 4676 LIT GOOS-LOW MON & LOW MON-ASHE 500 KV	0.82	-1090	0.87	-4029	0.75	-2559	0.97	-2488	0.81	-3412	0.85	-2562	0.75	-599	0.75	-350
BF 4690 PAUL-ALLSTON 500 KV & ALLSTON 500/230 XFMR	0.82	-1093	0.88	-4034	0.75	-2553	0.98	-2283	0.82	-3332	0.85	-2414	0.75	-598	0.75	-351
BF 4708 HATWAI 500 KV BUS	0.82	-1107	0.88	-3817	0.76	-2564	0.97	-2579	0.82	-3505	0.84	-2619	0.80	-465	0.77	-261
BF 4728 COULEE-CHIEF JO 500 KV & CHEIF JO 500/230 XFMR	0.82	-1104	0.87	-4126	0.75	-2578	0.97	-2569	0.81	-3456	0.84	-2618	0.75	-605	0.75	-356
BF 4775 CEN FERRY-LOW GRAN #1 & #2 500 KV + RAS	0.82	-1084	0.87	-4131	0.75	-2666	0.97	-2839	0.80	-3824	0.83	-2830	0.75	-607	0.75	-350
BF 4776 HATWAI-LOW GRAN & LOW GRAN-CEN FERRY 500 KV	0.82	-1038	0.87	-3990	0.76	-2535	0.97	-2611	0.82	-3536	0.84	-2652	0.78	-525	0.76	-302
BF 4870 JOHN DAY-BIG EDDY 500 KV & BIG EDDY 500/230 KV	0.82	-1109	0.87	-4243	0.75	-2577	0.96	-2552	0.82	-3419	0.85	-2580	0.74	-610	0.75	-358
BF 4888 ASHE-SLATT & CGS 500 KV	0.82	-1114	0.88	-3753	0.75	-2708	0.97	-2671	0.81	-3788	0.84	-2721	0.75	-593	0.75	-359
BF 4891 LOW MON-ASHE & ASHE-SLATT 500 KV	0.82	-1061	0.87	-3408	0.76	-2520	0.98	-2106	0.84	-3211	0.86	-2313	0.76	-569	0.76	-329
BF 4901 LOW MON-ASHE & ASHE-HANFORD 500 KV	0.82	-1065	0.85	-3655	0.76	-2549	0.98	-2301	0.83	-3346	0.86	-2416	0.76	-571	0.76	-330
BF 4940 LOW MON-ASHE & ASHE-MARION 500 KV	0.83	-1047	0.88	-3452	0.76	-2446	0.98	-1832	0.85	-2941	0.86	-2022	0.76	-579	0.75	-337
BF 4957 SUMMER L-MALIN & SUMMER L-HEMINGWAY 500 KV	0.85	-945	0.88	-3941	0.76	-1731	0.97	-2156	0.81	-2643	0.86	-2253	0.76	-562	0.76	-324
BF 4959 GRIZZLY-SUMMER L & SUMMER L-MALIN 500 KV	0.85	-971	0.89	-3790	0.77	-1782	0.98	-2574	0.82	-2487	0.87	-2114	0.76	-560	0.76	-323
BF 4996 CAPTJACK-MALIN #1 & #2 500 KV	0.82	-1089	0.87	-4277	0.75	-2526	0.97	-2559	0.75	-3226	0.84	-2611	0.75	-604	0.75	-353
BF 5003 SLATT-BUCKLEY & SLATT-BOARDMAN 500 KV	0.83	-1044	0.89	-3782	0.76	-2393	0.98	-2575	0.84	-2987	0.87	-2168	0.75	-585	0.75	-341
BF 5006 SLATT-LONGHORN & SLATT-GRASSLAND 500 KV	0.83	-1080	0.87	-4093	0.75	-2451	0.97	-2356	0.82	-3371	0.85	-2506	0.74	-609	0.75	-358
BF 5015 ASHE-SLATT & SLATT-BUCKLEY 500 KV	0.83	-1019	0.89	-3323	0.76	-2396	0.98	-1733	0.86	-2858	0.88	-1979	0.76	-558	0.76	-323
BF 5018 ASHE-SLATT & SLATT-JOHN DAY 500 KV	0.83	-1059	0.87	-3565	0.76	-2480	0.98	-1895	0.84	-3194	0.86	-2295	0.76	-574	0.76	-332
BF 5021 SLATT-JOHN DAY & SLATT-LONGHORN 500 KV	0.83	-1079	0.87	-4025	0.75	-2491	0.97	-2167	0.82	-3328	0.85	-2453	0.75	-605	0.75	-354
BF 5028 BUCKLEY-GRIZZLY & GRIZZLY-SUMMER LAKE 500 KV	0.84	-932	0.91	-3502	0.77	-2124	0.98	-1645	0.84	-2510	0.88	-1939	0.77	-537	0.76	-307
BF 5040 GRIZZLY-JOHN DAY & GRIZZLY-ROUND BU 500 KV	0.83	-1028	0.89	-3840	0.76	-2369	0.97	-2006	0.83	-2869	0.86	-2203	0.76	-576	0.75	-333
BF 5114 ECHO LAKE-RAVER & ECHO LAKE- SNOK TAP 500 KV	0.82	-1101	0.88	-3948	0.75	-2573	0.97	-3170	0.82	-3443	0.84	-2581	0.75	-596	0.75	-352
BF 5117 ECHO LAKE-MAPLE VALLEY & ECHO LAKE-RAVER 500 KV	0.82	-1100	0.88	-3928	0.75	-2569	0.97	-2478	0.81	-3416	0.85	-2565	0.75	-600	0.75	-353
BF 5148 COULEE-SCHULTZ & ECHO LAKE-SCHULTZ 500 KV	0.82	-1094	0.88	-3728	0.75	-2556	0.97	-2412	0.82	-3377	0.85	-2512	0.75	-587	0.75	-346
BF 5170 WAUTOMA-SCHULTZ & SCHULTZ-RAVER 500 KV	0.82	-1091	0.87	-3726	0.75	-2554	0.98	-2286	0.83	-3355	0.85	-2463	0.76	-581	0.75	-343
BF 5179 VANTAGE-SCHULTZ & SCHULTZ-RAVER #4	0.82	-1104	0.87	-3940	0.75	-2575	0.97	-2507	0.82	-3437	0.84	-2574	0.75	-599	0.75	-352
BF 5187 MCNARY-LONGHORN & LONGHORN-SLATT 500 KV	0.82	-1064	0.88	-4036	0.76	-2540	0.97	-2370	0.82	-3355	0.85	-2493	0.75	-595	0.75	-346
BF 5193 GRASSLAND-COYOTE & COYOTE-LONGHORN 500 KV	0.82	-1093	0.88	-3950	0.75	-2608	0.97	-2412	0.83	-3455	0.85	-2505	0.75	-594	0.75	-354
BF 5214 LOW MON-MCNARY & CALPINE PH 500 KV	0.88	-1049	0.89	-3442	0.76	-2607	0.98	-2203	0.83	-3415	0.86	-2413	0.76	-576	0.75	-340
BF 5250 HANFORD-WAUTOMA#1 & WAUTOMA-KNIGHT 500 KV	0.83	-1057	0.87	-3624	0.76	-2480	0.98	-1972	0.84	-3141	0.87	-2239	0.76	-575	0.75	-334
BF 5259 HANFORD-WAUTOMA#2 & WAUTOMA-ROCK CK 500 KV	0.83	-1057	0.87	-3586	0.76	-2492	0.98	-2033	0.84	-3203	0.86	-2291	0.76	-570	0.76	-331
BF 5266 SLATT-BUCKLY 500 KV	0.83	-1049	0.89	-3820	0.76	-2424	0.98	-1974	0.84	-3046	0.86	-2192	0.75	-590	0.75	-344
BF 5339 VANTAGE-SCHULTZ 500 KV & VANTAGE 500/230 XFMR #1	0.82	-1103	0.86	-4040	0.75	-2577	0.97	-2532	0.82	-3444	0.84	-2591	0.75	-600	0.75	-353
BF 5345 VANTAGE-HANFORD 500 KV & VANTAGE 500/230 XFMR #1	0.82	-1093	0.84	-3925	0.75	-2572	0.97	-2469	0.81	-3418	0.85	-2551	0.75	-593	0.75	-350
BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.90	-638	0.91	-3436	0.75	-1833	0.98	-2294	0.86	-2376	0.89	-1913	0.80	-448	0.77	-249
BF IPC HEMINGWAY-SUMMER L 500 KV & HEMINGWAY 500/230 XFMR	0.89	-845	0.87	-4264	0.72	-1777	0.97	-3189	0.82	-3159	0.85	-2580	0.75	-586	0.75	-341
BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.89	-592	0.88	-4343	0.70	-1928	0.97	-2710	0.82	-3277	0.84	-2694	0.77	-520	0.76	-301
BF IPC POPULUS-CHILL-HEMINGWAY 500 KV & HEM 500/230 XFMR	0.88	-891	0.87	-4279	0.70	-2319	0.97	-2559	0.82	-3377	0.84	-2609	0.75	-599	0.75	-348
BF LOLO 230KV	0.84	-1103	0.88	-4046	0.75	-2572	0.97	-2382	0.82	-3281	0.85	-2478	0.75	-586	0.75	-336
BF MCNARY 230 KV SECT 1	0.82	-1133	0.87	-4143	0.75	-2660	0.97	-2694	0.81	-3653	0.84	-2714	0.74	-606	0.75	-363
BF MCNARY 230 KV SECT 2	0.82	-1118	0.87	-4219	0.75	-2617	0.97	-3282	0.80	-3594	0.96	-1960	0.74	-607	0.75	-361
BF MCNARY 230 KV SECT 3	0.82	-1099	0.89	-3907	0.75	-2585	0.97	-2480	0.82	-3441	0.85	-2548	0.75	-605	0.75	-359
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.85	-750	0.93	-2889	0.81	-1693	0.98	-1882	0.88	-2025	0.90	-1457	0.80	-431	0.77	-239
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV+PTSN	0.85	-757	0.93	-2918	0.81	-1711	0.98	-1270	0.88	-2040	0.90	-1470	0.80	-445	0.77	-243
BF PGE GRASSLAND-COYOTE SP 500KV & CARTY GAS PLANT	0.82	-1077	0.88	-4075	0.75	-2535	0.97	-2364	0.82	-3303	0.85	-2463	0.75	-595	0.75	-347
BF PGE GRASSLAND-SLATT 500KV & BOARDMAN PLANT	0.82	-1103	0.88	-3992	0.75	-2598	0.97	-2488	0.81	-3538	0.85	-2585	0.75	-598	0.75	-359
BUS: ALVEY 500 KV + RAS	0.82	-1094	0.88	-4351	0.75	-2589	0.97	-3259	0.87	-2696	0.82	-2597	0.73	-623	0.75	-378
BUS: BELL BPA 500 KV	0.82	-1103	0.87	-4154	0.75	-2579	0.97	-2566	0.81	-3452	0.84	-2615	0.78	-534	0.75	-356

Appendix F - 16hs2a_2250idnw_nww Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BUS: BUCKLEY 500 KV	0.83	-1022	0.90	-3530	0.76	-2351	0.98	-1710	0.85	-2762	0.85	-1852	0.76	-579	0.75	-338
BUS: DIXONVILLE 500 KV	0.83	-1036	0.88	-4043	0.76	-2381	0.97	-2237	0.86	-2487	0.85	-2330	0.76	-579	0.75	-336
BUS: HOT SPRINGS 500 KV	0.82	-1103	0.87	-4232	0.75	-2573	0.97	-3232	0.81	-3454	0.84	-2620	0.75	-577	0.75	-351
BUS: KEELER 500 KV + RAS	0.81	-1147	0.92	-3320	0.75	-2810	0.98	-2393	0.84	-3773	0.86	-2271	0.73	-628	0.74	-397
BUS: ROCK CREEK 500 KV	0.83	-1056	0.88	-3585	0.76	-2488	0.98	-1973	0.84	-3176	0.86	-2265	0.76	-570	0.76	-331
BUS: SICKLER 500 KV	0.82	-1101	0.88	-3890	0.75	-2575	0.97	-2517	0.82	-3447	0.84	-2581	0.75	-599	0.75	-353
BUS: SUMMER LAKE 500 KV	0.86	-929	0.89	-3746	0.77	-1697	0.98	-1885	0.82	-2446	0.87	-2065	0.76	-554	0.76	-320
N-1: ALLSTON-KEELER 500 KV + RAS	0.81	-1150	0.91	-3549	0.74	-2824	0.98	-2689	0.82	-4085	0.85	-2585	0.73	-628	0.74	-397
N-1: ALLSTON-NAPAVINE 500 KV	0.82	-1094	0.88	-4037	0.75	-2553	0.98	-2289	0.82	-3337	0.85	-2425	0.75	-599	0.75	-351
N-1: ALLSTON-PAUL #2 500 KV	0.82	-1094	0.87	-4059	0.75	-2553	0.98	-2289	0.82	-3337	0.85	-2430	0.75	-598	0.75	-351
N-1: ALVERY-DIXONVILLE 500 KV	0.83	-1034	0.88	-4011	0.76	-2372	0.97	-2191	0.87	-2355	0.85	-2356	0.76	-580	0.75	-337
N-1: ALVEY-MARION 500 KV	0.83	-1046	0.89	-3884	0.76	-2402	0.98	-2025	0.86	-2575	0.86	-2238	0.75	-585	0.75	-341
N-1: ASHE-HANFORD 500 KV	0.82	-1102	0.85	-3921	0.75	-2576	0.97	-2518	0.82	-3427	0.85	-2559	0.75	-599	0.75	-352
N-1: ASHE-LOW MON 500 KV	0.82	-1094	0.87	-4079	0.75	-2564	0.97	-2517	0.82	-3430	0.84	-2574	0.75	-603	0.75	-352
N-1: ASHE-MARION 500 KV	0.83	-1056	0.89	-3642	0.76	-2457	0.98	-1889	0.85	-2996	0.86	-2066	0.75	-582	0.75	-341
N-1: ASHE-SLATT 500 KV	0.82	-1065	0.87	-3646	0.76	-2526	0.98	-2153	0.83	-3249	0.86	-2349	0.76	-572	0.76	-330
N-1: BELL-COULEE 500 KV	0.82	-1101	0.87	-4211	0.75	-2573	0.97	-2570	0.81	-3457	0.84	-2622	0.77	-548	0.75	-346
N-1: BELL-TAFT 500 KV	0.82	-1106	0.87	-4233	0.75	-2581	0.97	-2564	0.81	-3446	0.84	-2615	0.77	-546	0.75	-360
N-1: BIG EDDY-CELILO 500 KV	0.82	-1105	0.87	-4287	0.75	-2579	0.97	-2575	0.81	-3459	0.84	-2627	0.74	-608	0.75	-357
N-1: BIG EDDY-JOHN DAY 500 KV	0.82	-1107	0.87	-4264	0.75	-2577	0.96	-2582	0.82	-3441	0.84	-2604	0.74	-609	0.75	-358
N-1: BIG EDDY-KNIGHT 500 KV	0.82	-1090	0.87	-4079	0.75	-2551	0.98	-2916	0.82	-3369	0.85	-2516	0.75	-597	0.75	-349
N-1: BIG EDDY-OSTRANDER 500 KV	0.82	-1103	0.87	-4226	0.75	-2569	0.98	-2333	0.81	-3403	0.84	-2539	0.74	-608	0.75	-357
N-1: BOISE BENCH-BROWNLEE #3 230 KV	0.82	-1029	0.87	-4256	0.76	-2461	0.97	-2539	0.82	-3422	0.84	-2599	0.75	-604	0.75	-353
N-1: BRADY-ANTELOPE 230 KV	0.82	-1102	0.87	-4269	0.75	-2559	0.97	-2568	0.81	-3451	0.84	-2619	0.75	-567	0.75	-354
N-1: BROADVIEW-GARRISON #1 500 KV	0.82	-1109	0.87	-4280	0.75	-2577	0.97	-2597	0.81	-3481	0.84	-2649	0.81	-471	0.78	-280
N-1: BROWNLEE-ONTARIO 230 KV	0.83	-992	0.87	-4221	0.76	-2364	0.97	-2508	0.82	-3399	0.84	-2575	0.75	-601	0.75	-352
N-1: BUCKLEY-GRIZZLY 500 KV	0.83	-1055	0.88	-3993	0.76	-2443	0.97	-2181	0.83	-3095	0.86	-2336	0.75	-588	0.75	-342
N-1: BUCKLEY-MARION 500 KV	0.82	-1097	0.88	-4112	0.75	-2542	0.97	-2385	0.82	-3314	0.82	-2237	0.75	-607	0.75	-357
N-1: BUCKLEY-SLATT 500 KV	0.83	-1049	0.89	-3820	0.76	-2424	0.98	-1974	0.84	-3046	0.86	-2192	0.75	-590	0.75	-344
N-1: CAPTAIN JACK-OLINDA 500 KV	0.84	-1019	0.89	-3859	0.76	-2270	0.97	-2079	0.83	-2299	0.87	-2176	0.76	-573	0.76	-331
N-1: CAPTJACK-KFALLS 500 KV	0.83	-1054	0.87	-4219	0.76	-2418	0.97	-3045	0.75	-3247	0.88	-2435	0.75	-589	0.75	-342
N-1: CASCADE CROSSING 500 KV	0.83	-1084	0.89	-3878	0.75	-2486	0.98	-2074	0.84	-3088	0.85	-2084	0.75	-605	0.75	-356
N-1: CHIEF JO-COULEE 500 KV	0.82	-1106	0.87	-4198	0.75	-2580	0.97	-2579	0.81	-3461	0.84	-2635	0.74	-608	0.75	-358
N-1: CHIEF JO-MONROE 500 KV	0.82	-1103	0.88	-4055	0.75	-2573	0.97	-2527	0.82	-3445	0.84	-2594	0.75	-603	0.75	-355
N-1: CHIEF JO-SICKLER 500 KV	0.82	-1103	0.88	-4078	0.75	-2574	0.97	-2551	0.82	-3449	0.84	-2606	0.75	-600	0.75	-353
N-1: COULEE-HANFORD 500 KV	0.82	-1095	0.87	-3653	0.75	-2567	0.97	-2440	0.83	-3411	0.85	-2521	0.76	-569	0.75	-337
N-1: COULEE-SCHULTZ 500 KV	0.82	-1098	0.88	-3911	0.75	-2565	0.97	-3146	0.81	-3424	0.85	-2566	0.75	-589	0.75	-347
N-1: COVINGTON4-RAVER 500 KV	0.82	-1106	0.87	-4263	0.75	-2581	0.97	-2582	0.81	-3465	0.84	-2636	0.74	-609	0.75	-357
N-1: COVINGTON5-RAVER 500 KV	0.82	-1106	0.87	-4261	0.75	-2581	0.97	-2581	0.81	-3465	0.84	-2636	0.74	-608	0.75	-357
N-1: COYOTE-LONGHORN 500 KV	0.82	-1089	0.87	-4200	0.75	-2571	0.97	-2488	0.81	-3405	0.85	-2570	0.75	-600	0.75	-350
N-1: CUSTERW-MONROE 500 KV	0.82	-1105	0.88	-4117	0.75	-2581	0.97	-2570	0.81	-3470	0.84	-2619	0.75	-600	0.75	-354
N-1: DIXONVILLE-MERIDIAN 500 KV	0.83	-1048	0.88	-4062	0.76	-2411	0.97	-2275	0.84	-2691	0.85	-2367	0.75	-585	0.75	-340
N-1: DRYCREEK-LOLO 230 KV	0.82	-1106	0.87	-4286	0.75	-2580	0.97	-2579	0.81	-3460	0.84	-2638	0.75	-607	0.75	-357
N-1: DRYCREEK-N LEWISTON 230 KV	0.82	-1104	0.87	-4282	0.75	-2579	0.97	-2576	0.81	-3458	0.84	-2636	0.75	-607	0.75	-356
N-1: DRYCREEK-WALA AVA 230 KV	0.82	-1102	0.88	-4253	0.75	-2581	0.97	-2584	0.81	-3464	0.84	-2640	0.74	-610	0.75	-358
N-1: DWORSHAK-HATWAI 500 KV + RAS	0.82	-1140	0.88	-3840	0.76	-2580	0.97	-2560	0.82	-3499	0.84	-2609	0.76	-561	0.77	-278
N-1: DWORSHAK-HATWAI 500 KV + RAS + PTSN	0.82	-1143	0.88	-3858	0.76	-2597	0.97	-2573	0.82	-3509	0.84	-2617	0.76	-573	0.77	-282
N-1: DWORSHAK-TAFT 500 KV	0.82	-1130	0.88	-4011	0.76	-2576	0.97	-2575	0.82	-3484	0.84	-2620	0.80	-472	0.76	-289
N-1: ECHO LAKE-MAPLE VALLEY 500 KV	0.82	-1106	0.87	-4164	0.75	-2580	0.97	-2550	0.82	-3451	0.84	-2606	0.74	-608	0.75	-357
N-1: ECHO LAKE-RAVER 500 KV	0.82	-1103	0.87	-4193	0.75	-2575	0.97	-2552	0.81	-3451	0.84	-2610	0.75	-604	0.75	-355
N-1: ECHO LAKE-SCHULTZ 500 KV	0.82	-1103	0.87	-4114	0.75	-2574	0.97	-2524	0.82	-3441	0.84	-2594	0.75	-606	0.75	-356
N-1: ECHO LAKE-SNOK TAP 500 KV	0.82	-1102	0.88	-3988	0.75	-2574	0.97	-2522	0.82	-3448	0.84	-2588	0.75	-596	0.75	-352

Appendix F - 16hs2a_2250idnw_nww Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: GARRISON-TAFT #2 500 KV	0.82	-1109	0.87	-4316	0.75	-2583	0.97	-2597	0.82	-3476	0.84	-2648	0.76	-579	0.75	-347
N-1: GOLDHILL-PLACER 115 KV	0.82	-1109	0.87	-4341	0.75	-2587	0.97	-2612	0.82	-3501	0.84	-2666	0.74	-609	0.75	-357
N-1: GRASSLAND-COYOTE 500 KV	0.82	-1077	0.88	-4075	0.75	-2535	0.97	-3025	0.82	-3303	0.85	-2463	0.75	-595	0.75	-347
N-1: GRASSLAND-SLATT 500 KV	0.82	-1103	0.87	-4262	0.75	-2542	0.97	-2536	0.82	-3441	0.84	-2613	0.75	-607	0.75	-356
N-1: GRIZZLY-JOHN DAY #2 500 KV	0.83	-1032	0.89	-3876	0.76	-2386	0.97	-2709	0.83	-2898	0.86	-2226	0.76	-577	0.75	-334
N-1: GRIZZLY-MALIN 500 KV	0.84	-1021	0.89	-3814	0.76	-2326	0.98	-2602	0.82	-2717	0.87	-2143	0.76	-577	0.75	-335
N-1: GRIZZLY-PONDEROSA A-SUMMER L 500 KV	0.84	-983	0.89	-3862	0.77	-2252	0.98	-1999	0.83	-2832	0.87	-2194	0.76	-557	0.76	-321
N-1: GRIZZLY-PONDEROSA B-CAPT JACK 500 KV	0.84	-1019	0.89	-3782	0.76	-2317	0.98	-1934	0.82	-2689	0.87	-2126	0.76	-577	0.75	-335
N-1: GRIZZLY-ROUND BU 500 KV	0.82	-1104	0.87	-4269	0.75	-2572	0.97	-2536	0.81	-3444	0.84	-2610	0.75	-607	0.75	-357
N-1: HANFORD-LOW MON 500 KV	0.82	-1101	0.86	-4058	0.75	-2570	0.97	-3197	0.82	-3438	0.84	-2599	0.75	-605	0.75	-355
N-1: HANFORD-VANTAGE 500 KV	0.82	-1094	0.84	-3924	0.75	-2572	0.97	-2469	0.81	-3418	0.85	-2551	0.75	-593	0.75	-350
N-1: HANFORD-WAUTOMA 500 KV	0.82	-1101	0.86	-4192	0.75	-2570	0.97	-3193	0.82	-3442	0.84	-2595	0.75	-606	0.75	-355
N-1: HATWAI 500/230 KV XFMR + RAS	0.82	-1126	0.87	-4307	0.75	-2600	0.97	-2574	0.81	-3443	0.84	-2634	0.74	-616	0.75	-355
N-1: HATWAI-LOLO 230 KV	0.82	-1113	0.87	-4295	0.75	-2588	0.97	-2578	0.81	-3454	0.84	-2637	0.74	-611	0.75	-356
N-1: HATWAI-LOW GRAN 500 KV	0.82	-1039	0.87	-4018	0.76	-2538	0.97	-2632	0.82	-3544	0.84	-2663	0.78	-525	0.76	-302
N-1: HATWAI-N LEWISTON 230 KV	0.82	-1106	0.87	-4286	0.75	-2580	0.97	-2579	0.81	-3460	0.84	-2638	0.74	-607	0.75	-357
N-1: HELLS CANYON-BROWNLEE 230 KV	0.82	-995	0.88	-3942	0.76	-2461	0.97	-2288	0.83	-3194	0.86	-2413	0.76	-576	0.75	-337
N-1: HELLS CANYON-WALLA WALLA 230 KV	0.85	-1175	0.91	-3849	0.75	-2582	0.97	-2406	0.82	-3303	0.85	-2506	0.75	-594	0.75	-347
N-1: HEMINGWAY-GRASSLAND 500 KV	0.85	-776	0.91	-3442	0.80	-1750	0.98	-1655	0.85	-2393	0.89	-1916	0.80	-459	0.77	-251
N-1: HEMINGWAY-GRASSLAND 500 KV + FACRI	0.83	-988	0.86	-4513	0.76	-2199	0.97	-3706	0.84	-4124	0.82	-2964	0.76	-559	0.76	-321
N-1: HEMINGWAY-GRASSLAND 500 KV + PTSN SHUNT	0.84	-835	0.91	-3511	0.80	-1896	0.98	-1720	0.85	-2477	0.88	-1973	0.79	-474	0.77	-258
N-1: HEMINGWAY-SUMMER LAKE 500 KV	0.84	-996	0.87	-4256	0.76	-1836	0.97	-3175	0.82	-3150	0.85	-2573	0.75	-583	0.75	-339
N-1: HILL TOP 345/230 XFMR	0.83	-1080	0.87	-4274	0.76	-2476	0.97	-2576	0.82	-3385	0.84	-2625	0.75	-601	0.75	-352
N-1: HORSE HV-MCNARY 230 KV	0.82	-1096	0.87	-4223	0.75	-2565	0.97	-2529	0.82	-3434	0.84	-2589	0.75	-607	0.75	-356
N-1: HOT SPRINGS-TAFT 500 KV	0.82	-1103	0.87	-4232	0.75	-2573	0.97	-3232	0.81	-3454	0.84	-2620	0.75	-576	0.75	-351
N-1: HUMBOLDT-COYOTE CK 345 KV	0.82	-1163	0.87	-4193	0.75	-2608	0.97	-2444	0.82	-3165	0.85	-2510	0.74	-617	0.75	-361
N-1: HUNTINGTON-PINTO-FOUR CORNERS 345 KV	0.82	-1118	0.87	-4333	0.75	-2612	0.97	-2590	0.82	-3449	0.84	-2643	0.74	-615	0.75	-361
N-1: ING500-CUSTERW 500 KV	0.82	-1105	0.87	-4223	0.75	-2578	0.97	-2573	0.81	-3458	0.84	-2620	0.75	-604	0.75	-356
N-1: JOHN DAY-MARION 500 KV	0.82	-1093	0.88	-4088	0.75	-2537	0.97	-2317	0.82	-3268	0.82	-2238	0.75	-605	0.75	-355
N-1: JOHN DAY-ROCK CK 500 KV	0.83	-1060	0.88	-3714	0.76	-2495	0.98	-2032	0.84	-3205	0.86	-2313	0.76	-574	0.76	-332
N-1: JOHN DAY-SLATT 500 KV	0.83	-1089	0.87	-4113	0.75	-2512	0.97	-2235	0.82	-3380	0.85	-2510	0.75	-606	0.75	-356
N-1: KFALLS-MERIDIAN 500 KV	0.82	-1094	0.88	-4147	0.75	-2543	0.97	-2444	0.79	-3458	0.91	-1736	0.75	-604	0.75	-354
N-1: KNIGHT-WAUTOMA 500 KV	0.83	-1060	0.88	-3680	0.76	-2485	0.98	-1999	0.84	-3157	0.87	-2256	0.76	-576	0.75	-335
N-1: LAGRANDE-NORTH POWDER 230 KV	0.83	-1054	0.87	-4249	0.75	-2566	0.97	-2524	0.82	-3400	0.84	-2587	0.75	-602	0.75	-352
N-1: LANES-MARION 500 KV	0.82	-1095	0.87	-4139	0.75	-2545	0.97	-2398	0.83	-3240	0.85	-2415	0.75	-604	0.75	-354
N-1: LIT GOOSE-CENTRAL FERRY 500 KV	0.82	-1104	0.87	-4265	0.75	-2577	0.97	-2570	0.81	-3457	0.84	-2622	0.75	-606	0.75	-356
N-1: LIT GOOSE-LOW MON 500 KV	0.82	-1102	0.87	-4233	0.75	-2575	0.97	-2556	0.81	-3451	0.84	-2612	0.75	-605	0.75	-354
N-1: LOW GRAN-CENTRAL FERRY 500 KV	0.82	-1101	0.87	-4246	0.75	-2575	0.97	-2566	0.81	-3457	0.84	-2619	0.75	-603	0.75	-354
N-1: LOW MON-SAC TAP 500 KV	0.82	-1094	0.87	-3868	0.75	-2564	0.97	-2428	0.82	-3387	0.84	-2513	0.75	-582	0.75	-335
N-1: MALIN 500/230 XFMR	0.82	-1091	0.87	-4226	0.75	-2523	0.97	-3167	0.83	-3323	0.85	-2499	0.75	-605	0.75	-355
N-1: MALIN-HILLTOP 230 KV	0.82	-1106	0.87	-4300	0.75	-2580	0.97	-2583	0.81	-3464	0.84	-2641	0.74	-608	0.75	-357
N-1: MALIN-ROUND MTN #1 500 KV	0.83	-1071	0.88	-4103	0.76	-2443	0.97	-2340	0.82	-2848	0.86	-2410	0.75	-595	0.75	-347
N-1: MALIN-ROUND MTN #2 500 KV	0.83	-1069	0.88	-4097	0.76	-2436	0.97	-2321	0.82	-2821	0.86	-2400	0.75	-594	0.75	-346
N-1: MALIN-SUMMER LAKE 500 KV	0.83	-1100	0.88	-4052	0.76	-2398	0.97	-2285	0.81	-2879	0.86	-2341	0.75	-608	0.75	-358
N-1: MAPLE VLY-ROCKY RH 345 KV	0.82	-1104	0.87	-4154	0.75	-2576	0.97	-3213	0.81	-3449	0.84	-2607	0.75	-606	0.75	-356
N-1: MARION-PEARL 500 KV	0.82	-1096	0.87	-4159	0.75	-2535	0.97	-2377	0.84	-3084	0.80	-1903	0.75	-604	0.75	-354
N-1: MARION-SANTIAM 500 KV	0.82	-1112	0.87	-4375	0.75	-2597	0.97	-2681	0.81	-3549	0.83	-2728	0.74	-610	0.75	-358
N-1: MCLOUGLIN-OSTRANDER 230 KV	0.82	-1106	0.87	-4276	0.75	-2579	0.97	-2566	0.82	-3448	0.84	-2605	0.74	-608	0.75	-357
N-1: MCNARY 500/230 KV XFMR	0.83	-1006	0.89	-4129	0.76	-2546	0.98	-2519	0.81	-3504	0.84	-2611	0.75	-607	0.75	-357
N-1: MCNARY S2-MCNARY S3 230 KV	0.82	-1104	0.87	-4274	0.75	-2577	0.97	-2577	0.81	-3459	0.84	-2639	0.74	-608	0.75	-357
N-1: MCNARY-BOARD T1 230 KV	0.82	-1099	0.87	-4291	0.75	-2560	0.97	-2549	0.82	-3415	0.84	-2606	0.75	-607	0.75	-355
N-1: MCNARY-JOHN DAY 500 KV	0.83	-1066	0.88	-3975	0.75	-2498	0.97	-2209	0.83	-3287	0.86	-2418	0.75	-600	0.75	-351

Appendix F - 16hs2a_2250idnw_nww Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: MCNARY-LONGHORN 500 KV	0.82	-1067	0.87	-4102	0.76	-2562	0.97	-2454	0.82	-3396	0.85	-2545	0.75	-595	0.75	-346
N-1: MCNARY-ROSS 345 KV	0.82	-1091	0.87	-4176	0.75	-2556	0.97	-3125	0.82	-3384	0.85	-2538	0.75	-607	0.75	-356
N-1: MCNARY-ROUNDUP 230 KV	0.86	-962	0.87	-4185	0.76	-2509	0.97	-2455	0.83	-3325	0.85	-2539	0.75	-595	0.75	-348
N-1: MCNARY-SAC TAP-LOW MON 500 KV	0.82	-1089	0.87	-3795	0.75	-2554	0.97	-2374	0.82	-3348	0.85	-2469	0.75	-580	0.75	-334
N-1: MIDPOINT-HEMINGWAY 500 KV	0.85	-964	0.87	-4259	0.70	-2099	0.97	-3186	0.82	-3203	0.85	-2566	0.77	-533	0.76	-306
N-1: MIDPOINT-HEMINGWAY 500 KV + PTSN SHUNT	0.85	-969	0.87	-4278	0.70	-2112	0.97	-2536	0.82	-3214	0.85	-2574	0.77	-545	0.76	-309
N-1: MIDPOINT-HUMBOLDT 345 KV	0.82	-1165	0.87	-4156	0.75	-2630	0.97	-2397	0.83	-3087	0.85	-2469	0.74	-618	0.75	-362
N-1: NAPAVINE-PAUL 500 KV	0.82	-1100	0.87	-4192	0.75	-2566	0.97	-2484	0.81	-3416	0.85	-2564	0.75	-603	0.75	-353
N-1: OLYMPIA-PAUL 500 KV	0.82	-1108	0.87	-4345	0.75	-2584	0.97	-2619	0.82	-3489	0.84	-2671	0.74	-609	0.75	-358
N-1: ONTARIO-CALDWELL 230 KV	0.84	-1062	0.87	-4259	0.75	-2465	0.97	-3206	0.82	-3425	0.84	-2603	0.75	-604	0.75	-354
N-1: OSTRANDER-KNIGHT 500 KV	0.82	-1098	0.88	-4126	0.75	-2554	0.98	-2298	0.82	-3346	0.85	-2462	0.75	-606	0.75	-355
N-1: OSTRANDER-PEARL 500 KV	0.82	-1104	0.87	-4285	0.75	-2576	0.98	-2382	0.81	-3466	0.83	-2595	0.74	-608	0.75	-357
N-1: OSTRANDER-TROUTDALE 500 KV	0.82	-1107	0.87	-4260	0.75	-2582	0.97	-2557	0.82	-3448	0.84	-2594	0.74	-609	0.75	-357
N-1: OXBOW-BROWNLEE #2 230 KV	0.82	-1092	0.87	-4282	0.75	-2571	0.97	-2573	0.81	-3455	0.84	-2623	0.75	-607	0.75	-356
N-1: OXBOW-LOLO 230 KV	0.84	-1093	0.88	-4029	0.75	-2564	0.97	-2381	0.82	-3272	0.85	-2472	0.75	-585	0.75	-336
N-1: PAUL-SATSOP 500 KV	0.82	-1105	0.87	-4238	0.75	-2577	0.97	-2550	0.82	-3445	0.84	-2597	0.75	-607	0.75	-356
N-1: PEARL-KEELER 500 KV	0.82	-1092	0.88	-4004	0.75	-2539	0.98	-2199	0.83	-3247	0.85	-2292	0.75	-596	0.75	-349
N-1: PEARL-KEELER 500 KV + RAS	0.82	-1092	0.88	-4004	0.75	-2539	0.98	-2199	0.83	-3247	0.85	-2292	0.75	-596	0.75	-349
N-1: PINTO-FOUR CORNER 345 KV	0.82	-1109	0.87	-4283	0.75	-2586	0.97	-2570	0.81	-3432	0.84	-2620	0.74	-610	0.75	-358
N-1: PONDEROSA A 500/230 KV XFMR	0.82	-1107	0.87	-4288	0.75	-2579	0.97	-2578	0.81	-3455	0.84	-2636	0.74	-608	0.75	-357
N-1: PONDEROSA B 500/230 KV XFMR	0.82	-1105	0.87	-4289	0.75	-2578	0.97	-2581	0.81	-3460	0.84	-2639	0.74	-608	0.75	-357
N-1: RAVER-PAUL 500 KV	0.82	-1076	0.89	-3627	0.75	-2512	0.98	-2126	0.83	-3266	0.86	-2399	0.76	-580	0.75	-341
N-1: RAVER-TACOMA 500 KV	0.82	-1105	0.87	-4204	0.75	-2578	0.97	-2558	0.82	-3455	0.84	-2611	0.75	-607	0.75	-356
N-1: RED BUTTE-HARRY ALLEN 345 KV	0.82	-1116	0.87	-4260	0.75	-2610	0.97	-2539	0.82	-3378	0.84	-2595	0.74	-614	0.75	-362
N-1: ROBINSON-HARRY ALLEN 500 KV	0.83	-1082	0.87	-4300	0.76	-2468	0.97	-2588	0.81	-3480	0.84	-2643	0.75	-604	0.75	-354
N-1: ROCK CK-WAUTOMA 500 KV	0.83	-1060	0.88	-3638	0.76	-2495	0.98	-2054	0.84	-3210	0.86	-2305	0.76	-571	0.76	-331
N-1: ROUND MTN-TABLE MTN 500 KV	0.83	-1082	0.87	-4186	0.75	-2494	0.97	-2448	0.82	-3094	0.85	-2525	0.75	-599	0.75	-349
N-1: ROUNDUP-LAGRANDE 230 KV	0.85	-1040	0.87	-4211	0.75	-2558	0.97	-2477	0.81	-3358	0.85	-2557	0.75	-599	0.75	-350
N-1: SCHULTZ-SICKLER 500 KV	0.82	-1101	0.88	-4009	0.75	-2575	0.97	-2524	0.82	-3451	0.84	-2587	0.75	-600	0.75	-353
N-1: SCHULTZ-VANTAGE 500 KV	0.82	-1106	0.86	-4036	0.75	-2579	0.97	-2542	0.82	-3447	0.84	-2598	0.75	-601	0.75	-353
N-1: SCHULTZ-WAUTOMA 500 KV	0.82	-1093	0.86	-3813	0.75	-2558	0.97	-2389	0.82	-3368	0.85	-2497	0.75	-583	0.75	-344
N-1: SIGURD-GLEN CANYON 230 KV	0.82	-1105	0.87	-4300	0.75	-2575	0.97	-3244	0.81	-3461	0.84	-2640	0.75	-607	0.75	-356
N-1: SLATT 500/230 KV XFMR	0.82	-1115	0.88	-4011	0.75	-2641	0.97	-2535	0.82	-3580	0.85	-2605	0.74	-603	0.75	-362
N-1: SLATT-LONGHORN 500 KV	0.82	-1092	0.87	-4177	0.75	-2549	0.97	-2455	0.82	-3384	0.85	-2552	0.75	-606	0.75	-355
N-1: SNOK TAP-SNOKING 500 KV	0.82	-1106	0.87	-4243	0.75	-2580	0.97	-2577	0.81	-3464	0.84	-2623	0.74	-607	0.75	-357
N-1: TABLE MTN-TESLA 500 KV	0.83	-1083	0.87	-4206	0.75	-2500	0.97	-2482	0.82	-3157	0.85	-2549	0.75	-598	0.75	-349
N-1: TABLE MTN-VACA DIXON 500 KV	0.83	-1071	0.87	-4149	0.76	-2455	0.97	-2404	0.82	-2925	0.85	-2481	0.75	-593	0.75	-345
N-1: VANTAGE 500/230 KV XFMR #1	0.82	-1104	0.87	-4319	0.75	-2579	0.97	-2574	0.81	-3459	0.84	-2636	0.74	-607	0.75	-357
N-1: VANTAGE 500/230 KV XFMR #2	0.82	-1104	0.87	-4319	0.75	-2579	0.97	-2573	0.81	-3459	0.84	-2635	0.74	-607	0.75	-357
N-1: WALLA WALLA-TALBOT 230 KV	0.82	-1126	0.91	-3971	0.75	-2588	0.97	-2588	0.81	-3468	0.84	-2642	0.75	-606	0.75	-353
N-1: WALLA WALLA-WALLULA 230 KV	0.83	-1066	0.93	-3691	0.75	-2576	0.97	-2580	0.81	-3458	0.84	-2639	0.75	-606	0.75	-356
N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.83	-993	0.90	-2860	0.77	-2369	0.98	-1433	0.88	-2618	0.89	-1703	0.78	-523	0.76	-303
N-2: ASHE-MARION & BUCKLEY-MARION 500 KV	0.83	-1042	0.90	-3405	0.76	-2407	0.98	-1648	0.86	-2745	0.84	-1663	0.76	-580	0.75	-340
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.84	-975	0.92	-2930	0.77	-2234	0.98	-1249	0.89	-2369	0.89	-1541	0.76	-552	0.76	-322
N-2: ASHE-MARION & SLATT-COYOTE TAP-LONGHORN 500 KV	0.83	-1040	0.89	-3522	0.76	-2424	0.98	-1764	0.86	-2895	0.86	-1978	0.76	-579	0.75	-338
N-2: ASHE-MARION & SLATT-JOHN DAY 500 KV	0.83	-1033	0.89	-3438	0.76	-2377	0.98	-1587	0.86	-2850	0.86	-1927	0.76	-579	0.75	-338
N-2: ASHE-SLATT & MCNARY-JOHN DAY 500 KV	0.83	-1023	0.88	-3381	0.76	-2444	0.98	-1799	0.85	-3022	0.87	-2122	0.76	-561	0.76	-324
N-2: ASHE-SLATT & SLATT-COYOTE TAP-LONGHORN 500 KV	0.83	-1044	0.88	-3509	0.76	-2486	0.98	-1982	0.85	-3115	0.87	-2229	0.76	-566	0.76	-326
N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.82	-1159	0.88	-4188	0.76	-2630	0.97	-2823	0.81	-3744	0.83	-2816	0.86	-283	0.78	-221
N-2: BETHEL-CEDAR SP 500KV & BETHEL-ROUND BUTTE 230 KV	0.82	-1094	0.88	-4059	0.75	-2520	0.98	-2242	0.83	-3259	0.85	-2170	0.74	-609	0.75	-358
N-2: BETHEL-CEDAR SP 500KV & BETHEL-SANTIAM 230KV	0.82	-1092	0.88	-4065	0.75	-2516	0.98	-2248	0.83	-3258	0.85	-2238	0.74	-607	0.75	-357
N-2: BETHEL-CEDAR SP 500KV & SANTIAM-MIKKALO 500KV	0.83	-1086	0.89	-3900	0.75	-2493	0.98	-2098	0.84	-3104	0.85	-2106	0.75	-606	0.75	-356

Appendix F - 16hs2a_2250idnw_nww Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-CHEMAWA 230 KV	0.82	-1101	0.87	-4190	0.75	-2562	0.98	-2321	0.82	-3355	0.84	-2453	0.75	-607	0.75	-357
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-TROUTDALE 230 KV	0.82	-1103	0.87	-4221	0.75	-2569	0.98	-2336	0.82	-3388	0.84	-2507	0.74	-608	0.75	-357
N-2: BOISE BENCH-BROWNLEE #1 & #2 230 KV	0.82	-823	0.87	-4129	0.78	-2103	0.97	-2388	0.82	-3260	0.85	-2494	0.75	-588	0.75	-341
N-2: BOISE BENCH-BROWNLEE #3 & BOISE BENCH-HORSEFLAT#4 230 KV	0.82	-823	0.87	-4126	0.78	-2098	0.97	-2385	0.82	-3256	0.85	-2480	0.75	-587	0.75	-340
N-2: BRIDGER-POPULUS #1 & #2 345 KV	0.83	-1059	0.87	-4216	0.76	-2251	0.97	-2511	0.82	-3394	0.84	-2578	0.73	-610	0.74	-383
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV	0.84	-1049	0.87	-4198	0.79	-2034	0.97	-2495	0.82	-3379	0.85	-2569	0.73	-586	0.74	-389
N-2: BROADVIEW-GARRISONT #1 & #2 500 KV + RAS	0.82	-1125	0.88	-4383	0.74	-2717	0.97	-2968	0.80	-3961	0.82	-2928	0.70	-582	0.79	-405
N-2: BROWNLEE-HELLS CANYON & OXBOW-LOLO 230 KV	0.84	-1027	0.90	-3495	0.76	-2358	0.98	-1867	0.85	-2821	0.88	-2120	0.77	-536	0.76	-304
N-2: BROWNLEE-OXBOW & BROWNLEE-HELLS CANYON 230 KV	0.82	-986	0.88	-3934	0.76	-2452	0.97	-2281	0.83	-3187	0.86	-2408	0.76	-576	0.75	-336
N-2: BUCKLEY-MARION & JOHN DAY-MARION 500 KV	0.83	-1083	0.89	-3855	0.75	-2493	0.98	-2672	0.84	-3055	0.80	-1735	0.75	-603	0.75	-355
N-2: CHIEF JO-MONROE & CHIEF JO-SICKLER 500 KV	0.82	-1099	0.89	-3768	0.75	-2566	0.97	-2481	0.81	-3421	0.85	-2565	0.75	-591	0.75	-349
N-2: CHIEF JO-MONROE 500 KV & CHIEF JO-SNOHOMS4 345 KV	0.82	-1101	0.88	-3930	0.75	-2570	0.97	-2495	0.82	-3432	0.84	-2573	0.75	-601	0.75	-353
N-2: CHIEF JO-MONROE 500 KV & MONROE-SAMMAMSH 230 KV	0.82	-1103	0.88	-4014	0.75	-2573	0.97	-2516	0.82	-3442	0.84	-2586	0.75	-603	0.75	-354
N-2: CHIEF JO-SICKLER 500 KV & CHIEF J3-SNOHOMS3 345 KV	0.82	-1102	0.88	-3979	0.75	-2573	0.97	-2529	0.82	-3447	0.84	-2593	0.75	-598	0.75	-352
N-2: COULEE-CHIEF JO 500 KV & CHIEF J4-SNOHOMS4 345 KV	0.82	-1105	0.88	-4099	0.75	-2579	0.97	-2560	0.81	-3457	0.84	-2612	0.75	-607	0.75	-357
N-2: COULEE-HANFORD & HANFORD-VANTAGE 500 KV	0.82	-1070	0.85	-3115	0.76	-2554	0.98	-2217	0.83	-3344	0.86	-2363	0.78	-520	0.76	-317
N-2: COULEE-SCHULTZ #1 & #2 500 KV	0.82	-1079	0.90	-3078	0.76	-2529	0.98	-2201	0.83	-3317	0.86	-2427	0.77	-540	0.76	-322
N-2: CUSTERW-ING500 & CUSTERW-MONROE 500 KV	0.82	-1103	0.88	-4044	0.75	-2579	0.97	-2553	0.82	-3461	0.84	-2607	0.75	-596	0.75	-353
N-2: CUSTERW-MONROE #1 & #2 500 KV + RAS	0.81	-1169	0.86	-4725	0.74	-2826	0.97	-3183	0.79	-4218	0.81	-3137	0.72	-647	0.74	-401
N-2: DC-BIPOLE	0.84	-933	0.89	-3945	0.78	-2099	0.96	-2389	0.84	-2309	0.87	-2292	0.75	-577	0.75	-345
N-2: DOUBLE PALO VERDE	0.85	-563	0.96	-1815	0.80	-1993	0.99	-1335	0.92	-2200	0.92	-1658	0.80	-440	0.77	-276
N-2: ECHOLAKE-MAPLE VLY 500 KV & COVINGTON-MAPLE VLY 230 KV	0.82	-1106	0.87	-4162	0.75	-2580	0.97	-2550	0.80	-3556	0.84	-2606	0.74	-608	0.75	-357
N-2: ECHOLAKE-MAPLE VLY 500 KV & ROCKY RH-MAPLE VLY 345 KV	0.82	-1104	0.88	-4027	0.75	-2577	0.97	-2518	0.82	-3445	0.84	-2586	0.75	-607	0.75	-356
N-2: GARRISON-TAFT #1 & #2 500 KV + RAS	0.82	-1124	0.87	-4320	0.74	-2682	0.97	-2770	0.81	-3696	0.83	-2778	0.83	-455	0.74	-456
N-2: GRASSLAND-CEDAR SP 500KV & SLATT-BUCKLEY 500KV	0.84	-1017	0.91	-3336	0.76	-2310	0.98	-1575	0.87	-2648	0.88	-1705	0.75	-584	0.75	-341
N-2: GRASSLAND-COYOTE 500KV & SLATT-LONGHORN 500KV	0.82	-984	0.91	-3326	0.77	-2415	0.98	-1692	0.86	-2866	0.89	-2010	0.76	-564	0.76	-325
N-2: GRIZZLY-MALIN & GRIZZLY-CAPTAIN JACK 500 KV + RAS	0.83	-1022	0.89	-4172	0.76	-2387	0.97	-2387	0.80	-2753	0.84	-2318	0.73	-628	0.74	-388
N-2: GRIZZLY-MALIN & GRIZZLY-SUMMER LAKE 500 KV + RAS	0.83	-981	0.89	-4247	0.77	-2327	0.97	-3118	0.80	-3005	0.84	-2440	0.74	-609	0.75	-372
N-2: GRIZZLY-MALIN & MALIN-SUMMER LAKE 500 KV + RAS	0.82	-1128	0.86	-4807	0.75	-2523	0.97	-3304	0.79	-2845	0.83	-2525	0.72	-658	0.74	-413
N-2: HANFORD-ASHE & HANFORD-LOW MON 500 KV	0.82	-1101	0.82	-3248	0.75	-2571	0.97	-3137	0.82	-3386	0.85	-2532	0.75	-592	0.75	-351
N-2: HANFORD-WAUTOMA #1 & #2 500 KV	0.83	-1069	0.84	-3627	0.76	-2510	0.98	-2863	0.83	-3295	0.85	-2423	0.75	-591	0.75	-342
N-2: JOHN DAY-BIG EDDY #1 & #2 500 KV	0.82	-1122	0.91	-3798	0.75	-2576	0.91	-2434	0.82	-3268	0.88	-2324	0.74	-620	0.75	-366
N-2: JOHN DAY-BIG EDDY & JOHN DAY-MARION 500 KV	0.82	-1094	0.88	-4054	0.75	-2533	0.96	-2974	0.82	-3224	0.82	-2210	0.75	-606	0.75	-356
N-2: JOHN DAY-GRIZZLY #1 & #2 500 KV + RAS	0.83	-967	0.91	-3843	0.77	-2313	0.98	-1985	0.84	-2770	0.85	-2136	0.74	-592	0.75	-358
N-2: JOHN DAY-GRIZZLY #2 & BUCKLEY-GRIZZLY 500 KV + RAS	0.82	-1069	0.90	-4201	0.75	-2593	0.97	-2516	0.79	-3500	0.83	-2644	0.73	-629	0.74	-387
N-2: JOHN DAY-MARION & BUCKLEY-MARION 500 KV	0.83	-1083	0.89	-3855	0.75	-2493	0.98	-2022	0.84	-3055	0.80	-1735	0.75	-603	0.75	-355
N-2: JOHN DAY-MARION & MARION-PEARL 500 KV	0.83	-1073	0.88	-3826	0.75	-2452	0.97	-2098	0.86	-2704	0.80	-1356	0.75	-595	0.75	-349
N-2: JOHN DAY-ROCK CREEK 500 KV & MCNARY-ROSS 345 KV	0.83	-1045	0.88	-3624	0.76	-2473	0.98	-1930	0.84	-3121	0.87	-2217	0.76	-573	0.76	-332
N-2: KEELER-PEARL 500 & SHERWOOD-CARLTON 230 KV	0.82	-1091	0.88	-3993	0.75	-2536	0.98	-2198	0.83	-3230	0.86	-2274	0.75	-596	0.75	-349
N-2: KNIGHT-OSTRANDER & OSTRANDER-BIG EDDY 500 KV	0.82	-1094	0.88	-4018	0.75	-2539	0.98	-2145	0.83	-3239	0.84	-2237	0.75	-606	0.75	-356
N-2: KNIGHT-OSTRANDER 500 KV & MCNARY-ROSS 345 KV	0.82	-1083	0.88	-3996	0.75	-2530	0.98	-2185	0.83	-3261	0.85	-2362	0.75	-605	0.75	-355
N-2: KNIGHT-OSTRANDER 500 KV & MIDWAY-BONNEVILLE 230 KV	0.82	-1089	0.88	-4007	0.75	-2535	0.98	-2212	0.83	-3273	0.85	-2407	0.75	-601	0.75	-352
N-2: LOWER GRANITE-CENTRAL FERRY #1 & #2 500 + RAS	0.82	-1092	0.87	-4193	0.75	-2673	0.97	-2849	0.80	-3819	0.83	-2834	0.70	-726	0.76	-363
N-2: MALIN-ROUND MTN #1 & #2 500 KV	0.83	-1102	0.87	-4786	0.76	-2458	0.97	-2935	0.79	-2324	0.85	-2749	0.73	-645	0.74	-389
N-2: MCNARY-JOHN DAY & ROCK CREEK-JOHN DAY 500 KV	0.83	-1003	0.89	-3327	0.76	-2378	0.98	-2296	0.86	-2925	0.88	-1999	0.76	-555	0.76	-321
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-HORSE HEAVEN 230 KV	0.83	-1050	0.88	-3857	0.76	-2467	0.97	-2127	0.84	-3212	0.86	-2340	0.75	-598	0.75	-349
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-ROSS 345 KV	0.83	-1047	0.89	-3804	0.76	-2462	0.98	-1999	0.84	-3184	0.86	-2294	0.75	-598	0.75	-350
N-2: MCNARY-ROSS 345 KV & MCNARY-HORSE HEAVEN 230 KV	0.83	-1080	0.87	-4088	0.75	-2538	0.97	-2404	0.82	-3352	0.85	-2480	0.75	-606	0.75	-356
N-2: MIDPOINT-SUMMER LAKE 500 KV & MIDPOINT-KING 230 KV	0.85	-962	0.87	-4247	0.70	-2094	0.97	-2514	0.82	-3190	0.85	-2560	0.77	-523	0.76	-303
N-2: MONROE-CUSTERW & CHIEF JO-MONROE 500 KV	0.82	-1100	0.89	-3833	0.75	-2571	0.97	-2491	0.82	-3434	0.85	-2569	0.75	-594	0.75	-351
N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV + RAS	0.82	-1061	0.94	-2023	0.76	-2575	1.00	-1035	0.93	-2600	0.93	-1299	0.75	-566	0.75	-360
N-2: PAUL-NAPAVINE & PAUL-ALLSTON #2 500 KV + RAS	0.82	-1062	0.94	-2072	0.76	-2582	1.00	-1069	0.93	-2628	0.93	-1339	0.75	-566	0.75	-360

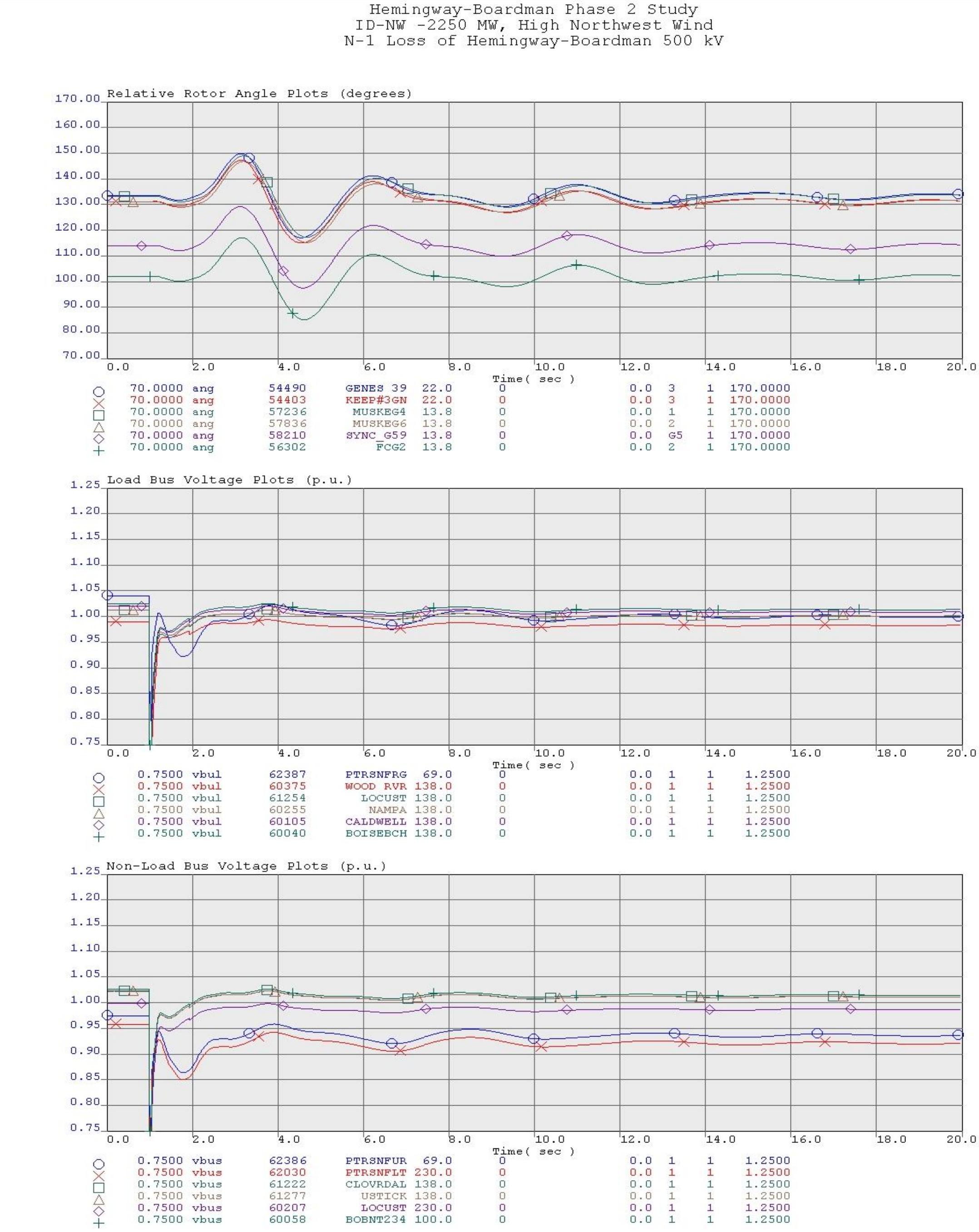
Appendix F - 16hs2a_2250idnw_nww Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Brownlee		Hanford		Hemingway		John Day		Malin		Marion		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: PAUL-RAVER & RAVER-COVINGT4 500 KV	0.83	-1077	0.89	-3573	0.75	-2513	0.98	-2108	0.83	-3263	0.86	-2389	0.76	-581	0.75	-341
N-2: PEARL-KEELER 500 KV & PEARL-SHERWOOD 230 KV + RAS	0.82	-1092	0.88	-4004	0.75	-2540	0.98	-2200	0.83	-3246	0.85	-2287	0.75	-597	0.75	-350
N-2: PEARL-OSTRANDER 500 KV & BIG EDDY-MCLOUGLN 230 KV	0.82	-1104	0.87	-4265	0.75	-2573	0.98	-2359	0.81	-3447	0.84	-2547	0.74	-608	0.75	-357
N-2: PEARL-OSTRANDER 500 KV & OSTRANDER-MCLOUGLN 230 KV	0.82	-1103	0.87	-4257	0.75	-2572	0.98	-2375	0.81	-3427	0.83	-2525	0.74	-608	0.75	-357
N-2: RAVER-COVINGTON #1 & #2 500 KV	0.82	-1107	0.87	-4213	0.75	-2583	0.97	-2576	0.81	-3465	0.84	-2622	0.74	-610	0.75	-358
N-2: RAVER-ECHO LAKE & RAVER-SCHULTZ 500 KV	0.82	-1101	0.88	-4057	0.75	-2570	0.97	-2504	0.82	-3436	0.84	-2582	0.75	-602	0.75	-354
N-2: RAVER-PAUL & NAPAVINE-PAUL 500 KV	0.83	-1074	0.89	-3600	0.75	-2506	0.98	-2093	0.83	-3220	0.86	-2365	0.76	-579	0.75	-340
N-2: RAVER-PAUL 500 KV & COULEE-OLYMPIA 300 KV	0.82	-1133	0.90	-3598	0.75	-2736	0.97	-2689	0.80	-3908	0.84	-2793	0.74	-619	0.75	-381
N-2: RAVER-PAUL 500 KV & TACOMA A-CHEHALIS 230 KV	0.82	-1132	0.90	-3701	0.75	-2732	0.97	-2695	0.80	-3899	0.84	-2796	0.73	-620	0.75	-381
N-2: RAVER-SCHULTZ #1 & #2 500 KV	0.82	-1096	0.88	-3789	0.75	-2557	0.97	-2399	0.82	-3369	0.85	-2517	0.75	-602	0.75	-353
N-2: RAVER-TACOMA & RAVER-COVINGT4 500 KV	0.82	-1105	0.87	-4139	0.75	-2578	0.97	-3201	0.82	-3445	0.84	-2598	0.74	-607	0.75	-357
N-2: RAVER-TACOMA 500 KV & TACOMA-CHRISTOP-COVINGTON 230 KV	0.82	-1104	0.87	-4178	0.75	-2576	0.97	-2545	0.82	-3447	0.84	-2603	0.75	-607	0.75	-356
N-2: ROUND MTN-TABLE MTN #1 & #2 500 KV + RAS	0.82	-1149	0.85	-5184	0.75	-2584	0.97	-3355	0.78	-2750	0.83	-3104	0.72	-659	0.74	-397
N-2: SCHULTZ-WAUTOMA & VANTAGE-SCHULTZ 500 KV + RAS	0.81	-1166	0.84	-4110	0.74	-2832	0.97	-3088	0.79	-4211	0.81	-3014	0.73	-625	0.74	-390
N-2: SICKLER-SCHULTZ & SCHULTZ-VANTAGE 500 KV + RAS	0.82	-1136	0.86	-4086	0.75	-2699	0.97	-2839	0.80	-3815	0.83	-2835	0.74	-617	0.75	-375
N-2: TABLE MTN-TESLA & TABLE MTN-VACA DIXON 500 KV	0.82	-1095	0.91	-3571	0.75	-2701	0.97	-2782	0.80	-3372	0.84	-2760	0.73	-630	0.74	-405
N-2: TAFT-BELL 500 KV & BELL-LANCASTER 230 KV	0.82	-1102	0.87	-4227	0.75	-2574	0.97	-2575	0.81	-3463	0.84	-2636	0.79	-492	0.75	-343
N-2: TAFT-BELL 500KV & BELL-BOUNDARY #3 230KV	0.82	-1108	0.87	-4185	0.75	-2586	0.97	-2570	0.81	-3456	0.84	-2617	0.77	-547	0.75	-361
N-2: TAFT-BELL 500KV & BELL-LANCASTER 230KV	0.82	-1102	0.87	-4227	0.75	-2574	0.97	-2575	0.81	-3463	0.84	-2636	0.79	-492	0.75	-343
N-2: TAFT-BELL 500KV & BELL-TRENTWOOD #2 115KV	0.82	-1107	0.87	-4232	0.75	-2581	0.97	-2565	0.81	-3447	0.84	-2615	0.77	-546	0.75	-360
N-2: TAFT-BELL 500KV & LANCASTER-NOXON 230KV	0.82	-1106	0.87	-4237	0.75	-2580	0.97	-2566	0.81	-3449	0.84	-2617	0.78	-535	0.75	-357
N-2: TAFT-DWORSHAK & GARRISON-TAFT #1 500KV	0.82	-1132	0.88	-4025	0.76	-2578	0.97	-2587	0.81	-3494	0.84	-2629	0.80	-469	0.77	-282
N-2: WAUTOMA-ROCK CK 500 KV & MIDWAY-BIG EDDY 230 KV	0.83	-1048	0.88	-3517	0.76	-2476	0.97	-2060	0.84	-3161	0.86	-2247	0.76	-562	0.76	-326
N-2: WAUTOMA-ROCK CK 500 KV & SPRINGCREEK-BIG EDDY 230 KV	0.83	-1048	0.88	-3517	0.76	-2476	0.97	-2721	0.84	-3161	0.86	-2247	0.76	-562	0.76	-326
N-3: SCHULTZ-RAVER #1 & #2 & #3 500 KV	0.82	-1092	0.88	-3638	0.75	-2544	0.98	-2895	0.82	-3333	0.85	-2478	0.75	-598	0.75	-352

Appendix F – 16lhs2a_2250idnw_nww Base Case Transient Stability Plots



Loss of Hemingway-Boardman 500 kV line
3ph fault @ HMWY 500 kV clear in 3 Cycles
RAS: None

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Figure F9: N-1 Loss of Hemingway-Summer Lake 500 kV Line (Angle & Voltage Plots)

Appendix F – 16lhs2a_2250idnw_nww Base Case Transient Stability Plots

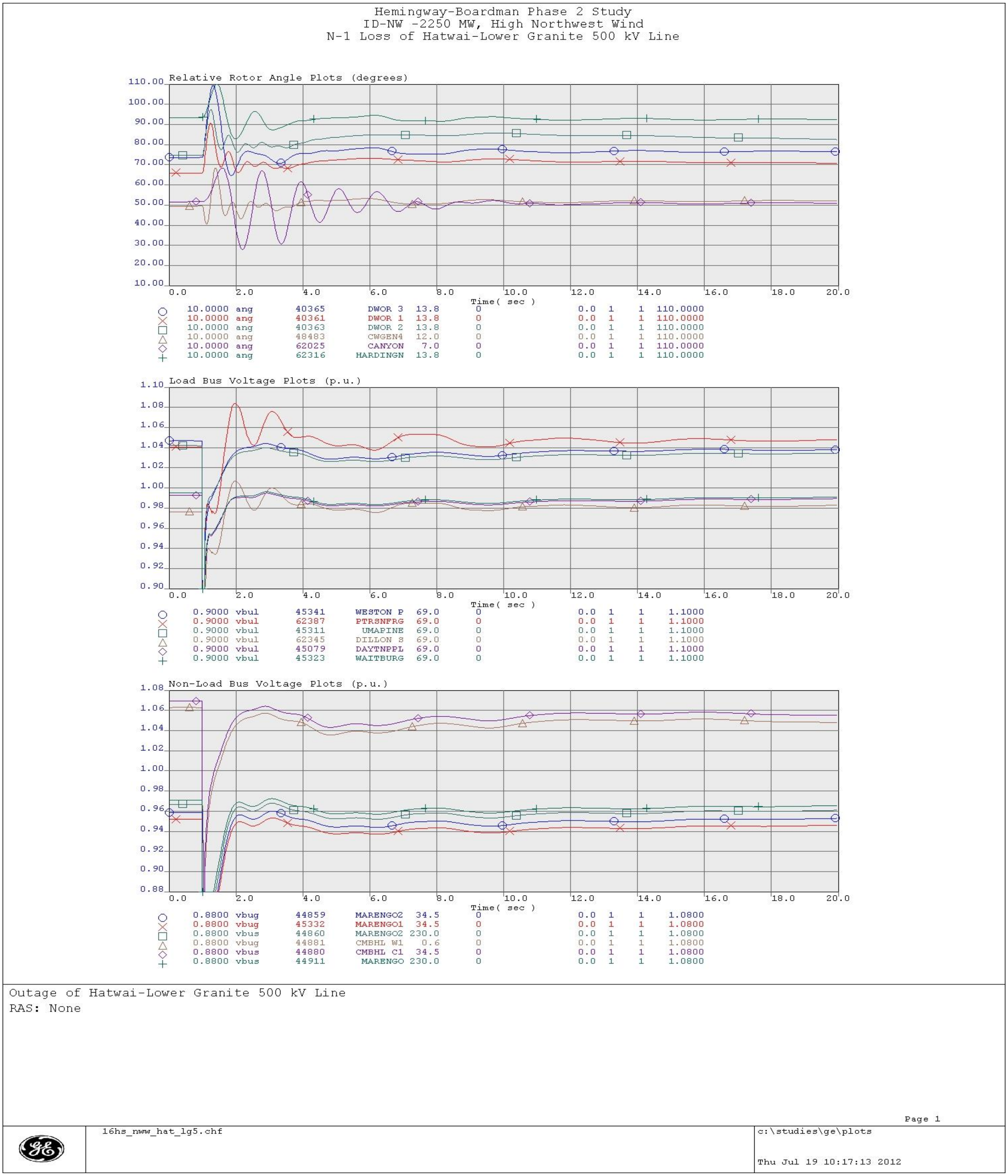


Figure F10: N-1 Loss of Hatwai-Lower Granite 500 kV Line (Angle & Voltage Plots)

Appendix F – 16lhs2a_2250idnw_nww Base Case Transient Stability Plots

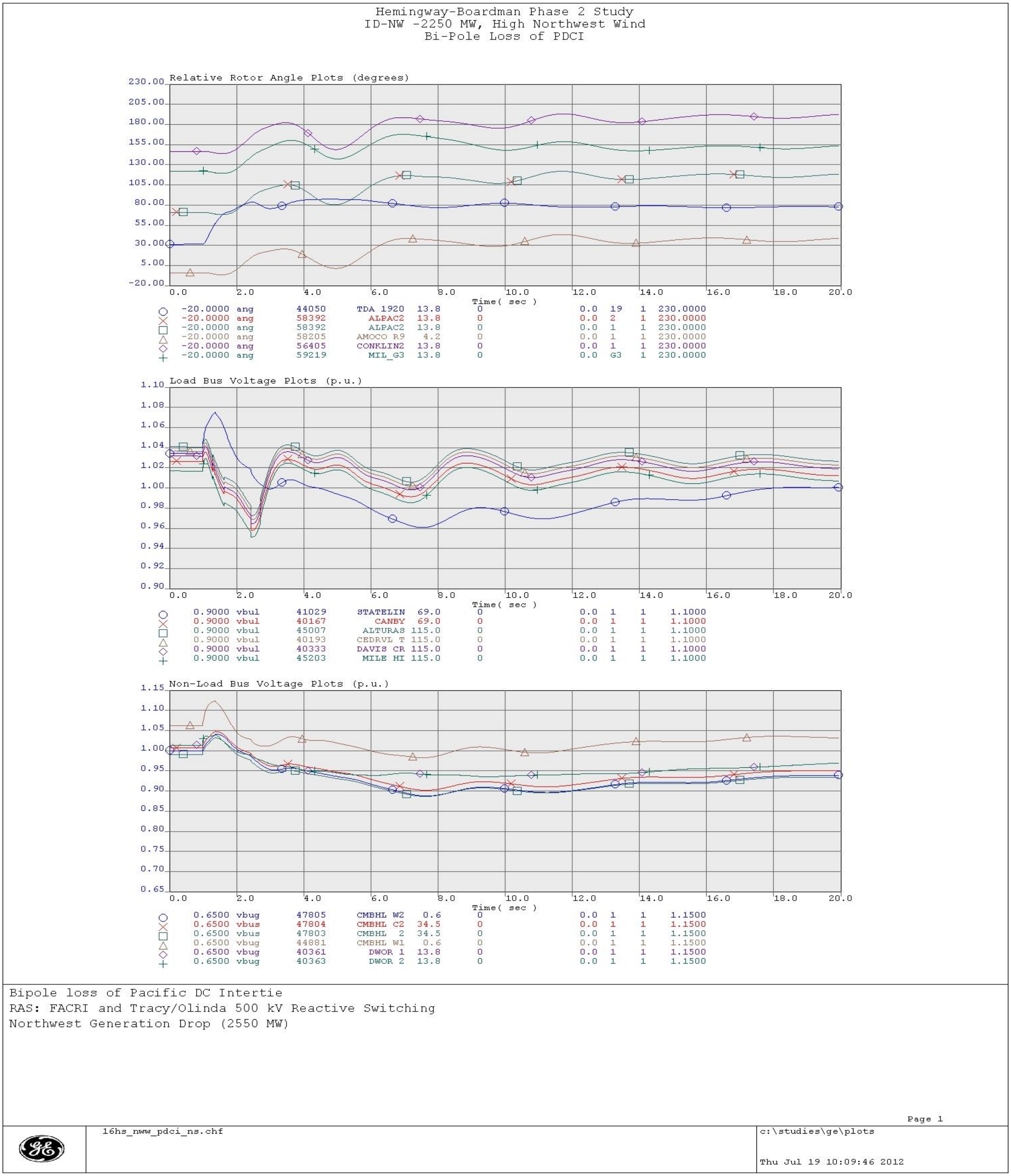


Figure F11: Bi-Pole Loss – Pacific DC Intertie (Angle & Voltage Plots)

Appendix F – 16lhs2a_2250idnw_nww Base Case Transient Stability Plots

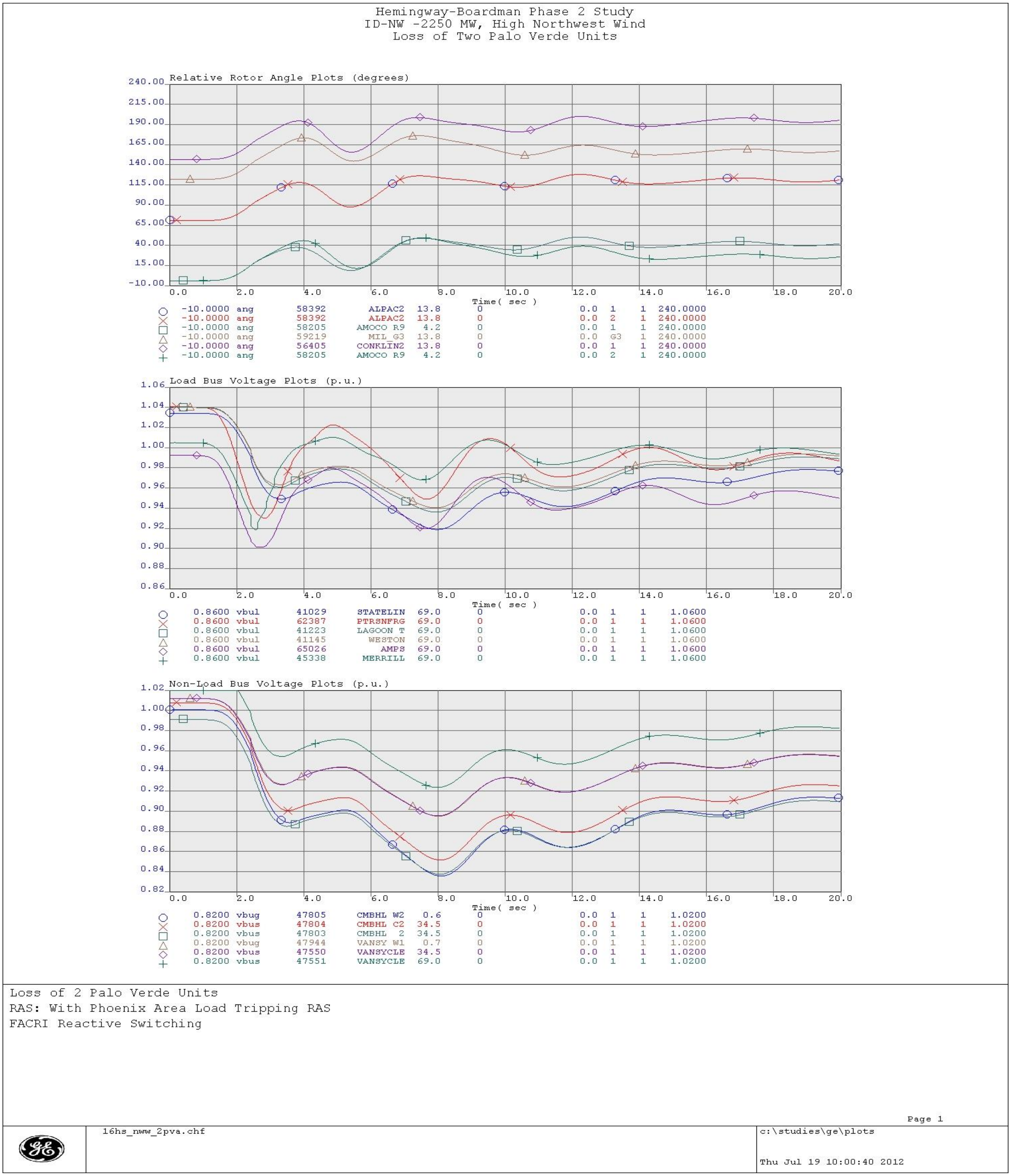


Figure F12: Loss of Two Palo Verde Units (Angle & Voltage Plots)

Appendix F – 16lhs2a_2250idnw_nww Base Case Transient Stability Plots

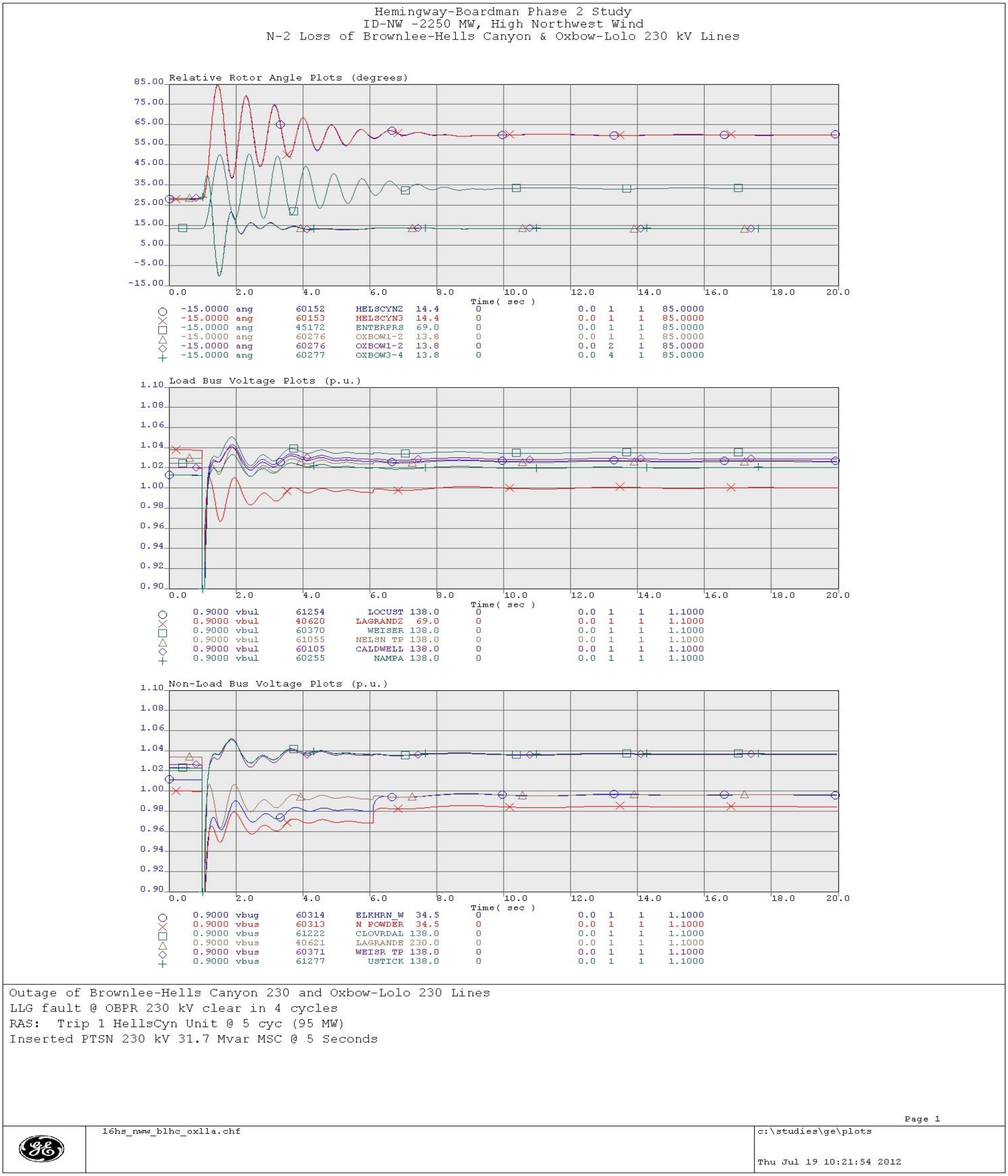
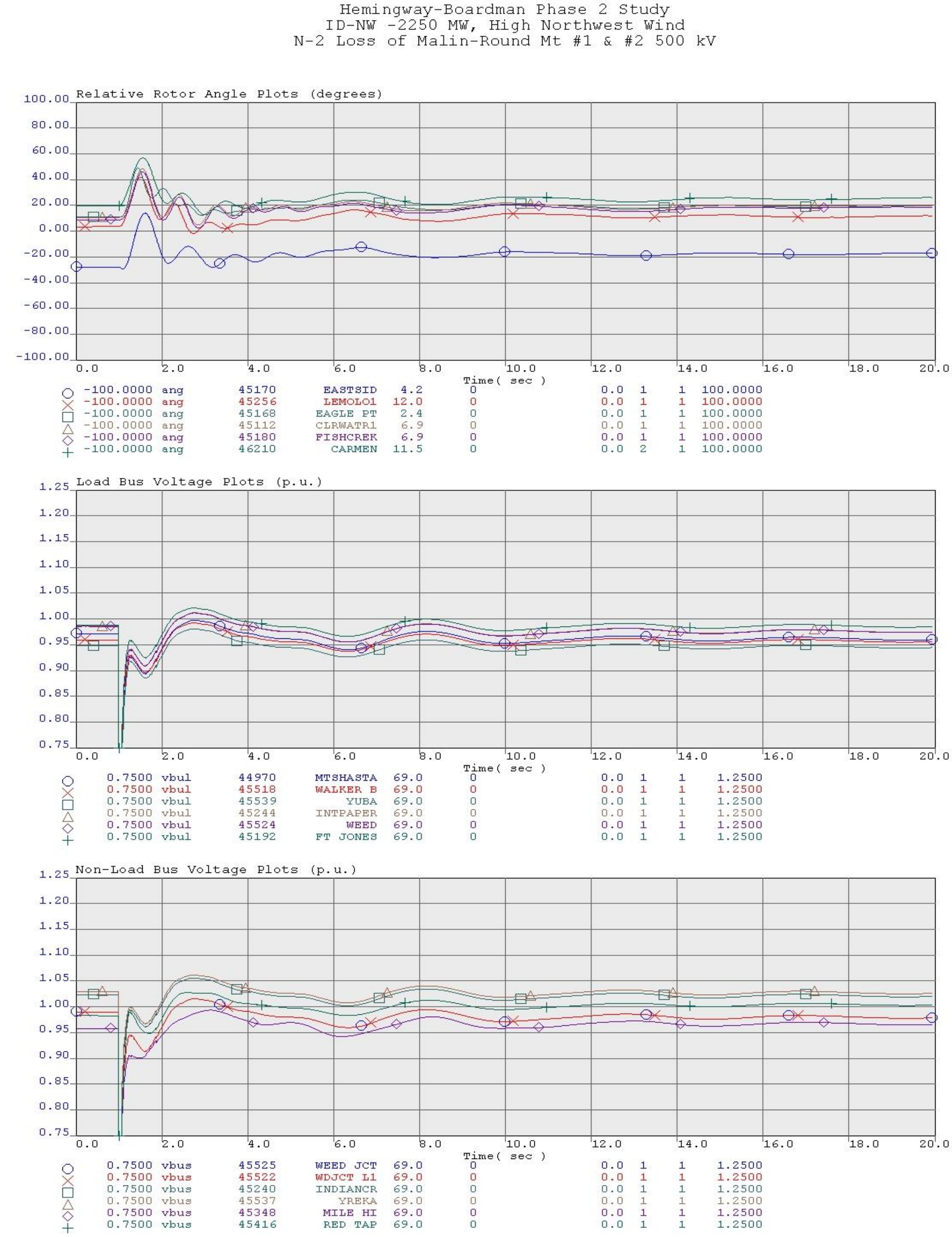


Figure F13: N-2 Loss of Brownlee-Hells Canyon &Oxbow-Lolo 230 kV Lines (Angle & Voltage Plots)

Appendix F – 16lhs2a_2250idnw_nww Base Case Transient Stability Plots



3-Phase Fault @ Malin 500 kV with 4 Cycle Clearing
Loss of Malin-Round Mtn #1 & #2 500 kV Lines
Opens Round Mtn-Table Mtn #2 500 kV Line
RAS: FACRI and Tracy/Olinda 500 kV Reactive Switching
NW Gen Drop 2400 MW

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Figure F14: N-2 Loss of Malin-Round Mt #1 & #2 500 kV Lines (Angle & Voltage Plots)

Appendix F - 16hs2a_2250idnw_nww Base Case Transient Stability Results

Fault	Disturbance/Outage	RAS Actions		Largest Swing Voltage Bus (% change)	Lowest Swing Voltage Bus (absolute value)	Largest Swing Voltage Load Bus (% change)	Lowest Load Bus Frequency (Hz)	Comments
		Cycles	Remedial Action					
N-1 3 Cy 3PH Hemingway 500 kV	Hemingway-Grassland 500 kV	Various	FACRI insert of Ft Rock Series Caps	Ptrsnfrg 69 11.4%	Ptrsnflt 230 0.851	Ptrsnfrg 69 11.4%	Bridger1 22 59.882	Stable & Damped
N-1 3 Cy 3PH Hatwai 500 kV	Hatwai-Lower Granite 500 kV	8 18	Libby 1-5 Generation Lancaster Generation	Marengo2 34.5 16.3%	Marengo1 34.5 0.796	Weston P 69 8.0%	Hardingn 13.8 59.823	Stable & Damped
Bi-pole Block	PDCI Bipole	Various	FACRI insertion of Ft Rock Series Caps, Malin Shunt CapC1 Tracy&Olinda React Switching NW 2550 MW Gen Drop	Cmbhl w2 0.6 7.5%	Midpt ~9 230 0.885	Statelin 69 7.5%	Sync_g19 13.8 59.769	Stable & Damped
N-2	Loss of 2 Palo Verde units	Various	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1&C2, CaptJack Shunt Cap C1	Cmbhl w2 0.6 16.5%	Cmbhl w2 0.6 0.836	Statelin 69 7.1%	Sync_g19 13.8 59.756	Stable & Damped
N-2 4 Cy LLG Oxbow 230 kV	Brownlee-Hells Canyon 230 kV Oxbow-Lolo 230 kV	5	Tripped 1 Hells Cyn Unit (110 MW)	Elkhrn_W 34.5 10.5%	Ptrsnflt 230 0.899	Locust 138 7.6%	Oxbow1-2 13.8 59.754	Stable & Damped
N-2 4 Cy 3PH Malin 500 kV	Malin-Round Mt #1 500 kV Malin-Round Mt #2 500 kV Round Mt-Table Mt #2 500 kV	Various	Chief Jo Braking Resistor Tracy&Olinda React Switching NW 2400 MW Gen Drop FACRI insert of Ft Rock Series Caps Flash Malin-Round Mt S-Caps	Mtshasta 69 15.8%	Yuba 69 0.802	Mtshasta 69 15.8%	Kno 13g6 13.8 59.767	Stable & Damped

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Shunt HANFORD_500.0 (40499) #s
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Bus MALIN R3_500.0 (40688)
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Bus HOT SPR_500.0 (40553)
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HERMCALP_500.0 (47638)

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP S1_ 18.0 (47641)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G2_ 18.0 (47640)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G1_ 18.0 (47639)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 2
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN Bus ASHE R1_500.0 (40062)
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Bus SANTIAM_500.0 (40941)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Shunt OSTRNDER_500.0 (40809) #s
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOK TAP_500.0 (41001)

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Contingency Studied	Actions Taken in the Contingency
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOKING_500.0 (41007)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt MONROE_500.0 (40749) #s
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR G2_ 20.0 (47744)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2AX_ 4.2 (47746)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2FG_ 13.8 (47747)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR G1_ 20.0 (47740)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1AX_ 4.2 (47742)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1FG_ 13.8 (47743)
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Transformer TONO_115.0 (42806) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Shunt OLY E_230.0 (40794) #s
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 80 MVR
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS SJUAN_G1_ 22.0 (10318) TO 63 MVR
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN Shunt MONROE_500.0 (40749) #s
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Transformer ALLSTON_500.0 (40045) TO ALLSTN E_230.0 (40043) CKT 2
BF 4708 Hatwai 500 kV Bus	OPEN Bus HATWAI_500.0 (40521)
BF 4708 Hatwai 500 kV Bus	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4708 Hatwai 500 kV Bus	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4708 Hatwai 500 kV Bus	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Transformer CHIEF JO_500.0 (40233) TO CHIEF J2_230.0 (40232) CKT 3
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN InjectionGroup RAS Lower Granite Gen Drop
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 67.1 MVR
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Transformer BIG EDDY_500.0 (40111) TO BIGEDDY1_230.0 (41341) CKT 2
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Bus CGS_ 25.0 (40063)
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1

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Contingency Studied	Actions Taken in the Contingency
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN Bus BURNS_500.0 (45029)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R3_500.0 (40688)
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN Bus ROUND BU_500.0 (43485)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Bus MAPLE VL_500.0 (40693)
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M1_500.0 (43115)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G1_ 18.0 (47639) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G2_ 18.0 (47640) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP S1_ 18.0 (47641) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
BF 5266 Slatt-Buckly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1

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Contingency Studied	Actions Taken in the Contingency
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Bus BURNS_500.0 (45029)
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF Lolo 230kV	OPEN Bus LOLO_230.0 (48197)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1G_ 18.0 (45454)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1S_ 13.8 (45455)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2G_ 18.0 (45456)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2S_ 13.8 (45457)
BF McNary 230 kV SECT 1	OPEN Bus MCN 01_ 13.8 (44101)
BF McNary 230 kV SECT 1	OPEN Bus MCN 02_ 13.8 (44102)
BF McNary 230 kV SECT 1	OPEN Bus MCN 03_ 13.8 (44103)
BF McNary 230 kV SECT 1	OPEN Bus MCN 04_ 13.8 (44104)
BF McNary 230 kV SECT 1	OPEN Bus BOARD T1_230.0 (40121)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_230.0 (40129)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_115.0 (40127)
BF McNary 230 kV SECT 1	OPEN Bus MORROW 1_115.0 (47334)
BF McNary 230 kV SECT 1	OPEN Bus PORT MOR_115.0 (47335)
BF McNary 230 kV SECT 1	OPEN Bus MORRO G1_ 13.8 (47658)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN T_ 69.0 (40608)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN_ 69.0 (47332)
BF McNary 230 kV SECT 1	OPEN Bus KINZ WW_ 12.5 (47331)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_ 69.0 (40125)
BF McNary 230 kV SECT 1	OPEN Bus IONE_ 69.0 (40575)
BF McNary 230 kV SECT 1	OPEN Bus TOWER RD_115.0 (41324)
BF McNary 230 kV SECT 1	OPEN Bus ALKALI C_115.0 (41319)
BF McNary 230 kV SECT 1	OPEN Bus HERMISTN_230.0 (45137)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH1_230.0 (44122)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH2_230.0 (44123)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX1_100.0 (44115)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX2_100.0 (44116)
BF McNary 230 kV SECT 2	OPEN Bus MCNRY S2_230.0 (41352)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH34_230.0 (44125)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH3_230.0 (44124)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH4_230.0 (44126)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX3_100.0 (44117)
BF McNary 230 kV SECT 2	OPEN Bus MCN 05_ 13.8 (44105)
BF McNary 230 kV SECT 2	OPEN Bus MCN 06_ 13.8 (44106)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX4_100.0 (44118)
BF McNary 230 kV SECT 2	OPEN Bus MCN 07_ 13.8 (44107)
BF McNary 230 kV SECT 2	OPEN Bus MCN 08_ 13.8 (44108)
BF McNary 230 kV SECT 2	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 52.2 MVR
BF McNary 230 kV SECT 3	OPEN Bus MCNRY S3_230.0 (41353)
BF McNary 230 kV SECT 3	OPEN Bus MCN PH5_230.0 (44127)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX5_100.0 (44119)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX6_100.0 (44120)
BF McNary 230 kV SECT 3	OPEN Bus MCN 09_ 13.8 (44109)
BF McNary 230 kV SECT 3	OPEN Bus MCN 10_ 13.8 (44110)
BF McNary 230 kV SECT 3	OPEN Bus MCN 11_ 13.8 (44111)
BF McNary 230 kV SECT 3	OPEN Bus MCN 12_ 13.8 (44112)
BF McNary 230 kV SECT 3	OPEN Bus MCNARY_345.0 (40721)
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	CLOSE Shunt QUARTZ_138.0 (60305) #c1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	CLOSE Shunt QUARTZ_138.0 (60305) #c1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Gen BOARD CT_ 18.5 (43044) #1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Transformer BOARD ST_ 16.0 (43045) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Transformer BOARD CT_ 18.5 (43044) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Gen BOARD ST_ 16.0 (43045) #1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
BF PGE Grassland-Slatt 500kV & Boardman Plant	OPEN Transformer BOARD F_ 24.0 (43047) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Slatt 500kV & Boardman Plant	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
Bus: Alvey 500 kV + RAS	OPEN Bus ALVEY_500.0 (40051)
Bus: Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
Bus: Bell BPA 500 kV	OPEN Bus BELL BPA_500.0 (40091)
Bus: Bell BPA 500 kV	OPEN Bus COULE R1_500.0 (40288)
Bus: Bell BPA 500 kV	OPEN Bus BELL SC_500.0 (40096)
Bus: Buckley 500 kV	OPEN Bus BUCKLEY_500.0 (40155)
Bus: Dixonville 500 kV	OPEN Bus DIXONVLE_500.0 (45095)
Bus: Dixonville 500 kV	SET SWITCHED SHUNT AT BUS GRANT PS_230.0 (45123) TO 147.4 MVR
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #2
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #3
Bus: Hot Springs 500 kV	OPEN Bus HOT SPR_500.0 (40553)
Bus: Keeler 500 kV + RAS	OPEN Bus KEELER_500.0 (40601)
Bus: Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
Bus: Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_500.0 (41401)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_230.0 (41402)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_230.0 (47386)
Bus: Rock Creek 500 kV	OPEN Bus ENRGZR T_230.0 (47823)
Bus: Rock Creek 500 kV	OPEN Bus WHITE CK_230.0 (47827)
Bus: Rock Creek 500 kV	OPEN Bus IMRIE_230.0 (47822)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_ 34.5 (47387)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC C1_ 34.5 (47388)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC W1_ 0.7 (47389)
Bus: Rock Creek 500 kV	OPEN Bus DOOLEY T_230.0 (47465)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 3_ 34.5 (47496)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 2_ 34.5 (47493)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C2_ 34.5 (47494)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W2_ 0.7 (47495)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C3_ 34.5 (47497)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W3_ 0.7 (47498)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE 1_ 34.5 (47829)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 1_ 34.5 (47825)
Bus: Rock Creek 500 kV	OPEN Bus WILLIS T_230.0 (47824)
Bus: Rock Creek 500 kV	OPEN Bus TULMN 1_ 34.5 (47826)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C1_ 34.5 (47936)
Bus: Rock Creek 500 kV	OPEN Bus TULMN C1_ 34.5 (47938)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 2_ 34.5 (47903)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 1_ 34.5 (47902)
Bus: Rock Creek 500 kV	OPEN Bus MILLRA S_230.0 (47857)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE C1_ 34.5 (47865)
Bus: Rock Creek 500 kV	OPEN Bus MILLR 1_ 34.5 (47966)
Bus: Rock Creek 500 kV	OPEN Bus HARVST W_230.0 (47858)
Bus: Rock Creek 500 kV	OPEN Bus HRVST 1_ 34.5 (47979)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE W1_ 0.6 (47866)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C1_ 34.5 (47904)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C2_ 34.5 (47905)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W1_ 0.7 (47906)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W2_ 0.7 (47907)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W1_ 0.7 (47937)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W2_ 0.6 (47940)

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
Bus: Rock Creek 500 kV	OPEN Bus TULMN W1_ 0.7 (47939)
Bus: Rock Creek 500 kV	OPEN Bus MILLR C1_ 34.5 (47967)
Bus: Rock Creek 500 kV	OPEN Bus MILLR W1_ 0.6 (47968)
Bus: Rock Creek 500 kV	OPEN Bus HRVST C1_ 34.5 (47980)
Bus: Rock Creek 500 kV	OPEN Bus HRVST W1_ 0.7 (47981)
Bus: Sickler 500 kV	OPEN Bus SICKLER_500.0 (40973)
Bus: Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
Bus: Summer Lake 500 kV	OPEN Bus SUMMER L_500.0 (41043)
Bus: Summer Lake 500 kV	OPEN Bus BURNS_500.0 (45029)
Bus: Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-1: Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
N-1: Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
N-1: Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
N-1: Allston-Napavine 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-1: Allston-Paul #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-1: Alvery-Dixonville 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO DIXONVLE_500.0 (45095) CKT 1
N-1: Alvey-Marion 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
N-1: Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-1: Ashe-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
N-1: Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-1: Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-1: Bell-Coulee 500 kV	OPEN Bus COULE R1_500.0 (40288)
N-1: Bell-Taft 500 kV	OPEN Bus BELL SC_500.0 (40096)
N-1: Big Eddy-Celilo 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO CELILO1_500.0 (41311) CKT 1
N-1: Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-1: Big Eddy-Knight 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO KNIGHT_500.0 (41450) CKT 1
N-1: Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-1: Boise Bench-Brownlee #3 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-1: Brady-Antelope 230 kV	OPEN Line BRADY_230.0 (60073) TO ANTLOPE_230.0 (65075) CKT 1
N-1: Broadview-Garrison #1 500 kV	OPEN Bus GAR1EAST_500.0 (40451)
N-1: Broadview-Garrison #1 500 kV	OPEN Bus TOWN1_500.0 (62013)
N-1: Brownlee-Ontario 230 kV	OPEN MultiSectionLine BROWNLEE_230.0 (60095) TO ONTARIO_230.0 (60265) CKT 1
N-1: Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-1: Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-1: Buckley-Slatt 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-1: Captain Jack-Olinda 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO OLINDA_500.0 (30020) CKT 1
N-1: CaptJack-Kfalls 500 kV	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
N-1: Cascade Crossing 500 kV	OPEN Bus CDR SPRG_500.0 (43950)
N-1: Cascade Crossing 500 kV	OPEN Bus CDRSBET1_500.0 (43951)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHCRS1_500.0 (43491)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHEL5_500.0 (43041)
N-1: Chief Jo-Coulee 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-1: Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-1: Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-1: Coulee-Hanford 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-1: Coulee-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Covington4-Raver 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-1: Covington5-Raver 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
N-1: Coyote-Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
N-1: CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-1: Dixonville-Meridian 500 kV	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
N-1: Drycreek-Lolo 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO LOLO_230.0 (48197) CKT 1
N-1: Drycreek-N Lewiston 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO N LEWIST_230.0 (48255) CKT 1
N-1: Drycreek-Wala Ava 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO WALA AVA_230.0 (48451) CKT 1
N-1: Drycreek-Wala Ava 230 kV	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Dworshak-Hatwai 500 kV + RAS + PTSN	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS + PTSN	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS + PTSN	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Dworshak-Hatwai 500 kV + RAS + PTSN	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Dworshak-Taft 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-1: Echo Lake-Maple Valley 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO MAPLE VL_500.0 (40693) CKT 1
N-1: Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-1: Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Echo Lake-Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
N-1: Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-1: Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSHE1_115.0 (32229)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSESHE_115.0 (32230)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTL1_115.0 (32233)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_115.0 (32234)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_ 13.2 (32460)
N-1: Goldhill-Placer 115 kV	OPEN Bus FLINT1_115.0 (32236)
N-1: Grassland-Coyote 500 kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-1: Grassland-Slatt 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
N-1: Grizzly-John Day #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-1: Grizzly-Malin 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN MultiSectionLine PONDROSA_500.0 (40837) TO SUMMER L_500.0 (41043) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZ R3_500.0 (40488) TO PONDROSA_500.0 (40837) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO GRIZZ R3_500.0 (40488) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Grizzly-Round Bu 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO ROUND BU_500.0 (43485) CKT 1
N-1: Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-1: Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-1: Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Transformer HATWAI_500.0 (40521) TO HATWAI_230.0 (40519) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
N-1: Hatwai-Lolo 230 kV	OPEN Line HATWAI_230.0 (40519) TO LOLO_230.0 (48197) CKT 1
N-1: Hatwai-Lolo 230 kV	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 67.1 MVR
N-1: Hatwai-Low Gran 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Hatwai-Low Gran 500 kV	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 67.1 MVR
N-1: Hatwai-N Lewiston 230 kV	OPEN Line HATWAI_230.0 (40519) TO N LEWIST_230.0 (48255) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO HURICANE_230.0 (45103) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN MultiSectionLine HURICANE_230.0 (45103) TO WALAWALA_230.0 (45327) CKT 1
N-1: Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt MALIN_500.0 (40687) #s
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
N-1: Hemingway-Summer Lake 500 kV	OPEN Line HEMINWAY_500.0 (60155) TO BURNS_500.0 (45029) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN MultiSectionLine BURNS_500.0 (45029) TO SUMMER L_500.0 (41043) CKT 1
N-1: Hill Top 345/230 Xfmr	OPEN Transformer HIL TOP_230.0 (40537) TO HIL TOP_345.0 (64058) CKT 1
N-1: Horse Hv-McNary 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-1: Hot Springs-Taft 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line COYOTECR_345.0 (64032) TO HUMBOLDT_345.0 (64059) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line MAGGIECR_120.0 (64070) TO CARLIN_120.0 (64169) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt EIGHTMFK_120.0 (64457) #b
N-1: Humboldt-Coyote Ck 345 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 10.8 MVR
N-1: Humboldt-Coyote Ck 345 kV	CLOSE Shunt HUMBOLT1_ 24.9 (64216) #b
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO &1_345.0 (67582)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO_345.0 (66225)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #2_ 99.0 (65014)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #3_ 99.0 (65017)
N-1: Ing500-CusterW 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-1: John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-1: John Day-Rock Ck 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-1: John Day-Slatt 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-1: Kfalls-Meridian 500 kV	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
N-1: Knight-Wautoma 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
N-1: LaGrande-North Powder 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO N POWDER_230.0 (60312) CKT 1
N-1: Lanes-Marion 500 kV	OPEN Line LANE_500.0 (40629) TO MARION_500.0 (40699) CKT 1
N-1: Lit Goose-Central Ferry 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
N-1: Lit Goose-Low Mon 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
N-1: Low Gran-Central Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Low Mon-Sac Tap 500 kV	OPEN Line LOW MON_500.0 (40683) TO SACJWA T_500.0 (40917) CKT 1
N-1: Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
N-1: Malin-Hilltop 230 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 5.4 MVR
N-1: Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-1: Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-1: Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-1: Maple Vly-Rocky RH 345 kV	OPEN MultiSectionLine MAPLE VL_345.0 (40691) TO ROCKY RH_345.0 (40891) CKT 1
N-1: Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Line MARION_500.0 (40699) TO SANTIAM_500.0 (40941) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Shunt SANTIAM_230.0 (40939) #s
N-1: McLouglin-Ostrander 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-1: McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
N-1: McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS N POWDER_ 34.5 (60313) TO 9 MVR
N-1: McNary S2-McNary S3 230 kV	OPEN Line MCNRY S2_230.0 (41352) TO MCNRY S3_230.0 (41353) CKT 1
N-1: McNary-Board T1 230 kV	OPEN Line BOARD T1_230.0 (40121) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-1: McNary-Longhorn 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
N-1: McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-1: McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-1: McNary-Roundup 230 kV	OPEN Line MCNRY S1_230.0 (41351) TO ROUNDUP_230.0 (40905) CKT 1
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJWA T_500.0 (40917)
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
N-1: McNary-Sac Tap-Low Mon 500 kV	CLOSE Gen ICE H1-2_ 13.8 (40559) #1
N-1: Midpoint-Hemingway 500 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Midpoint-Humboldt 345 kV	OPEN Bus IDAHO-NV_345.0 (64061)
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS HIL TOP_230.0 (40537) TO 52.2 MVR
N-1: Midpoint-Humboldt 345 kV	OPEN Shunt GONDER_230.0 (64056) #v
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 10.8 MVR
N-1: Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Shunt OLY E_230.0 (40794) #s

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Ontario-Caldwell 230 kV	OPEN MultiSectionLine CALDWELL_230.0 (60110) TO LANGLEY_230.0 (60266) CKT 1
N-1: Ostrander-Knight 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-1: Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-1: Ostrander-Troutdale 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO TROUTDAL_500.0 (41095) CKT 1
N-1: Oxbow-Brownlee #2 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 2
N-1: Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-1: Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-1: Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO SATSOP_500.0 (40949) CKT 1
N-1: Pearl-Keeler 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-1: Pinto-Four Corner 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Ponderosa A 500/230 kV Xfmr	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Ponderosa B 500/230 kV Xfmr	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Raver-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-1: Raver-Tacoma 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus H ALLEN_345.0 (18001)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus HA PS_345.0 (18002)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus UTAH-NEV_345.0 (67657)
N-1: Robinson-Harry Allen 500 kV	OPEN Line ROBINSON_500.0 (64895) TO H ALLEN_500.0 (18450) CKT 1
N-1: Rock Ck-Wautoma 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Round Mtn-Table Mtn 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-1: Roundup-Lagrande 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO ROUNDUP_230.0 (40905) CKT 1
N-1: Schultz-Sickler 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-1: Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-1: Schultz-Wautoma 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Sigurd-Glen Canyon 230 kV	OPEN Bus SIGURDPS_230.0 (66355)
N-1: Slatt 500/230 kV Xfmr	OPEN Transformer SLATT_500.0 (40989) TO SLATT_230.0 (40986) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-1: Snok Tap-Snoking 500 kV	OPEN Line SNOK TAP_500.0 (41001) TO SNOKING_500.0 (41007) CKT 1
N-1: Table Mtn-Tesla 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-1: Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-1: Vantage 500/230 kV Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
N-1: Vantage 500/230 kV Xfmr #2	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 2
N-1: Walla Walla-Talbot 230 kV	OPEN Line TALBOT_230.0 (44912) TO WALAWALA_230.0 (45327) CKT 1
N-1: Walla Walla-Talbot 230 kV	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134 MVR
N-1: Walla Walla-Wallula 230 kV	OPEN Line WALAWALA_230.0 (45327) TO WALLULA_230.0 (45331) CKT 1
N-1: Walla Walla-Wallula 230 kV	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Ashe-Slatt 500 kV	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 17 MVR
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Line BETHEL_230.0 (43039) TO ROUNDB N_230.0 (43483) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	CLOSE Shunt BETHEL5_500.0 (43041) #1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN MultiSectionLine BETHEL_230.0 (43039) TO SANTIAM_230.0 (40939) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	CLOSE Shunt BETHEL5_500.0 (43041) #1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap MIKKALO_500.0 (43970) TO MKLOSNT2_500.0 (43971) CKT 2
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap SANTIAM_500.0 (40941) TO SANTMKO2_500.0 (43492) CKT 2
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN MultiSectionLine BIGEDDY2_230.0 (41342) TO CHEMAWA_230.0 (40213) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Bus PARKDALE_230.0 (40813)
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 2
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIHOR41_230.0 (61995) CKT 4 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO HORSEFLT_230.0 (60102) CKT 4
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO11_230.0 (61998) CKT 1 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO21_230.0 (61997) CKT 2 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 1
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine BRIDGER_345.0 (60085) TO 3MIKNOLL_345.0 (60084) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	CLOSE Shunt KINPORT_345.0 (60190) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Series Cap GAR1EAST_500.0 (40451) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line GAR1EAST_500.0 (40451) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Series Cap GAR2EAST_500.0 (40453) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line GAR2EAST_500.0 (40453) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 2_ 22.0 (62049) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt PTRSNFLT_230.0 (62030) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt OREBASIN_230.0 (66145) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt FRANNIE2_ 34.5 (67145) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS ROSEBUD_230.0 (63012) TO -10 MVR
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt GARLAND1_ 34.5 (67147) #1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Transformer HELLSCYN_230.0 (60150) TO HELSCYN1_ 14.4 (60151) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN Line MONROE_230.0 (40747) TO NOVELTY_230.0 (42304) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus CHIEF J3_345.0 (40223)
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus SNOHOMS3_345.0 (40993)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
N-2: Coulee-Schultz #1 & #2 500 kV	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.5 MVR
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #I
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO3_ 13.8 (41216) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO4_ 13.8 (41217) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO5_ 13.8 (41218) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO6_ 13.8 (41219) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO7_ 13.8 (41220) #F
N-2: DC-BIPOLE	OPEN Shunt MALIN_500.0 (40687) #s
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: DC-BIPOLE	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: DC-BIPOLE	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: DC-BIPOLE	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: DC-BIPOLE	CHANGE INJECTION GROUP RAS PDCI Gen Drop Units BY 'PDCI_gen_drop_value_less300' MW in generator merit order by opening
N-2: DC-BIPOLE	OPEN Bus SYLMAR1_230.0 (26097)
N-2: DC-BIPOLE	OPEN Bus SYLMAR2_230.0 (26099)
N-2: DC-BIPOLE	OPEN Shunt SYLMAR S_230.0 (24147) #b
N-2: DC-BIPOLE	OPEN Shunt SYLMARLA_230.0 (26094) #b
N-2: DC-BIPOLE	OPEN Shunt BIGEDDY2_230.0 (41342) #s
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #b
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS ANTELOPE_230.0 (24401) TO 158.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt BARRE_230.0 (24016) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS BARRE_230.0 (24016) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt CHINO_230.0 (24025) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS CHINO_230.0 (24025) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt DEVERS_230.0 (24804) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS DEVERS_230.0 (24804) TO 316.8 MVR
N-2: DC-BIPOLE	CLOSE Shunt EL NIDO_230.0 (24040) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS EL NIDO_230.0 (24040) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt GOULD_230.0 (24059) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS GOULD_230.0 (24059) TO 79.2 MVR

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: DC-BIPOLE	CLOSE Shunt LCIENEGA_230.0 (24082) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LCIENEGA_230.0 (24082) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LAGUBELL_230.0 (24076) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LAGUBELL_230.0 (24076) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOMW_230.0 (24093) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOMW_230.0 (24093) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOME_230.0 (25656) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOME_230.0 (25656) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRAGE_230.0 (24806) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRAGE_230.0 (24806) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MOORPARK_230.0 (24099) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MOORPARK_230.0 (24099) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_230.0 (24100) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS OLINDA_230.0 (24100) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt PADUA_230.0 (24112) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PADUA_230.0 (24112) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt PARDEE_230.0 (24114) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PARDEE_230.0 (24114) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt RIOHONDO_230.0 (24126) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS RIOHONDO_230.0 (24126) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt SANBRDNO_230.0 (24132) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS SANBRDNO_230.0 (24132) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt S.CLARA_230.0 (24128) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS S.CLARA_230.0 (24128) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #b
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #2
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VALLEYSC_115.0 (24160) TO 187.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt VILLA PK_230.0 (24154) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VILLA PK_230.0 (24154) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VINCENT_230.0 (24155) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VINCENT_230.0 (24155) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VSTA_230.0 (24901) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VSTA_230.0 (24901) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt WALNUT_230.0 (24158) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS WALNUT_230.0 (24158) TO 79.2 MVR
N-2: DC-BIPOLE	OPEN Bus CELILO4_230.0 (41314)
N-2: DC-BIPOLE	OPEN Bus CELILO3_230.0 (41313)
N-2: DC-BIPOLE	OPEN Bus CELILO2_500.0 (41312)
N-2: DC-BIPOLE	OPEN Bus CELILO1_500.0 (41311)
N-2: Double Palo Verde	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-2: Double Palo Verde	OPEN Shunt MALIN_500.0 (40687) #s
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: Double Palo Verde	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: Double Palo Verde	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: Double Palo Verde	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: Double Palo Verde	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: Double Palo Verde	OPEN Gen PALOVRD2_ 24.0 (14932) #1
N-2: Double Palo Verde	OPEN Gen PALOVRD1_ 24.0 (14931) #1
N-2: Double Palo Verde	CHANGE LOAD AT BUS AGUAFAPS_ 69.0 (14400) BY -120 MW (cnst pf)
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 67.1 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS HOPKR W2_ 34.5 (47802) TO 14.4 MVR
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Line COVINGTN_230.0 (40303) TO MAPLEV12_230.0 (40692) CKT 2
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_345.0 (40691)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus ROCKY RH_345.0 (40891)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN Bus PONDROSB_500.0 (40834)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus PONDROSA_500.0 (40837)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus GRIZZ R3_500.0 (40488)
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus CASCADTP_230.0 (40185)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus WINDSHAR_230.0 (41155)
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus ALFALFA_230.0 (40039)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus OUTLOOK_230.0 (45229)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Load MILCTYDC_230.0 (63010) #D1
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Shunt MILCTYCD 230.0 (63010) #b1
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN InjectionGroup RAS Lower Granite Gen Drop
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
	merit order by opening
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #6
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG2_ 13.2 (38755) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #10
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #11
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine MCNARY_345.0 (40721) TO ROSS_345.0 (40901) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN Line KING_230.0 (60177) TO MIDPOINT_230.0 (60232) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line PEARL #_230.0 (43773) TO SHERWOOD_230.0 (43527) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN MultiSectionLine BIGEDDY3_230.0 (41343) TO MCLOUGLN_230.0 (43313) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT5_500.0 (40306)
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus COULEE_300.0 (40285)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus OLYMPIA_300.0 (40795)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Bus CENTR SS_230.0 (47748)
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN Bus CHRISTOP_230.0 (42505)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 2
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Transformer ROUND MT_500.0 (30005) TO RD MT 1M_500.0 (30065) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_DLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_SLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 1_ 12.5 (38825)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 2_ 12.5 (38830)

Appendix F - 16hs2a_2250idnw_N_nww Base Case Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 3_ 12.5 (38835)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 4_ 12.5 (38840)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 5_ 12.5 (38845)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT1_ 13.8 (38700)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT2_ 13.8 (38705)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT3_ 13.8 (38710)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT4_ 13.8 (38715)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 4-5_ 13.8 (31782)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBOU2-3_ 11.5 (31808)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 1_ 11.5 (31810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 1_ 18.0 (34600)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 2_ 18.0 (34602)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 3_ 18.0 (34604)
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus ADDY N_230.0 (40021)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Line BELL BPA_115.0 (40087) TO BIGELOW_115.0 (40113) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine LANCASTR_230.0 (40624) TO NOXONBPA_230.0 (40787) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4

Appendix G

16hs2a_2250idnw_N_wom Base Case (High West of McNary & West of Slatt)

Appendix G– 16hs2sa_2250idnw_N_wom Case Post-Transient Contingency Results

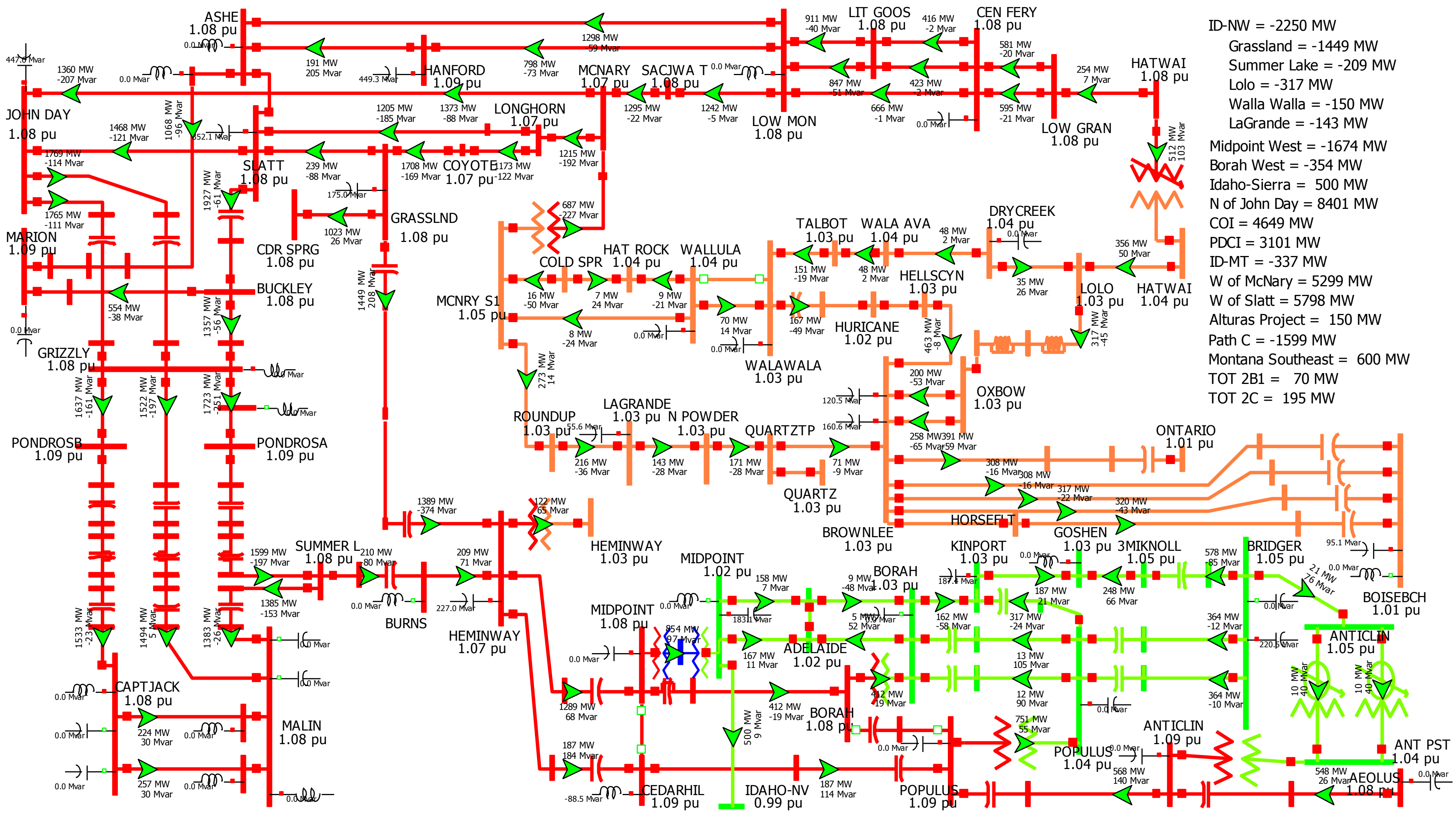

Figure G1: 16hs2sa_2250idnw_N_wom Case **Pre-Contingency**

Appendix G– 16hs2sa_2250idnw_N_wom Case Post-Transient Contingency Results

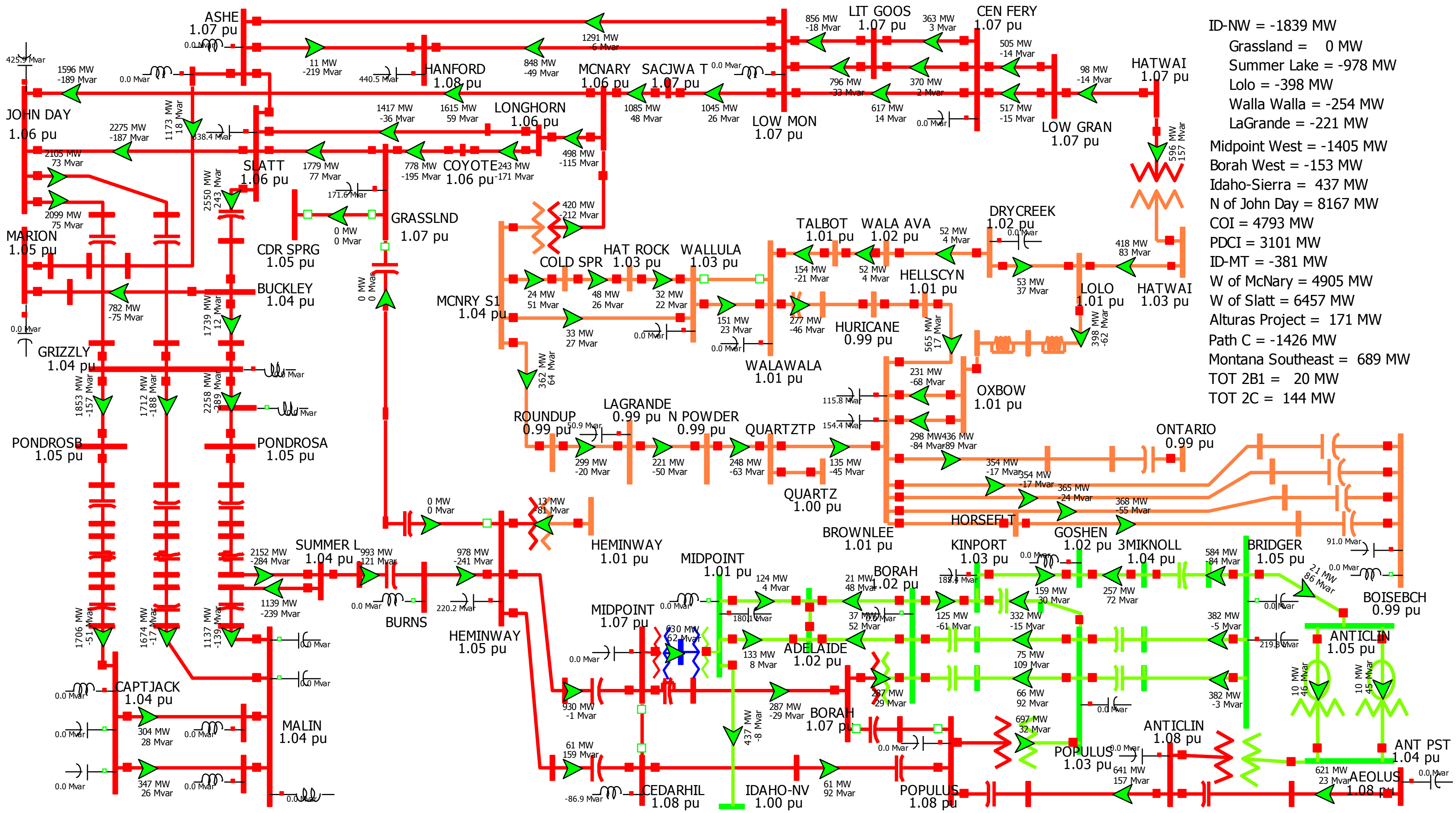

Figure G2: 16la1sa_3400idnw_N_wom Case after the contingency **BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN**

Appendix G– 16hs2sa_2250idnw_N_wom Case Post-Transient Contingency Results

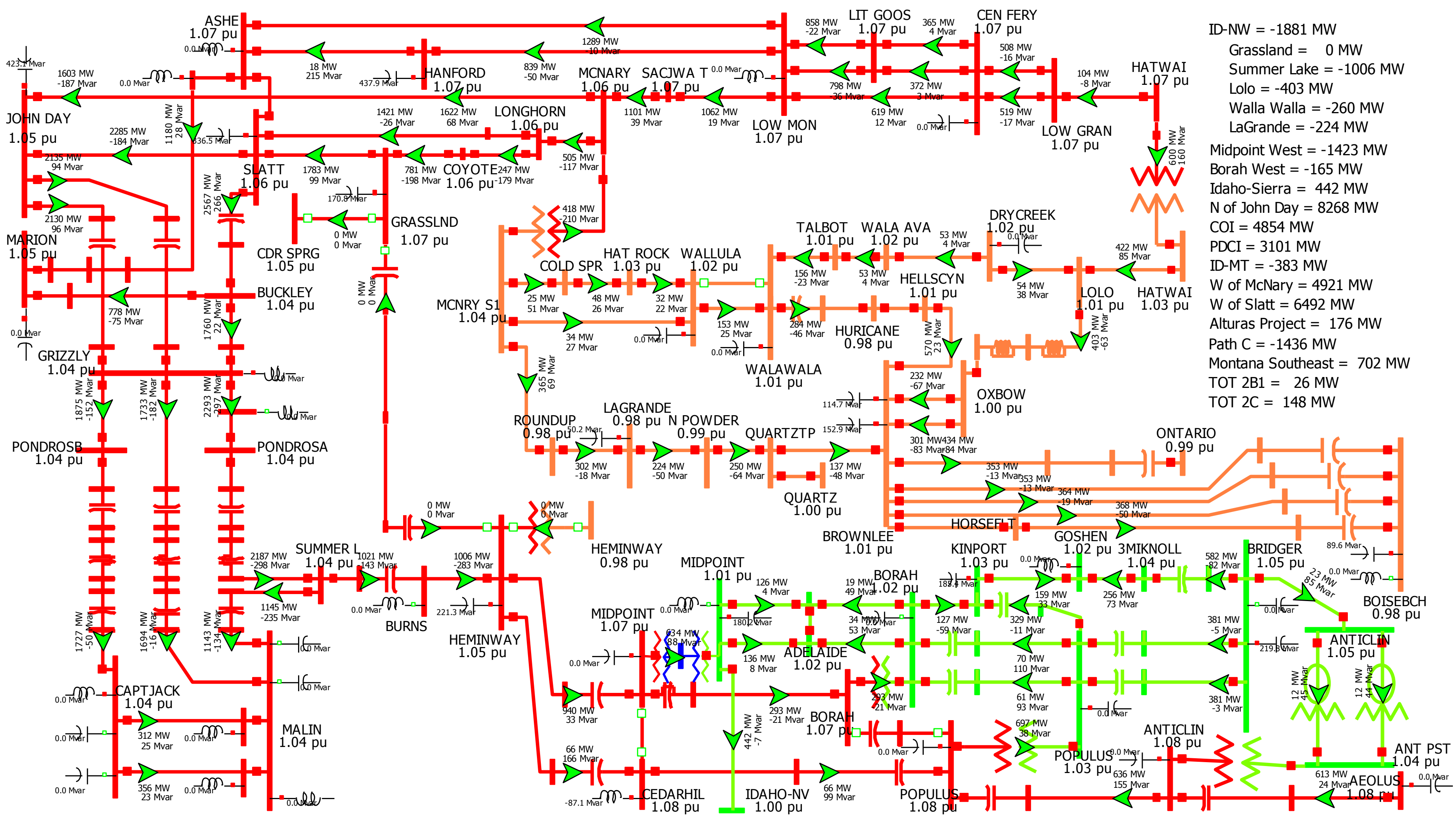

Figure G3: 16la1sa_3400idnw_N_wom Case after the contingency **BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr**

Appendix G– 16hs2sa_2250idnw_N_wom Case Post-Transient Contingency Results

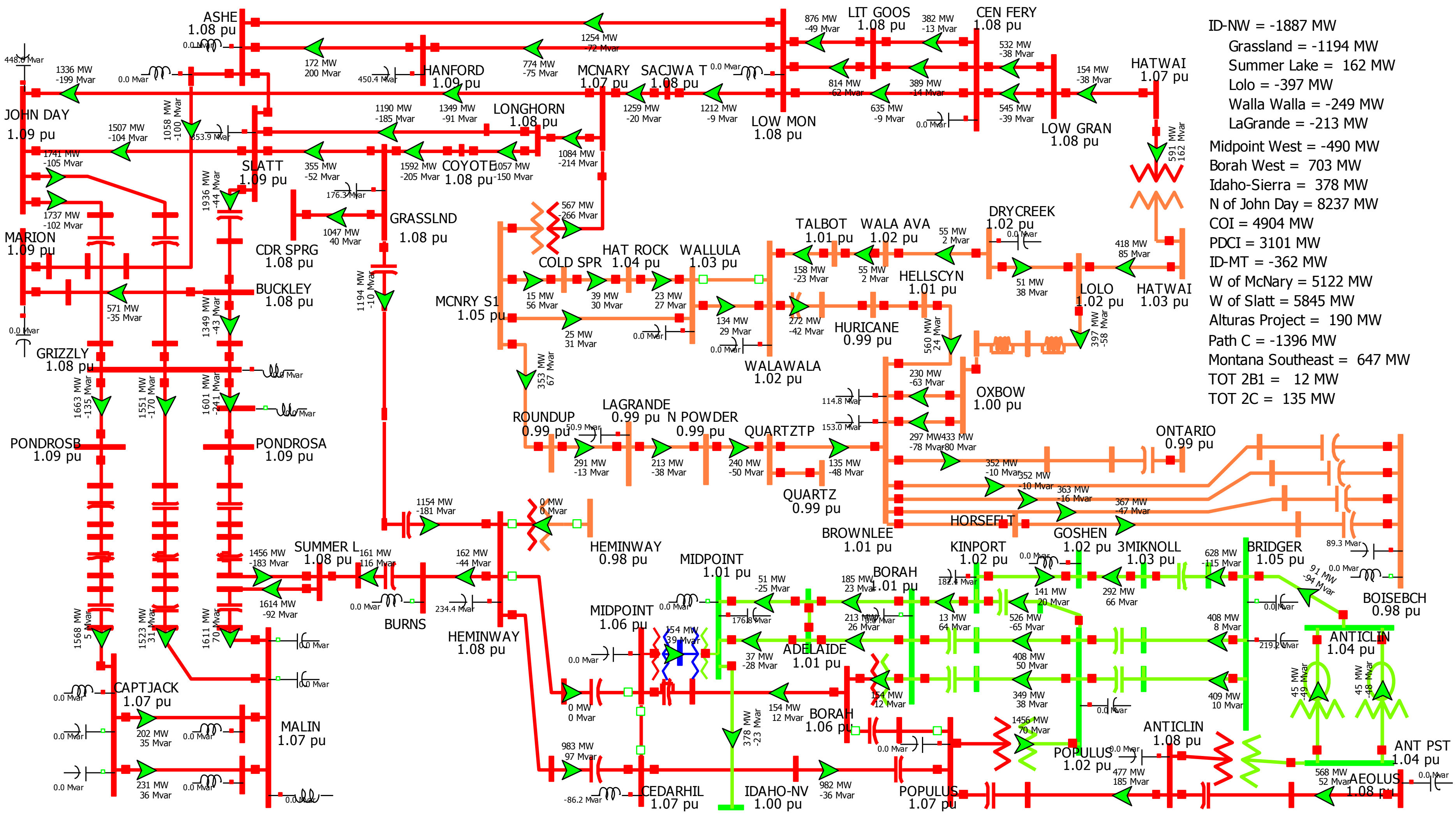

Figure G4: 16la1sa_3400idnw_N_wom Case after the contingency **BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr**

Appendix G– 16hs2sa_2250idnw_N_wom Case Post-Transient Contingency Results

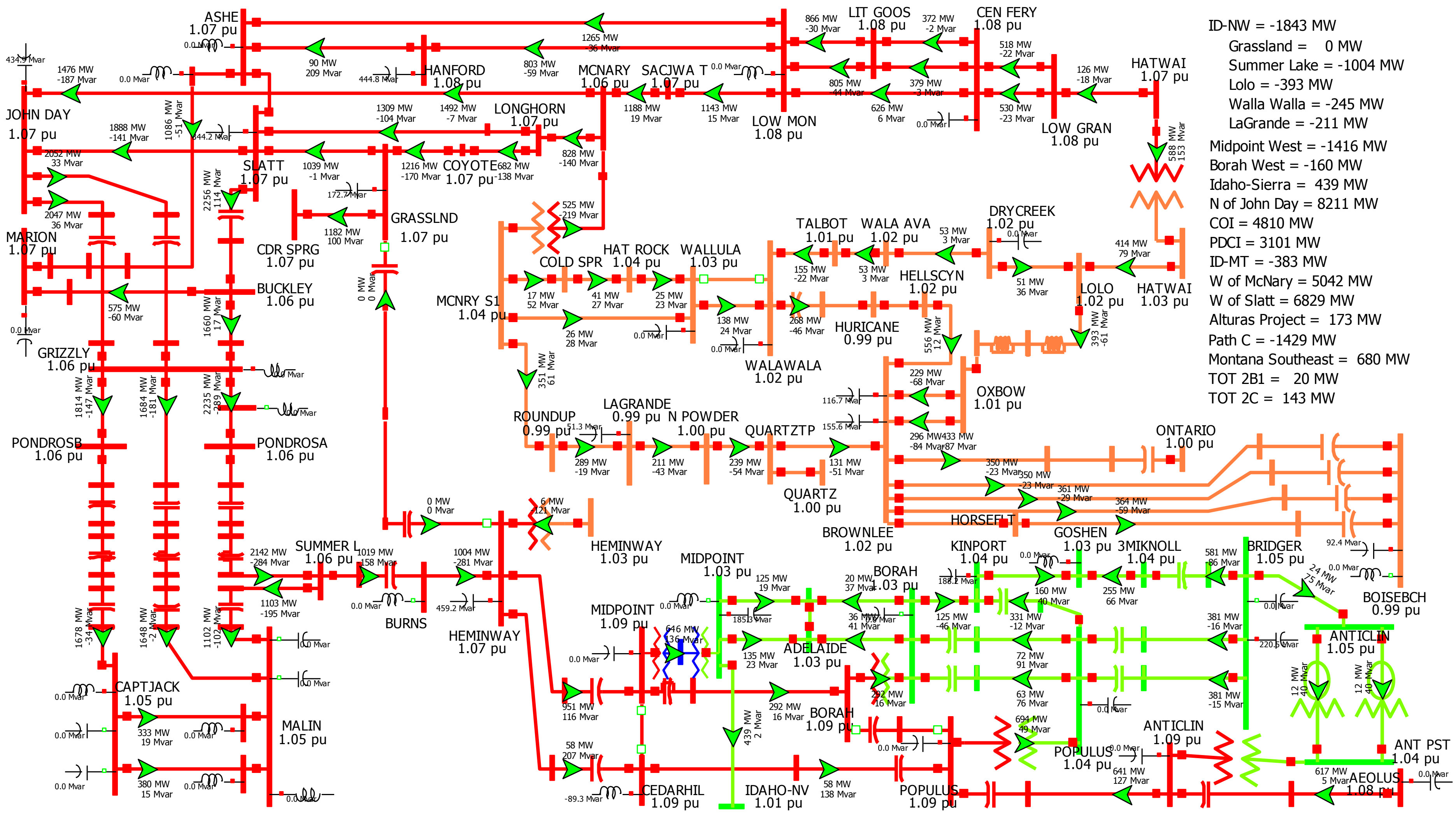

Figure G5: 16la1sa_3400idnw_N_wom Case after the contingency **N-1: Hemingway-Grassland 500 kV + PTSN Shunt**

Appendix G– 16hs2sa_2250idnw_N_wom Case Post-Transient Contingency Results

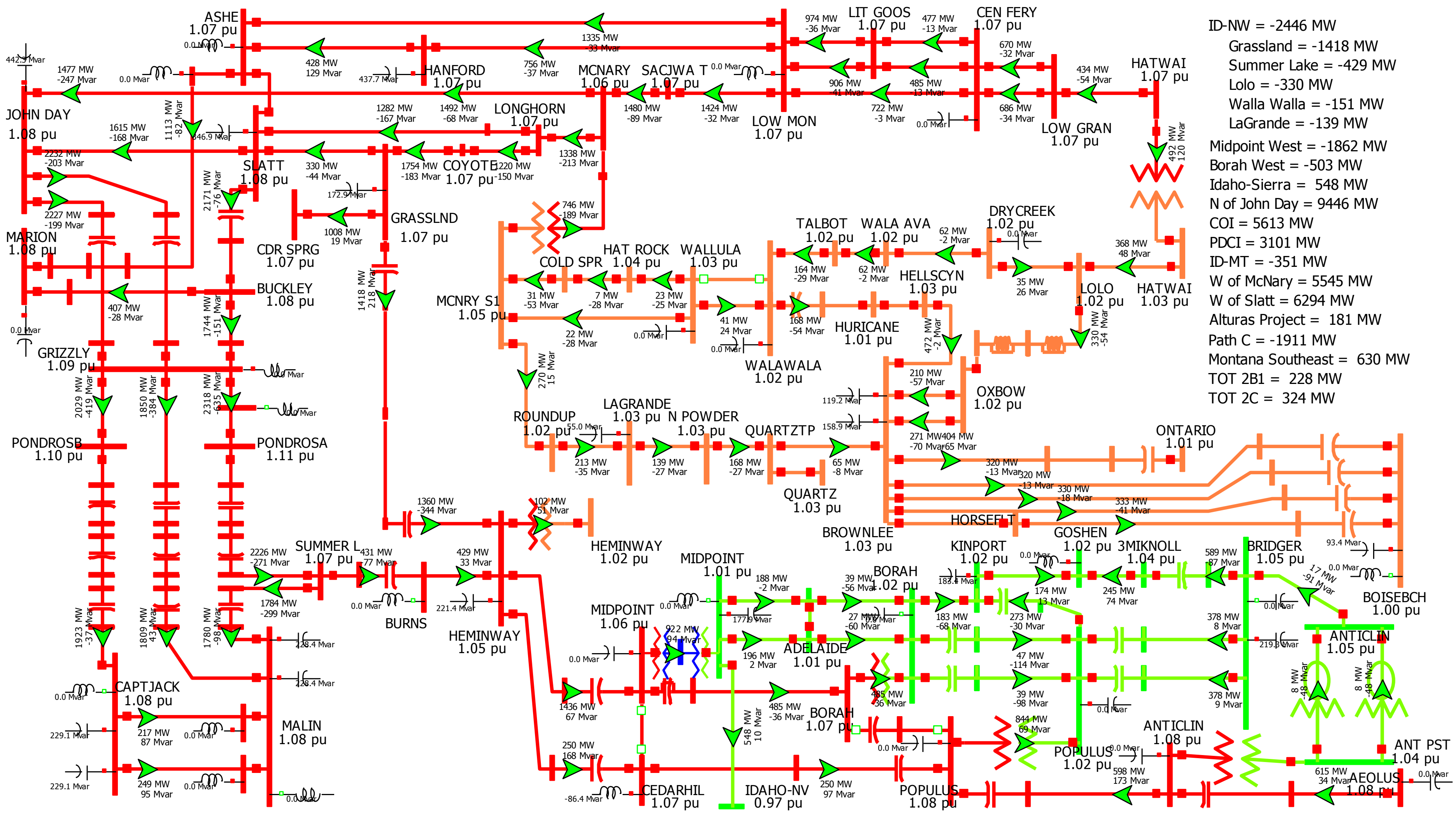

Figure G6: 16la1sa_3400idnw_N_wom Case after the contingency **N-2: Double Palo Verde**

Appendix G– 16hs2sa_2250idnw_N_wom Case Post-Transient Contingency Results

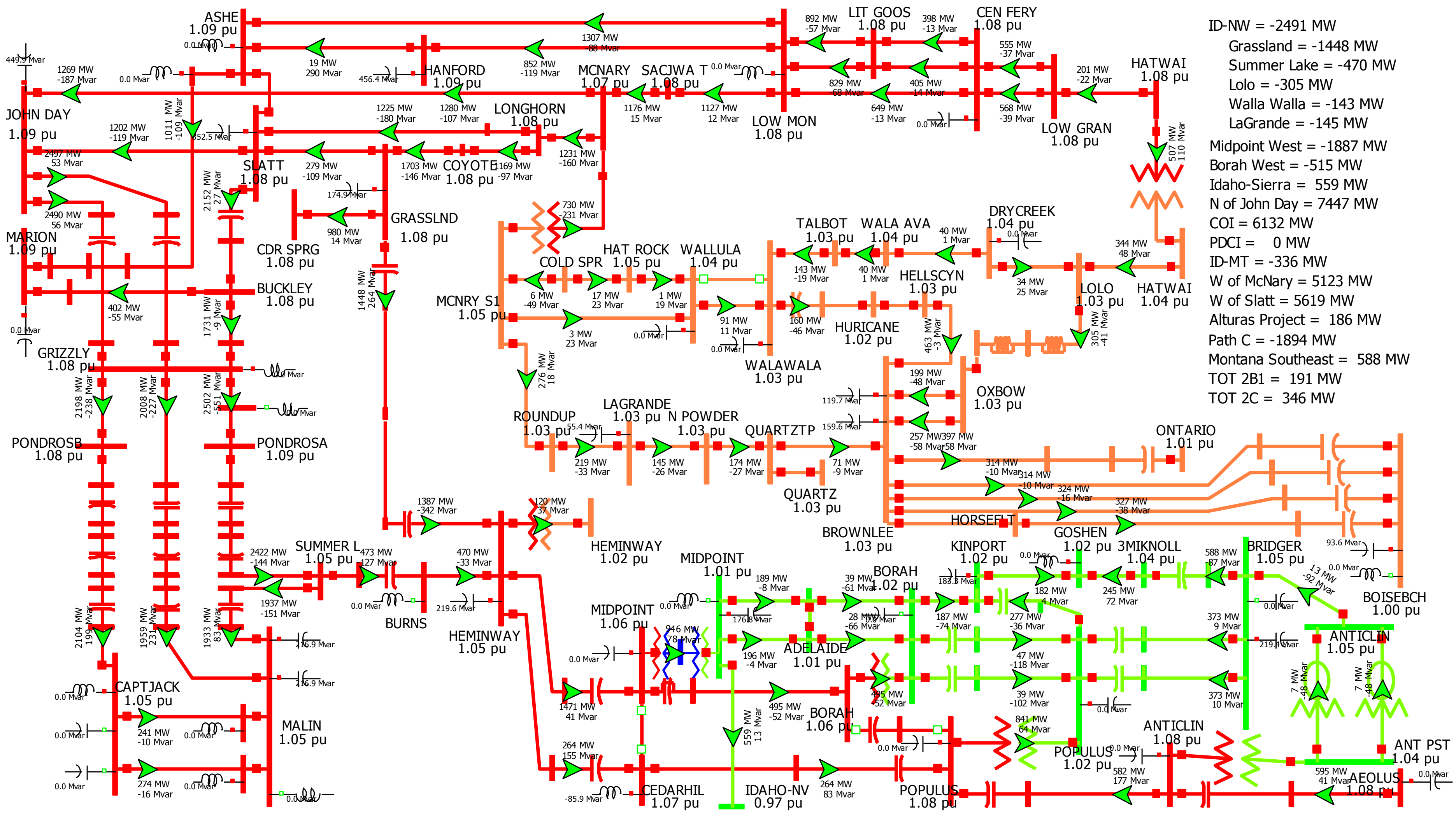

Figure G7: 16la1sa_3400idnw_N_wom Case after the contingency **N-2: DC-BIPOLE**

Appendix G - 16hs2a_2250idnw_wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	MERIDINP (45197) -> MERIDINP (45195) CKT 2 at MERIDINP	Branch MVA	369.3	681.4	650.0	104.8	780.0	87.4
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	633.8	1191.2	979.0	121.7	1287.7	92.5
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	GLENDL (45113) -> GRANT PS (45123) CKT 1 at GLENDL	Branch Amp	299.0	767.5	722.9	106.2	1265.2	60.7
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4028 Taft-Dworshak & Taft Reactor 500kV	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	No Violations							
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1649.6	2849.3	2442.0	116.7	3235.5	88.1
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1644.9	2849.3	2199.9	129.5	3235.5	88.1
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1649.6	2847.6	2666.9	106.8	4000.0	71.2
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1630.1	2827.2	2667.0	106.0	4000.0	70.7
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1605.2	2767.3	2699.7	102.5	4000.0	69.2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1587.0	2741.8	2699.7	101.6	4000.0	68.5
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	No Violations							
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	No Violations							
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	No Violations							
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations							
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1649.6	2901.6	2442.0	118.8	3235.5	89.7
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1644.9	2901.6	2199.9	131.9	3235.5	89.7
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1649.6	2899.1	2666.9	108.7	4000.0	72.5
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1630.1	2879.7	2667.0	108.0	4000.0	72.0
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	DAIRY (45140)	% Δ Volts	1.03	0.97				6.19%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	CASEBEER (45086)	% Δ Volts	1.02	0.97				5.15%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	BONANTAP (45060)	% Δ Volts	1.03	0.98				5.10%
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1246.2	1237.0	100.7	1395.9	89.3
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	ATHENA (45015)	% Δ Volts	0.99	0.93				6.45%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	PILOT RK (45413)	% Δ Volts	0.99	0.93				6.45%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	BUCKAROO (45027)	% Δ Volts	1.00	0.94				6.38%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	MISSIONT (47191)	% Δ Volts	1.00	0.94				6.38%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	PENDLBPA (41247)	% Δ Volts	1.00	0.94				6.38%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	PENDLT T (41248)	% Δ Volts	1.00	0.94				6.38%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	PENDLTON (45235)	% Δ Volts	1.00	0.94				6.38%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	JONTMB11 (90164)	% Δ Volts	1.01	0.95				6.32%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	ROUNDUP (40903)	% Δ Volts	1.01	0.95				6.32%

Appendix G - 16hs2a_2250idnw_wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	LJ2 1 (47808)	% Δ Volts	1.02	0.96				6.25%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	ROUNDUP (40905)	% Δ Volts	1.03	0.97				6.19%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	LAGRANDE (40619)	% Δ Volts	0.98	0.93				5.38%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	MCKAY (45322)	% Δ Volts	1.00	0.95				5.26%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	ROUNDUP2 (41253)	% Δ Volts	1.01	0.96				5.21%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	LJ2 C1 (47807)	% Δ Volts	1.03	0.98				5.10%
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	No Violations							
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	766.2	986.3	950.0	103.8	1286.0	76.7
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	766.2	991.0	950.0	104.3	1286.0	77.1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations							
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	908.6	1022.7	1009.1	101.3	1285.2	79.6
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	SCIO (45479)	% Δ Volts	1.01	0.95				6.32%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	SANTIAM (45475)	% Δ Volts	1.03	0.97				6.19%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	SANTMSS (45476)	% Δ Volts	1.03	0.97				6.19%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	DETROIT (40344)	% Δ Volts	1.04	0.98				6.12%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	DETROIT (40345)	% Δ Volts	1.04	0.98				6.12%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	EVRGNBIO (44873)	% Δ Volts	1.02	0.97				5.15%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	EVRGNTAP (44866)	% Δ Volts	1.02	0.97				5.15%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	LYONS (45316)	% Δ Volts	1.02	0.97				5.15%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	TMBLCR T (41079)	% Δ Volts	1.02	0.97				5.15%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	SANT TAP (40937)	% Δ Volts	1.03	0.98				5.10%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	SANTIAM (40939)	% Δ Volts	1.03	0.98				5.10%
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	No Violations							
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations							
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations							
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	No Violations							
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	No Violations							
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations							
BF 4542 Paul-Allston 500 kV & Center G2	No Violations							
BF 4542 Paul-Napavine 500 kV & Center G1	No Violations							
BF 4550 Olympia-Paul & Paul-Allston 500 kV	No Violations							
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	No Violations							

Appendix G - 16hs2a_2250idnw_wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1287.6	1237.0	104.1	1395.9	92.2
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	ATHENA (45015)	% Δ Volts	0.99	0.92				7.14%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	PILOT RK (45413)	% Δ Volts	0.99	0.92				7.14%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	MISSIONT (47191)	% Δ Volts	1.00	0.93				7.07%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	PENDLTON (45235)	% Δ Volts	1.00	0.94				6.95%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	BUCKAROO (45027)	% Δ Volts	1.00	0.94				6.84%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	PENDLBPA (41247)	% Δ Volts	1.00	0.94				6.61%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	ROUNDUP (40903)	% Δ Volts	1.01	0.95				6.54%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	PENDLT T (41248)	% Δ Volts	1.00	0.94				6.50%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	ROUNDUP2 (41253)	% Δ Volts	1.01	0.95				6.32%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	LAGRANDE (40619)	% Δ Volts	0.98	0.92				6.18%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	LAGRAND2 (40620)	% Δ Volts	1.04	0.98				6.12%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	MCKAY (45322)	% Δ Volts	1.00	0.94				5.93%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	LAGRANDE (40621)	% Δ Volts	1.03	0.98				5.53%
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	N POWDER (60313)	% Δ Volts	1.00	0.95				5.37%
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	No Violations							
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations							
BF 4700 Hatwai 500kV & 230 kV + RAS	No Violations							
BF 4708 Hatwai 500 kV Bus	BELL S2 (40088) -> BELL BPA (40087) CKT 1 at BELL S2	Branch MVA	232.3	252.9	249.0	101.5	312.0	81.0
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	No Violations							
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	No Violations							
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations							
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	No Violations							
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	No Violations							
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	No Violations							
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	No Violations							
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations							
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	No Violations							
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	No Violations							
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations							
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations							
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							

Appendix G - 16hs2a_2250idnw_wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations							
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	No Violations							
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1287.6	1237.0	104.1	1395.9	92.2
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	ATHENA (45015)	% Δ Volts	0.99	0.92				7.14%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	PILOT RK (45413)	% Δ Volts	0.99	0.92				7.14%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	MISSIONT (47191)	% Δ Volts	1.00	0.93				7.07%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	PENDLTON (45235)	% Δ Volts	1.00	0.94				6.95%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	BUCKAROO (45027)	% Δ Volts	1.00	0.94				6.84%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	PENDLBPA (41247)	% Δ Volts	1.00	0.94				6.61%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	ROUNDUP (40903)	% Δ Volts	1.01	0.95				6.54%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	PENDLT T (41248)	% Δ Volts	1.00	0.94				6.50%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	ROUNDUP (40905)	% Δ Volts	1.03	0.97				6.40%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	ROUNDUP2 (41253)	% Δ Volts	1.01	0.95				6.32%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	LAGRANDE (40619)	% Δ Volts	0.98	0.92				6.18%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	LAGRAND2 (40620)	% Δ Volts	1.04	0.98				6.12%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	MCKAY (45322)	% Δ Volts	1.00	0.94				5.93%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	LAGRANDE (40621)	% Δ Volts	1.03	0.98				5.53%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	N POWDER (60313)	% Δ Volts	1.00	0.95				5.37%
BF 5214 Low Mon-McNary & Calpine PH 500 kV	No Violations							
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1377.9	1237.0	111.4	1395.9	98.7
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	800.1	1031.0	920.0	112.1	1046.8	98.5
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	711.3	823.7	800.0	103.0	1199.9	68.7
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts	0.97	0.89				8.99%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	PTRSNFUR (62386)	% Δ Volts	0.98	0.90				8.89%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	AMPS (65025)	% Δ Volts	0.97	0.91				6.59%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	No Violations							
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	800.1	1045.9	920.0	113.7	1046.8	99.9
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1389.9	1237.0	112.4	1395.9	99.6
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts	0.97	0.90				7.78%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	AMPS (65025)	% Δ Volts	0.97	0.91				6.59%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	PTRSNFUR (62386)	% Δ Volts	0.98	0.92				6.52%
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	No Violations							
BF Lolo 230kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1272.4	1237.0	102.9	1395.9	91.2
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	800.08	1053.5	920.0	114.5	1046.8	100.6
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1402.9	1237.0	113.4	1395.9	100.5
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	908.59	1016.6	1009.1	100.7	1285.2	79.1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	711.27	831.62	800.0	104.0	1199.9	69.3
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1730.4	2433.5	2400.0	101.4	3800.0	64.0

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	PTRSNFLT (62030)	% Δ Volts	0.97	0.88				10.23%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	PTRSNFUR (62386)	% Δ Volts	0.98	0.90				8.89%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	AMPS (65025)	% Δ Volts	0.97	0.9				7.78%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	BELMONTP (45377)	% Δ Volts	0.97	0.92				5.43%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	NORTHCST (45408)	% Δ Volts	0.97	0.92				5.43%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	DILLON S (62084)	% Δ Volts	0.98	0.93				5.38%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	LAGRANDE (40619)	% Δ Volts	0.98	0.93				5.38%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	BIGGRASS (65155)	% Δ Volts	0.99	0.94				5.32%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	BURNS (45029)	% Δ Volts	1.05	1.0				5.00%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+Caps	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	800.08	1046.8	920.0	113.8	1046.8	100.0
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+Caps	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1395.1	1237.0	112.8	1395.9	99.9
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+Caps	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	711.27	832.4	800.0	104.0	1199.9	69.4
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+Caps	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1730.4	2429.0	2400.0	101.2	3800.0	63.9
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	No Violations							
BF PGE Grassland-Slatt 500kV & Boardman Plant	No Violations							
Bus: Alvey 500 kV + RAS	No Violations							
Bus: Bell BPA 500 kV	No Violations							
Bus: Buckley 500 kV	No Violations							
Bus: Dixonville 500 kV	No Violations							
Bus: Hot Springs 500 kV	No Violations							
Bus: Keeler 500 kV + RAS	No Violations							
Bus: Rock Creek 500 kV	No Violations							
Bus: Sickler 500 kV	No Violations							
Bus: Summer Lake 500 kV	No Violations							
N-1: Allston-Keeler 500 kV + RAS	No Violations							
N-1: Allston-Napavine 500 kV	No Violations							
N-1: Allston-Paul #2 500 kV	No Violations							
N-1: Alvery-Dixonville 500 kV	No Violations							
N-1: Alvey-Marion 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	908.6	1074.5	1009.1	106.5	1285.2	83.6
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Bell-Coulee 500 kV	No Violations							
N-1: Bell-Taft 500 kV	No Violations							
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV	No Violations							
N-1: Broadview-Garrison #1 500 kV	No Violations							
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 1 at COTWDWAP	Branch Amp	278.3	837.4	785.7	106.6	926.3	90.4
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 2 at COTWDWAP	Branch Amp	278.3	837.4	785.7	106.6	926.3	90.4
N-1: Captain Jack-Olinda 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1649.6	2499.3	2442.0	102.3	3235.5	77.2
N-1: Captain Jack-Olinda 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1644.9	2499.3	2199.9	113.6	3235.5	77.2
N-1: Captain Jack-Olinda 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1800.5	2411.4	2199.9	109.6	3280.5	73.5
N-1: Captain Jack-Olinda 500 kV	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1785.3	2391.1	2199.9	108.7	3280.5	72.9
N-1: Captain Jack-Olinda 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1930.7	2553.9	2477.9	103.1	4000.0	63.8
N-1: CaptJack-Kfalls 500 kV	No Violations							
N-1: Cascade Crossing 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	908.6	1025.4	1009.1	101.6	1285.2	79.8
N-1: Chief Jo-Coulee 500 kV	No Violations							
N-1: Chief Jo-Monroe 500 kV	No Violations							
N-1: Chief Jo-Sickler 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Covington4-Raver 500 kV	No Violations							
N-1: Covington5-Raver 500 kV	No Violations							
N-1: Coyote-Longhorn 500 kV	No Violations							
N-1: CusterW-Monroe 500 kV	No Violations							
N-1: Dixonville-Meridian 500 kV	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	633.8	1147.7	979.0	117.2	1287.7	89.1
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV + RAS	No Violations							
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Echo Lake-Maple Valley 500 kV	No Violations							
N-1: Echo Lake-Raver 500 kV	No Violations							
N-1: Echo Lake-Schultz 500 kV	No Violations							
N-1: Echo Lake-Snok Tap 500 kV	No Violations							
N-1: Garrison-Taft #2 500 kV	No Violations							
N-1: Goldhill-Placer 115 kV	No Violations							
N-1: Grassland-Coyote 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	No Violations							
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Hatwai 500/230 kV Xfmr + RAS	No Violations							
N-1: Hatwai-Lolo 230 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Hatwai-Low Gran 500 kV	No Violations							
N-1: Hatwai-N Lewiston 230 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	800.1	1006.0	920.0	109.3	1046.8	96.1
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Grassland 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1380.3	1237.0	111.6	1395.9	98.9
N-1: Hemingway-Grassland 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	800.1	1034.6	920.0	112.5	1046.8	98.8
N-1: Hemingway-Grassland 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	711.3	823.1	800.0	102.9	1199.9	68.6
N-1: Hemingway-Grassland 500 kV	PTRSNFLT (62030)	% Δ Volts	0.97	0.89				8.99%
N-1: Hemingway-Grassland 500 kV	PTRSNFUR (62386)	% Δ Volts	0.98	0.91				7.69%
N-1: Hemingway-Grassland 500 kV	AMPS (65025)	% Δ Volts	0.97	0.91				6.59%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1722.2	2917.5	2400.0	121.6	3200.0	91.2
N-1: Hemingway-Grassland 500 kV + FACRI	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1256.0	1237.0	101.5	1395.9	90.0
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1730.4	2937.8	2400.0	122.4	3800.0	77.3
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1375.1	1237.0	111.2	1395.9	98.5
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	800.1	1030.3	920.0	112.0	1046.8	98.4
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	711.3	825.2	800.0	103.1	1199.9	68.8
N-1: Hemingway-Summer Lake 500 kV	No Violations							
N-1: Hill Top 345/230 Xfmr	No Violations							
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: Hot Springs-Taft 500 kV	No Violations							
N-1: Humboldt-Coyote Ck 345 kV	No Violations							
N-1: Huntington-Pinto-Four Corners 345 kV	No Violations							
N-1: Ing500-CusterW 500 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Kfalls-Meridian 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	No Violations							
N-1: Lanes-Marion 500 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-Sac Tap 500 kV	No Violations							
N-1: Malin 500/230 Xfmr	No Violations							
N-1: Malin-Hilltop 230 kV	No Violations							
N-1: Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1649.6	2850.1	2442.0	116.7	3235.5	88.1
N-1: Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1644.9	2850.1	2199.9	129.6	3235.5	88.1
N-1: Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1649.6	2848.1	2666.9	106.8	4000.0	71.2
N-1: Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1630.1	2828.2	2667.0	106.0	4000.0	70.7
N-1: Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1605.2	2828.6	2699.7	104.8	4000.0	70.7
N-1: Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1587.0	2805.8	2699.7	103.9	4000.0	70.1
N-1: Malin-Summer Lake 500 kV	No Violations							
N-1: Maple Vly-Rocky RH 345 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Marion-Pearl 500 kV	No Violations							
N-1: Marion-Santiam 500 kV	No Violations							
N-1: McLouglin-Ostrander 230 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary S2-McNary S3 230 kV	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Longhorn 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1243.0	1237.0	100.5	1395.9	89.0
N-1: McNary-Sac Tap-Low Mon 500 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV	PTRSNFLT (62030)	% Δ Volts	0.97	0.92				5.43%
N-1: Midpoint-Hemingway 500 kV	PTRSNFUR (62386)	% Δ Volts	0.98	0.93				5.38%
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	No Violations							
N-1: Midpoint-Humboldt 345 kV	No Violations							
N-1: Napavine-Paul 500 kV	No Violations							
N-1: Olympia-Paul 500 kV	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1276.9	1237.0	103.2	1395.9	91.5
N-1: Paul-Satsop 500 kV	No Violations							
N-1: Pearl-Keeler 500 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	766.2	974.5	950.0	102.6	1286.0	75.8
N-1: Pearl-Keeler 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	766.2	974.5	950.0	102.6	1286.0	75.8
N-1: Pinto-Four Corner 345 kV	No Violations							
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Raver-Paul 500 kV	No Violations							
N-1: Raver-Tacoma 500 kV	No Violations							
N-1: Red Butte-Harry Allen 345 kV	No Violations							
N-1: Robinson-Harry Allen 500 kV	No Violations							
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1800.5	3239.4	2199.9	147.2	3280.5	98.7
N-1: Round Mtn-Table Mtn 500 kV	ROUND MT (30005) -> ROUTAB21 (30018) CKT 2 at ROUTAB21	Branch Amp	1800.5	3239.4	2667.0	121.5	4000.0	81.0
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB22 (30019) -> TABLE MT (30015) CKT 2 at ROUTAB22	Branch Amp	1778.4	3214.4	2667.0	120.5	4000.0	80.4
N-1: Roundup-Lagrande 230 kV	No Violations							
N-1: Schultz-Sickler 500 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Sigurd-Glen Canyon 230 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Slatt-Longhorn 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Snok Tap-Snoking 500 kV	No Violations							
N-1: Table Mtn-Tesla 500 kV	TABLE MT (30015) -> TABVAC11 (30031) CKT 1 at TABVAC11	Branch Amp	1930.7	2902.7	2667.0	108.8	4000.0	72.6
N-1: Table Mtn-Tesla 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1930.7	2902.7	2477.9	117.1	4000.0	72.6
N-1: Table Mtn-Tesla 500 kV	TABVAC12 (30032) -> VACA-DIX (30030) CKT 1 at VACA-DIX	Branch Amp	1919.2	2895.8	2667.0	108.6	4000.0	72.4
N-1: Table Mtn-Tesla 500 kV	VACTES11 (30044) -> TESLA (30040) CKT 1 at VACTES11	Branch Amp	1362.5	2264.1	2230.0	101.5	4000.0	56.6
N-1: Table Mtn-Vaca Dixon 500 kV	TABTES11 (30041) -> TABTES12 (30043) CKT 1 at TABTES11	Branch Amp	1469.8	2619.8	2230.0	117.5	3555.9	73.7
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	800.1	925.6	920.0	100.6	1046.8	88.4
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Buckley 500 kV	BETHEL5 (43041) -> BETHEL (43039) CKT 1 at BETHEL5	Branch MVA	1013.0	1318.7	1309.0	100.7	1691.0	78.0
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	PTRSNFUR (62386)	% Δ Volts	0.98	0.93				5.38%
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	No Violations							
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	908.59	1046.1	1009.1	103.7	1285.2	81.4
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	908.59	1025.2	1009.1	101.6	1285.2	79.8
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	BROONT12 (61981) -> ONTARIO (60265) CKT 1 at BROONT12	Branch Amp	959.6	1590.9	1590.0	100.1	2147.0	74.1
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	BROONT12 (61981) -> ONTARIO (60265) CKT 1 at BROONT12	Branch Amp	959.6	1601.2	1590.0	100.7	2147.0	74.6
N-2: Bridger-Populus #1 & #2 345 kV	No Violations							
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	No Violations							
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	AMPS (65025)	% Δ Volts	0.97	1.03				5.83%
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	PTRSNFUR (62386)	% Δ Volts	0.98	1.04				5.77%
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	PTRSNFLT (62030)	% Δ Volts	0.97	1.02				4.90%
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	No Violations							
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	800.1	977.4	920.0	106.2	1046.8	93.4
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations							
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations							
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations							
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	No Violations							
N-2: DC-BIPOLE	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM14	Branch Amp	1722.2	2664.1	2400.0	111.0	3200.0	83.3
N-2: DC-BIPOLE	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1644.9	2236.8	2199.9	101.7	2828.0	79.1

Appendix G - 16hs2a_2250idnw_wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: DC-BIPOLE	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1800.5	2352.9	2199.9	107.0	3280.5	71.7
N-2: DC-BIPOLE	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1785.3	2333.0	2199.9	106.0	3280.5	71.1
N-2: DC-BIPOLE	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	1730.4	2679.0	2400.0	111.6	3800.0	70.5
N-2: DC-BIPOLE	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1546.1	2218.0	2134.0	103.9	3499.9	63.4
N-2: DC-BIPOLE	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1930.7	2521.8	2477.9	101.8	4000.0	63.0
N-2: DC-BIPOLE	MIDWAY (30060) -> MIDVIN11 (30061) CKT 1 at MIDWAY	Branch Amp	1525.4	2186.9	2134.0	102.5	3499.9	62.5
N-2: DC-BIPOLE	MIDVIN12 (30062) -> VINCENT (24156) CKT 1 at MIDVIN12	Branch Amp	1504.6	2157.9	2134.0	101.1	3499.9	61.7
N-2: Double Palo Verde	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1722.2	2429.8	2400.0	101.2	3200.0	75.9
N-2: Double Palo Verde	E EDMON9 (54089) -> NISKU A9 (54091) CKT 80 at E EDMON9	Branch Amp	379.2	411.6	410.0	100.4	552.3	74.5
N-2: Double Palo Verde	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	1730.4	2449.2	2400.0	102.0	3800.0	64.5
N-2: Double Palo Verde	WBK 25 (50742)	% Δ Volts	1.02	0.96				6.25%
N-2: Double Palo Verde	WRK 25 (50289)	% Δ Volts	1.02	0.96				6.25%
N-2: Double Palo Verde	HRD 25 (51210)	% Δ Volts	1.03	0.97				6.19%
N-2: Double Palo Verde	MIDPT 148 (81851)	% Δ Volts	1.08	1.02				5.88%
N-2: Double Palo Verde	NKL 60T3 (51087)	% Δ Volts	1.08	1.02				5.88%
N-2: Double Palo Verde	NKL 74P (51069)	% Δ Volts	1.08	1.02				5.88%
N-2: Double Palo Verde	WRK 73H1 (51712)	% Δ Volts	1.08	1.02				5.88%
N-2: Double Palo Verde	WRK 73H2 (51714)	% Δ Volts	1.08	1.02				5.88%
N-2: Double Palo Verde	WBK 1T1 (80261)	% Δ Volts	0.93	0.88				5.68%
N-2: Double Palo Verde	WBK 1T2 (50658)	% Δ Volts	0.93	0.88				5.68%
N-2: Double Palo Verde	WBK 1T3 (80272)	% Δ Volts	0.93	0.88				5.68%
N-2: Double Palo Verde	BDM 244P (50902)	% Δ Volts	0.96	0.91				5.49%
N-2: Double Palo Verde	YORKCANY (12091)	% Δ Volts	0.99	0.94				5.32%
N-2: Double Palo Verde	NXC 12T1 (80062)	% Δ Volts	1.01	0.96				5.21%
N-2: Double Palo Verde	NKL 25 (51092)	% Δ Volts	1.02	0.97				5.15%
N-2: Double Palo Verde	SMW 25T1 (50291)	% Δ Volts	1.02	0.97				5.15%
N-2: Double Palo Verde	DGR 12 (50152)	% Δ Volts	1.03	0.98				5.10%
N-2: Double Palo Verde	SCT 12 (50275)	% Δ Volts	1.03	0.98				5.10%
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations							
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations							
N-2: Garrison-Taft #1 & #2 500 kV + RAS	PTRSNFUR (62386)	% Δ Volts	0.98	1.03				4.85%
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	No Violations							
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1128.7	1273.7	1237.0	103.0	1395.9	91.2
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1730.4	3236.4	2400.0	134.8	3800.0	85.2
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM11	Branch Amp	1480.7	3206.7	2700.0	118.8	4000.0	80.2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	1663.7	3081.6	2400.0	128.4	3800.0	81.1
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON12	Branch Amp	1646.5	3065.0	2400.0	127.7	3800.0	80.7
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	1663.7	3161.2	2400.0	131.7	3800.0	83.2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON12	Branch Amp	1646.5	3147.6	2400.0	131.1	3800.0	82.8
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations							
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	2054.9	3281.3	2900.0	113.1	4350.0	75.4

Appendix G - 16hs2a_2250idnw_wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH11	Branch Amp	1878.6	3444.2	3000.0	114.8	4050.0	85.0
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	766.2	974.7	950.0	102.6	1286.0	75.8
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	No Violations							
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1786.5	3601.8	2667.4	135.0	4099.2	87.9
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI11	Branch Amp	1754.8	3500.0	2667.4	131.2	4099.2	85.4
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPTJACK	Branch Amp	1754.8	3500.0	2667.4	131.2	4099.2	85.4
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	1945.1	3105.5	2993.0	103.8	4514.9	68.8
N-2: Malin-Round Mtn #1 & #2 500 kV	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	1945.1	3105.5	2993.0	103.8	4514.9	68.8
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	1914.1	3071.1	2993.0	102.6	4514.9	68.0
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at OLIMAX12	Branch Amp	1914.1	3071.1	2993.0	102.6	4514.9	68.0
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	1892.6	3034.1	2993.0	101.4	4514.9	67.2
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	PTRSNFLT (62030)	% Δ Volts	0.97	0.91				6.59%
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	PTRSNFUR (62386)	% Δ Volts	0.98	0.93				5.38%
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations							
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	No Violations							
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	No Violations							
N-2: Paul-Raver & Raver-Covingt4 500 kV	No Violations							
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	766.2	981.6	950.0	103.3	1286.0	76.3
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	No Violations							
N-2: Raver-Covington #1 & #2 500 kV	No Violations							
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations							
N-2: Raver-Paul & Napavine-Paul 500 kV	No Violations							
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations							
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations							
N-2: Raver-Schultz #1 & #2 500 kV	No Violations							
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations							
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations							
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	DELEVN (30114) -> CORTINA (30450) CKT 1 at CORTINA	Branch Amp	683.9	899.4	830.9	108.3	953.9	94.3
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	BRDGVLLE (31110) -> FRUTLDJT (31120) CKT 1 at BRDGVLLE	Branch Amp	289.4	328.6	328.1	100.2	371.4	88.5
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1786.5	3337.4	2667.4	125.1	4099.2	81.4
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI12	Branch Amp	1754.8	3245.6	2667.4	121.7	4099.2	79.2
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPTJACK	Branch Amp	1754.8	3237.3	2667.4	121.4	4099.2	79.0
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	1945.1	3419.7	2993.0	114.3	4514.9	75.7

Appendix G - 16hs2a_2250idnw_wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	1945.1	3419.7	2993.0	114.3	4514.9	75.7
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	1914.1	3398.0	2993.0	113.5	4514.9	75.3
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at MAXWELL	Branch Amp	1914.1	3398.0	2993.0	113.5	4514.9	75.3
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	1892.6	3364.8	2993.0	112.4	4514.9	74.5
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	No Violations							
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	No Violations							
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHE (30790) -> MCMULLN1 (30825) CKT 1 at MCMULLN1	Branch Amp	285.7	917.1	825.9	111.1	976.5	93.9
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	MCMULLN1 (30825) -> KEARNEY (30830) CKT 1 at MCMULLN1	Branch Amp	232.9	858.7	825.1	104.1	975.0	88.1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHEJ (34159) -> HAMMONDS (34160) CKT 1 at HAMMONDS	Branch Amp	388.8	466.2	462.9	100.7	579.9	80.4
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	E EDMON9 (54089) -> NISKU A9 (54091) CKT 80 at E EDMON9	Branch Amp	379.2	412.8	410.0	100.7	552.3	74.7
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	WBK 25 (50742)	% Δ Volts	1.02	0.96				6.25%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	HRD 25 (51210)	% Δ Volts	1.03	0.97				6.19%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	WBK 1T1 (80261)	% Δ Volts	0.93	0.88				5.68%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	WBK 1T2 (50658)	% Δ Volts	0.93	0.88				5.68%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	WBK 1T3 (80272)	% Δ Volts	0.93	0.88				5.68%
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	ADDY (40017)	% Δ Volts	1.02	0.96				6.25%
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	ARDEN (48015)	% Δ Volts	1.01	0.96				5.21%
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	COLV AVA (48083)	% Δ Volts	1.01	0.96				5.21%
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	METCHIP (48223)	% Δ Volts	1.01	0.96				5.21%
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	ORIN (48301)	% Δ Volts	1.01	0.96				5.21%
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	No Violations							
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	No Violations							
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations							

Appendix G - 16hs2a_2250idnw_N_wom Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Brownlee		Malin		Marion		John Day		Hanford		McNary		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 11L12 MERIDIAN-KLAM FALLS 500 KV+KFGEN2+ST	0.74	-3598	0.82	-1116	0.78	-3532	0.91	-1770	0.97	-2504	0.87	-4549	0.88	-3285	0.75	-605	0.76	-345
BF 11L22 CAPT JACK-KLAM FALLS 500 KV+KFGEN2+ST	0.74	-2688	0.82	-1110	0.73	-3614	0.89	-2169	0.97	-2577	0.86	-4719	0.88	-3380	0.75	-602	0.76	-343
BF 11R1 MERIDIAN-KLAM FALLS 500 KV & MERIDIAN 500/230 KV XFMR	0.74	-2664	0.82	-1129	0.81	-3534	0.93	-1673	0.97	-2611	0.87	-4710	0.88	-3370	0.74	-612	0.76	-345
BF 11R6 MERIDIAN-DIXONVILLE 500 KV & MERIDIAN 500/230 KV XFMR	0.75	-2708	0.82	-1089	0.88	-2614	0.83	-2496	0.97	-2466	0.86	-4735	0.88	-3321	0.75	-597	0.75	-334
BF 4003 HANFORD-VANTAGE & HANFORD CAPS	0.74	-2590	0.82	-1129	0.81	-3599	0.83	-2640	0.97	-2534	0.82	-4120	0.88	-3250	0.75	-604	0.76	-343
BF 4019 CAPTJACK-MALIN #2 & MALIN 500/230 XFMR	0.74	-2725	0.82	-1129	0.81	-3556	0.83	-2668	0.97	-2721	0.85	-4879	0.88	-3438	0.74	-614	0.76	-347
BF 4028 TAFT-DWORSHAK & TAFT REACTOR 500KV	0.74	-2700	0.82	-1158	0.80	-3760	0.82	-2836	0.97	-2818	0.85	-4868	0.88	-3504	0.76	-572	0.76	-321
BF 4046 JOHN DAY-GRIZZLY #2 & GRIZZLY-MALIN #2 500 KV	0.76	-2767	0.83	-1019	0.83	-2758	0.86	-2165	0.97	-2021	0.88	-4265	0.89	-2954	0.76	-565	0.76	-312
BF 4064 CAPTJACK-MALIN & MALIN-ROUND MTN #1 500 KV	0.74	-2385	0.82	-1108	0.79	-3068	0.84	-2597	0.97	-2543	0.86	-4756	0.88	-3343	0.75	-605	0.76	-339
BF 4072 GRIZZLY-MALIN #2 & MALIN-ROUND MTN #2 500 KV	0.76	-2613	0.83	-1050	0.81	-2586	0.86	-2296	0.97	-2239	0.87	-4470	0.89	-3113	0.76	-580	0.76	-321
BF 4095 LOW MON-HANFORD & HANFORD-WAUTOMA 500 KV	0.74	-2433	0.82	-1125	0.80	-3668	0.83	-2732	0.97	-2649	0.83	-4539	0.88	-3272	0.75	-608	0.76	-343
BF 4104 ASHE-HANFORD & HANFORD-WAUTOMA 500 KV	0.74	-2724	0.82	-1135	0.80	-3652	0.83	-2689	0.97	-2669	0.80	-4520	0.88	-3301	0.74	-611	0.76	-345
BF 4111 HOT SPRINGS-TAFT & TAFT-DWORSHAK 500 KV	0.74	-2735	0.82	-1157	0.80	-3759	0.82	-2833	0.97	-2813	0.86	-4824	0.88	-3498	0.76	-563	0.76	-321
BF 4114 GARRISON-TAFT #1 +TAFT REACTOR 500KV	0.74	-2765	0.82	-1150	0.80	-3747	0.82	-2833	0.97	-2810	0.84	-5026	0.88	-3502	0.75	-621	0.76	-346
BF 4119 GARRISON-TAFT #1 & TAFT-BELL 500 KV	0.74	-2762	0.82	-1142	0.80	-3739	0.82	-2816	0.97	-2780	0.85	-4873	0.88	-3460	0.78	-526	0.75	-324
BF 4131 SLATT-JOHN DAY & JOHN DAY-GRIZZLY #2 500 KV	0.75	-2751	0.83	-1063	0.82	-3106	0.84	-2334	0.97	-1846	0.87	-4345	0.89	-2937	0.75	-588	0.75	-328
BF 4143 (OR 4134) JOHN DAY-GRIZZLY #1 & JOHN DAY CAPS 500 KV	0.75	-2496	0.82	-1061	0.82	-3010	0.86	-2258	0.97	-1921	0.88	-4287	0.89	-2978	0.76	-582	0.75	-324
BF 4148 HOT SPRINGS-TAFT & GARRISON-TAFT #2 500 KV	0.74	-2515	0.82	-1145	0.80	-3742	0.82	-2821	0.97	-2790	0.85	-4900	0.88	-3478	0.77	-554	0.75	-331
BF 4170 JOHN DAY-MARION & JOHN DAY CAPS 500 KV	0.74	-2753	0.82	-1117	0.81	-3369	0.82	-2234	0.97	-2152	0.87	-4483	0.89	-3116	0.75	-609	0.76	-344
BF 4186 (OR 4582) MALIN-ROUND MTN 500 KV & MALIN 500/230 XFMR	0.75	-2670	0.82	-1094	0.83	-2880	0.85	-2430	0.97	-2481	0.86	-4689	0.88	-3293	0.75	-601	0.75	-337
BF 4194 ROCK CK-JOHN DAY & BIG EDDY-JOHN DAY 500 KV	0.75	-2558	0.82	-1104	0.81	-3519	0.84	-2524	0.96	-3198	0.86	-4367	0.89	-3105	0.75	-587	0.75	-327
BF 4197 JOHN DAY-BIG EDDY #1 & JOHN DAY CAPS 500 KV	0.74	-2677	0.82	-1130	0.81	-3520	0.84	-2611	0.96	-2421	0.86	-4663	0.88	-3280	0.74	-613	0.76	-347
BF 4202 JOHN DAY-BIG EDDY#2 & BIG EDDY-OSTRANDER 500 KV	0.74	-2707	0.82	-1142	0.80	-3632	0.83	-2666	0.96	-2619	0.86	-4800	0.88	-3389	0.74	-619	0.76	-350
BF 4231 MCNARY-LONGHORN 500 KV & MCNARY 500/230 KV XFMR	0.76	-2738	0.82	-1013	0.80	-3719	0.91	-2332	0.97	-2695	0.88	-4456	0.70	-2533	0.75	-605	0.76	-340
BF 4234 MCNARY-LONGHORN & MCNARY-HERMCALP 500 KV	0.74	-2683	0.82	-1130	0.79	-3963	0.83	-2850	0.97	-2780	0.85	-4587	0.86	-2101	0.75	-606	0.75	-351
BF 4247 LIT GOOS-LOW MON #2 & LOW MON-MCNARY 500 KV	0.74	-2850	0.82	-1117	0.80	-3654	0.83	-2659	0.97	-2602	0.85	-4163	0.87	-2907	0.76	-574	0.76	-318
BF 4259 LIT GOOS-LOW MON #2 & LOW MON-HANFORD 500 KV	0.74	-2726	0.82	-1126	0.80	-3683	0.83	-2752	0.97	-2684	0.84	-4629	0.88	-3279	0.75	-606	0.76	-342
BF 4268 MONROE-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.74	-2729	0.82	-1142	0.80	-3736	0.83	-2806	0.97	-2774	0.86	-4769	0.88	-3465	0.75	-608	0.76	-346
BF 4276 ING500-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.74	-2753	0.82	-1142	0.80	-3730	0.83	-2810	0.97	-2775	0.85	-4866	0.88	-3469	0.74	-613	0.76	-347
BF 4280 KEELER-PEARL & PEARL-MARION 500 KV + RAS	0.74	-2752	0.82	-1134	0.84	-3263	0.79	-1933	0.97	-2488	0.85	-4689	0.89	-3224	0.74	-612	0.76	-345
BF 4280 KEELER-PEARL & PEARL-OSTRANDER 500 KV + RAS	0.74	-2716	0.82	-1134	0.81	-3534	0.82	-2386	0.97	-2558	0.85	-4764	0.88	-3325	0.74	-610	0.76	-344
BF 4287 PEARL-OSTRANDER 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.74	-2729	0.82	-1136	0.81	-3565	0.82	-2537	0.97	-2586	0.86	-4719	0.88	-3358	0.74	-615	0.76	-347
BF 4293 SCHULTZ-RAVER & RAVER COVINGTON5 500 KV	0.74	-2728	0.82	-1141	0.80	-3717	0.83	-2783	0.97	-2744	0.85	-4776	0.88	-3449	0.74	-616	0.76	-348
BF 4336 CHIEF JO-SICKLER 500 KV & SICKLER 500/230 XFMR	0.74	-2748	0.82	-1141	0.80	-3737	0.83	-2804	0.97	-2769	0.86	-4695	0.88	-3454	0.74	-611	0.76	-346
BF 4336 SICKLER-SCHULTZ 500 KV & SICKLER 500/230 XFMR	0.74	-2753	0.82	-1141	0.80	-3734	0.83	-2798	0.97	-2762	0.86	-4681	0.88	-3449	0.74	-611	0.76	-346
BF 4377 ASHE-MARION & MARION-ALVEY 500 KV + RAS	0.74	-2752	0.81	-1125	0.85	-3241	0.81	-2440	0.97	-2527	0.86	-4633	0.89	-3228	0.74	-623	0.75	-370
BF 4386 BUCKLEY-MARION & MARION-SANTIAM 500 KV	0.74	-2788	0.82	-1133	0.81	-3545	0.80	-2331	0.97	-2555	0.86	-4682	0.91	-2991	0.74	-616	0.76	-348
BF 4432 OSTRANDER-TROUTDALE & SPLIT OSTRANDER 500 KV	0.74	-2710	0.82	-1136	0.81	-3595	0.83	-2584	0.98	-2409	0.86	-4700	0.88	-3361	0.74	-615	0.76	-347
BF 4439 BIG EDDY-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.74	-2729	0.82	-1142	0.80	-3677	0.82	-2654	0.97	-2635	0.86	-4825	0.88	-3419	0.74	-618	0.76	-349
BF 4442 BIG EDDY-OSTRANDER 500 KV & OSTRANDER-MCLOUGHLIN 230 KV	0.74	-2745	0.82	-1141	0.80	-3671	0.82	-2670	0.97	-3509	0.85	-4839	0.88	-3412	0.74	-618	0.76	-349
BF 4448 KNIGHT-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.74	-2742	0.82	-1136	0.81	-3620	0.83	-2589	0.97	-3458	0.86	-4746	0.88	-3358	0.74	-615	0.76	-347
BF 4450 KNIGHT-OSTRANDER & OSTRANDER-PEARL 500 KV	0.74	-2733	0.82	-1134	0.81	-3611	0.82	-2580	0.97	-2532	0.86	-4737	0.88	-3350	0.74	-614	0.76	-347
BF 4502 PAUL-ALLSTON & ALLSTON-KEELER 500 KV + RAS	0.74	-2728	0.82	-1115	0.83	-3432	0.86	-2281	0.97	-3247	0.87	-4425	0.89	-3126	0.75	-595	0.75	-334
BF 4510 PEARL-MARION 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.74	-2683	0.82	-1134	0.84	-3246	0.79	-1927	0.97	-2490	0.86	-4627	0.89	-3218	0.74	-614	0.76	-347
BF 4526 CUSTERW-MONROE & MONROE-ECHO LAKE 500 KV + RAS	0.73	-2711	0.81	-1201	0.78	-4453	0.81	-3150	0.96	-3224	0.85	-5072	0.87	-3791	0.72	-665	0.75	-403

Appendix G - 16hs2a_2250idnw_N_wom Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Brownlee		Malin		Marion		John Day		Hanford		McNary		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV	0.74	-3019	0.82	-1112	0.82	-3500	0.85	-2466	0.97	-2341	0.87	-4155	0.89	-3086	0.75	-590	0.75	-333
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV + RAS	0.73	-2683	0.81	-1211	0.77	-4690	0.80	-3227	0.95	-4512	0.86	-4969	0.87	-3886	0.73	-657	0.74	-412
BF 4540 PAUL-NAPAVINE & PAUL-SATSOP 500 KV	0.74	-3090	0.82	-1138	0.80	-3687	0.83	-2741	0.97	-2705	0.86	-4757	0.88	-3420	0.74	-613	0.76	-346
BF 4542 PAUL-ALLSTON 500 KV & CENTER G2	0.74	-2743	0.81	-1153	0.80	-3892	0.84	-2703	0.97	-2781	0.87	-4621	0.88	-3450	0.74	-617	0.75	-359
BF 4542 PAUL-NAPAVINE 500 KV & CENTER G1	0.74	-2823	0.81	-1157	0.79	-3938	0.83	-2816	0.97	-2848	0.86	-4683	0.88	-3497	0.74	-620	0.75	-361
BF 4550 OLYMPIA-PAUL & PAUL-ALLSTON 500 KV	0.74	-2831	0.82	-1136	0.80	-3668	0.83	-2659	0.97	-2666	0.85	-4763	0.88	-3393	0.74	-611	0.76	-345
BF 4554 OLYMPIA-PAUL 500 KV & TONO 500/115 XFMR	0.74	-2738	0.82	-1146	0.80	-3750	0.82	-2852	0.97	-2818	0.85	-4939	0.88	-3500	0.74	-620	0.76	-350
BF 4572 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.77	-2758	0.82	-964	0.81	-3705	0.88	-2435	0.98	-2517	0.87	-3956	0.79	-2937	0.76	-571	0.76	-317
BF 4630 CEN FERRY-LIT GOOS #1 & LIT GOOS-LOW MON #1 500 KV	0.74	-2632	0.82	-1137	0.80	-3724	0.83	-2798	0.97	-2755	0.85	-4837	0.88	-3430	0.75	-610	0.76	-345
BF 4652 TAFT-DWORSHAK & TAFT-HATWAI 500 KV + RAS	0.73	-2747	0.81	-1215	0.78	-4279	0.80	-3175	0.97	-3250	0.84	-5284	0.87	-3862	0.76	-594	0.74	-379
BF 4672 MONROE-CHIEF JO 500 KV & MONROE CAPS	0.74	-2965	0.82	-1138	0.80	-3676	0.83	-2693	0.97	-2655	0.87	-4366	0.88	-3369	0.75	-609	0.76	-345
BF 4676 LIT GOOS-LOW MON & LOW MON-ASHE 500 KV	0.74	-2742	0.82	-1115	0.80	-3689	0.83	-2724	0.97	-2655	0.85	-4580	0.88	-3245	0.75	-597	0.75	-335
BF 4690 PAUL-ALLSTON 500 KV & ALLSTON 500/230 XFMR	0.74	-2717	0.82	-1134	0.80	-3638	0.83	-2622	0.97	-2633	0.86	-4727	0.88	-3356	0.75	-609	0.76	-344
BF 4700 HATWAI 500KV & 230 KV + RAS	0.72	-2733	0.82	-1256	0.79	-4198	0.80	-3105	0.97	-3156	0.84	-5070	0.87	-3775	0.76	-588	0.74	-379
BF 4708 HATWAI 500 KV BUS	0.74	-2979	0.82	-1193	0.80	-3730	0.83	-2804	0.97	-2773	0.86	-4592	0.88	-3462	0.78	-511	0.77	-290
BF 4728 COULEE-CHIEF JO 500 KV & CHEIF JO 500/230 XFMR	0.74	-2782	0.82	-1142	0.80	-3727	0.82	-2806	0.97	-2768	0.85	-4807	0.88	-3462	0.74	-613	0.76	-347
BF 4775 CEN FERRY-LOW GRAN #1 & #2 500 KV + RAS	0.73	-2751	0.81	-1194	0.77	-4465	0.79	-3290	0.96	-3582	0.83	-5257	0.87	-3967	0.73	-654	0.74	-392
BF 4776 HATWAI-LOW GRAN & LOW GRAN-CEN FERRY 500 KV	0.74	-3009	0.82	-1119	0.80	-3740	0.83	-2815	0.97	-2789	0.85	-4669	0.88	-3447	0.76	-570	0.75	-331
BF 4870 JOHN DAY-BIG EDDY 500 KV & BIG EDDY 500/230 KV	0.74	-2739	0.82	-1146	0.80	-3681	0.83	-2756	0.95	-2846	0.85	-4867	0.88	-3440	0.74	-620	0.76	-350
BF 4888 ASHE-SLATT & CGS 500 KV	0.74	-2749	0.81	-1162	0.79	-4212	0.81	-3005	0.97	-3040	0.84	-4617	0.87	-3617	0.74	-610	0.75	-359
BF 4891 LOW MON-ASHE & ASHE-SLATT 500 KV	0.75	-2927	0.82	-1093	0.81	-3553	0.84	-2545	0.97	-2446	0.84	-4001	0.88	-3033	0.76	-574	0.76	-319
BF 4901 LOW MON-ASHE & ASHE-HANFORD 500 KV	0.75	-2695	0.82	-1095	0.81	-3649	0.85	-2583	0.97	-2593	0.82	-4207	0.88	-3169	0.76	-576	0.76	-319
BF 4940 LOW MON-ASHE & ASHE-MARION 500 KV	0.75	-2711	0.82	-1077	0.83	-3269	0.84	-2185	0.97	-2108	0.86	-4015	0.90	-2772	0.76	-579	0.76	-323
BF 4957 SUMMER L-MALIN & SUMMER L-HEMINGWAY 500 KV	0.76	-2607	0.84	-997	0.80	-2845	0.85	-2433	0.97	-3255	0.86	-4619	0.89	-3203	0.76	-575	0.76	-319
BF 4959 GRIZZLY-SUMMER L & SUMMER L-MALIN 500 KV	0.76	-1874	0.84	-1023	0.81	-2701	0.86	-2306	0.97	-2224	0.87	-4485	0.89	-3124	0.76	-575	0.76	-318
BF 4996 CAPTJACK-MALIN #1 & #2 500 KV	0.74	-1931	0.82	-1131	0.70	-3516	0.83	-2791	0.97	-2757	0.85	-4937	0.88	-3467	0.74	-614	0.76	-346
BF 5003 SLATT-BUCKLEY & SLATT-BOARDMAN 500 KV	0.75	-2707	0.82	-1081	0.83	-3293	0.85	-2326	0.97	-2165	0.87	-4380	0.89	-2989	0.75	-595	0.75	-334
BF 5006 SLATT-LONGHORN & SLATT-GRASSLAND 500 KV	0.74	-2546	0.82	-1110	0.81	-3640	0.84	-2639	0.97	-2486	0.86	-4581	0.89	-2602	0.74	-621	0.75	-352
BF 5015 ASHE-SLATT & SLATT-BUCKLEY 500 KV	0.75	-2561	0.82	-1059	0.83	-3186	0.85	-2194	0.97	-2033	0.87	-3851	0.90	-2799	0.76	-567	0.76	-315
BF 5018 ASHE-SLATT & SLATT-JOHN DAY 500 KV	0.75	-2559	0.82	-1100	0.82	-3532	0.84	-2501	0.97	-2952	0.86	-4103	0.89	-2977	0.75	-583	0.75	-326
BF 5021 SLATT-JOHN DAY & SLATT-LONGHORN 500 KV	0.74	-2663	0.82	-1114	0.81	-3592	0.84	-2592	0.97	-2199	0.86	-4550	0.88	-2964	0.74	-612	0.76	-346
BF 5028 BUCKLEY-GRIZZLY & GRIZZLY-SUMMER LAKE 500 KV	0.77	-2654	0.83	-979	0.82	-2813	0.85	-2160	0.97	-1942	0.88	-4236	0.89	-2952	0.77	-548	0.76	-300
BF 5040 GRIZZLY-JOHN DAY & GRIZZLY-ROUND BU 500 KV	0.75	-2298	0.82	-1073	0.82	-3143	0.84	-2426	0.97	-2237	0.87	-4537	0.89	-3130	0.75	-587	0.75	-327
BF 5114 ECHO LAKE-RAVER & ECHO LAKE- SNOK TAP 500 KV	0.74	-2553	0.82	-1140	0.80	-3728	0.83	-2786	0.97	-2751	0.85	-4657	0.88	-3443	0.75	-608	0.76	-345
BF 5117 ECHO LAKE-MAPLE VALLEY & ECHO LAKE-RAVER 500 KV	0.74	-2750	0.82	-1139	0.80	-3700	0.83	-2746	0.97	-2700	0.86	-4579	0.88	-3407	0.75	-610	0.76	-346
BF 5148 COULEE-SCHULTZ & ECHO LAKE-SCHULTZ 500 KV	0.74	-2748	0.82	-1134	0.80	-3679	0.83	-2711	0.97	-2655	0.86	-4400	0.88	-3360	0.75	-600	0.76	-339
BF 5170 WAUTOMA-SCHULTZ & SCHULTZ-RAVER 500 KV	0.74	-2738	0.82	-1135	0.80	-3677	0.83	-2711	0.97	-2643	0.84	-4434	0.88	-3358	0.75	-604	0.76	-341
BF 5179 VANTAGE-SCHULTZ & SCHULTZ-RAVER #4	0.74	-2742	0.82	-1141	0.80	-3711	0.83	-2781	0.97	-2728	0.85	-4575	0.88	-3426	0.74	-612	0.76	-346
BF 5187 MCNARY-LONGHORN & LONGHORN-SLATT 500 KV	0.75	-2748	0.82	-1097	0.80	-3660	0.83	-2692	0.97	-2570	0.86	-4578	0.88	-2115	0.75	-603	0.75	-338
BF 5193 GRASSLAND-COYOTE & COYOTE-LONGHORN 500 KV	0.74	-2718	0.81	-1137	0.79	-3894	0.83	-2825	0.97	-2758	0.85	-4718	0.87	-3111	0.75	-606	0.76	-349
BF 5211 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.77	-2843	0.82	-964	0.81	-3705	0.88	-2435	0.98	-2517	0.87	-3956	0.79	-2937	0.76	-571	0.76	-317
BF 5214 LOW MON-MCNARY & CALPINE PH 500 KV	0.74	-2632	0.81	-1142	0.80	-3870	0.83	-2701	0.97	-2657	0.86	-4060	0.87	-2831	0.76	-578	0.75	-332
BF 5250 HANFORD-WAUTOMA#1 & WAUTOMA-KNIGHT 500 KV	0.75	-2830	0.82	-1098	0.82	-3476	0.85	-2429	0.97	-2275	0.86	-4198	0.89	-3020	0.75	-584	0.75	-327
BF 5259 HANFORD-WAUTOMA#2 & WAUTOMA-ROCK CK 500 KV	0.75	-2662	0.82	-1100	0.82	-3532	0.84	-2514	0.97	-2331	0.85	-4245	0.89	-3082	0.76	-582	0.75	-324
BF 5266 SLATT-BUCKLY 500 KV	0.75	-2676	0.82	-1084	0.83	-3311	0.84	-2356	0.97	-2216	0.87	-4398	0.89	-3057	0.75	-597	0.75	-335

Appendix G - 16hs2a_2250idnw_N_wom Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Brownlee		Malin		Marion		John Day		Hanford		McNary		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 5339 VANTAGE-SCHULTZ 500 KV & VANTAGE 500/230 XFMR #1	0.74	-2584	0.82	-1142	0.80	-3722	0.83	-2796	0.97	-2756	0.84	-4674	0.88	-3447	0.74	-615	0.76	-347
BF 5345 VANTAGE-HANFORD 500 KV & VANTAGE 500/230 XFMR #1	0.74	-2751	0.82	-1138	0.80	-3703	0.83	-2769	0.97	-2720	0.82	-4375	0.88	-3409	0.74	-611	0.76	-345
BF IPC HEMINGWAY-GRASSLAND 500 KV & HEMINGWAY 500/230 XFMR	0.74	-2750	0.88	-664	0.83	-2649	0.87	-2121	0.97	-1917	0.89	-4096	0.90	-2834	0.80	-452	0.78	-238
BF IPC HEMINGWAY-SUMMER L 500 KV & HEMINGWAY 500/230 XFMR	0.72	-1994	0.87	-878	0.80	-3401	0.83	-2771	0.97	-3594	0.85	-4916	0.88	-3446	0.75	-599	0.75	-336
BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.70	-1865	0.89	-615	0.81	-3361	0.83	-2767	0.97	-2756	0.85	-4913	0.88	-3454	0.77	-507	0.77	-284
BF IPC POPULUS-CHILL-HEMINGWAY 500 KV & HEM 500/230 XFMR	0.70	-2435	0.87	-919	0.80	-3646	0.83	-2800	0.97	-2767	0.85	-4934	0.88	-3466	0.75	-608	0.76	-340
BF LOLO 230KV	0.73	-2494	0.83	-1138	0.80	-3572	0.83	-2681	0.97	-2603	0.86	-4685	0.88	-3327	0.75	-596	0.75	-358
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV	0.81	-1826	0.84	-783	0.86	-2258	0.88	-1585	0.98	-2248	0.93	-3412	0.92	-2422	0.80	-433	0.75	-228
BF PGE GRASSLAND-CEDAR SP 500KV & GRASSLAND-HEM 500KV+PTSN	0.81	-1842	0.84	-790	0.86	-2273	0.88	-1595	0.98	-2259	0.93	-3429	0.92	-2431	0.80	-445	0.78	-232
BF PGE GRASSLAND-COYOTE SP 500KV & CARTY GAS PLANT	0.74	-2775	0.81	-1121	0.81	-3699	0.84	-2642	0.97	-3377	0.86	-4521	0.88	-2958	0.75	-601	0.78	-344
BF PGE GRASSLAND-SLATT 500KV & BOARDMAN PLANT	0.74	-2800	0.81	-1159	0.80	-3917	0.82	-2864	0.97	-3696	0.85	-4798	0.88	-3373	0.74	-616	0.76	-329
BUS: ALVEY 500 KV + RAS	0.74	-2752	0.82	-1140	0.88	-2932	0.80	-2828	0.97	-2896	0.85	-5148	0.87	-3639	0.73	-634	0.75	-376
BUS: BELL BPA 500 KV	0.74	-2807	0.82	-1136	0.80	-3733	0.82	-2811	0.97	-2774	0.85	-4869	0.88	-3450	0.78	-523	0.75	-328
BUS: BUCKLEY 500 KV	0.75	-2745	0.83	-1062	0.83	-3077	0.83	-1992	0.97	-1968	0.89	-4121	0.90	-2855	0.75	-589	0.75	-330
BUS: DIXONVILLE 500 KV	0.75	-2512	0.82	-1079	0.86	-2642	0.82	-2540	0.97	-2452	0.85	-4751	0.88	-3322	0.75	-592	0.75	-330
BUS: HOT SPRINGS 500 KV	0.74	-2564	0.82	-1142	0.80	-3731	0.82	-2812	0.97	-2776	0.85	-4897	0.88	-3468	0.75	-587	0.76	-343
BUS: KEELER 500 KV + RAS	0.74	-2749	0.82	-1116	0.84	-3189	0.87	-2012	0.98	-2046	0.89	-4087	0.90	-2947	0.75	-597	0.75	-335
BUS: ROCK CREEK 500 KV	0.75	-2677	0.82	-1100	0.82	-3522	0.84	-2503	0.97	-2280	0.86	-4270	0.89	-3066	0.76	-582	0.75	-325
BUS: SICKLER 500 KV	0.74	-2676	0.82	-1140	0.80	-3732	0.83	-2793	0.97	-2757	0.86	-4657	0.88	-3445	0.75	-610	0.76	-346
BUS: SUMMER LAKE 500 KV	0.76	-2752	0.85	-983	0.81	-2675	0.86	-2280	0.97	-2186	0.87	-4446	0.89	-3092	0.76	-570	0.76	-316
N-1: ALLSTON-KEELER 500 KV + RAS	0.74	-1848	0.82	-1117	0.82	-3461	0.86	-2300	0.97	-2403	0.86	-4475	0.89	-3146	0.75	-597	0.75	-335
N-1: ALLSTON-NAPAVINE 500 KV	0.74	-2691	0.82	-1134	0.80	-3649	0.83	-2635	0.97	-2644	0.86	-4740	0.88	-3377	0.75	-610	0.76	-344
N-1: ALLSTON-PAUL #2 500 KV	0.74	-2734	0.82	-1134	0.80	-3649	0.83	-2639	0.97	-2644	0.85	-4747	0.88	-3376	0.75	-610	0.76	-344
N-1: ALVERY-DIXONVILLE 500 KV	0.75	-2734	0.82	-1078	0.87	-2528	0.83	-2591	0.97	-2418	0.86	-4730	0.88	-3304	0.75	-592	0.75	-330
N-1: ALVEY-MARION 500 KV	0.75	-2559	0.82	-1090	0.86	-2799	0.83	-2470	0.97	-2361	0.86	-4600	0.89	-3159	0.75	-596	0.75	-334
N-1: ASHE-HANFORD 500 KV	0.74	-2592	0.82	-1141	0.80	-3684	0.83	-2727	0.97	-2733	0.81	-4713	0.88	-3354	0.74	-616	0.76	-347
N-1: ASHE-LOW MON 500 KV	0.74	-2745	0.82	-1119	0.80	-3692	0.82	-2736	0.97	-2669	0.85	-4648	0.88	-3283	0.75	-603	0.75	-339
N-1: ASHE-MARION 500 KV	0.75	-2723	0.82	-1097	0.83	-3329	0.84	-2242	0.97	-2205	0.87	-4265	0.89	-2962	0.75	-592	0.75	-333
N-1: ASHE-SLATT 500 KV	0.75	-2634	0.82	-1107	0.81	-3597	0.83	-2600	0.97	-3388	0.85	-4238	0.88	-3198	0.76	-581	0.76	-323
N-1: BELL-COULEE 500 KV	0.74	-2716	0.82	-1136	0.80	-3730	0.82	-2810	0.97	-2772	0.85	-4881	0.88	-3452	0.77	-544	0.75	-331
N-1: BELL-TAFT 500 KV	0.74	-2744	0.82	-1140	0.80	-3732	0.82	-2814	0.97	-2777	0.85	-4924	0.88	-3459	0.78	-538	0.75	-333
N-1: BIG EDDY-CELILO 500 KV	0.74	-2748	0.82	-1143	0.80	-3727	0.82	-2811	0.97	-2775	0.85	-4936	0.88	-3472	0.74	-618	0.76	-348
N-1: BIG EDDY-JOHN DAY 500 KV	0.74	-2751	0.82	-1144	0.80	-3692	0.82	-2786	0.96	-2772	0.85	-4900	0.88	-3448	0.74	-619	0.76	-350
N-1: BIG EDDY-KNIGHT 500 KV	0.74	-2748	0.82	-1130	0.80	-3665	0.83	-2726	0.97	-2554	0.85	-4736	0.88	-3374	0.75	-608	0.76	-342
N-1: BIG EDDY-OSTRANDER 500 KV	0.74	-2730	0.82	-1141	0.80	-3676	0.82	-2707	0.97	-3514	0.85	-4867	0.88	-3431	0.74	-618	0.76	-349
N-1: BOISE BENCH-BROWNLEE #3 230 KV	0.74	-2742	0.82	-1064	0.80	-3695	0.83	-2788	0.97	-2742	0.85	-4906	0.88	-3450	0.74	-613	0.76	-345
N-1: BRADY-ANTELOPE 230 KV	0.74	-2632	0.82	-1140	0.80	-3720	0.82	-2805	0.97	-2768	0.85	-4919	0.88	-3465	0.75	-576	0.76	-346
N-1: BROADVIEW-GARRISON #1 500 KV	0.74	-2741	0.82	-1147	0.80	-3748	0.82	-2826	0.97	-2797	0.85	-4913	0.88	-3483	0.80	-482	0.78	-279
N-1: BROWNLEE-ONTARIO 230 KV	0.76	-2755	0.82	-1029	0.80	-3682	0.83	-2776	0.97	-2721	0.85	-4881	0.88	-3430	0.74	-610	0.76	-344
N-1: BUCKLEY-GRIZZLY 500 KV	0.75	-2530	0.82	-1091	0.81	-3374	0.83	-2526	0.97	-2376	0.86	-4631	0.88	-3253	0.75	-597	0.75	-334
N-1: BUCKLEY-MARION 500 KV	0.74	-2612	0.82	-1135	0.80	-3602	0.80	-2362	0.97	-2598	0.86	-4739	0.88	-3330	0.74	-617	0.76	-349
N-1: BUCKLEY-SLATT 500 KV	0.75	-2718	0.82	-1084	0.83	-3311	0.84	-2356	0.97	-2216	0.87	-4398	0.89	-3057	0.75	-597	0.75	-335
N-1: CAPTAIN JACK-OLINDA 500 KV	0.75	-2584	0.83	-1069	0.81	-2575	0.85	-2426	0.97	-2367	0.86	-4602	0.88	-3235	0.75	-585	0.75	-326
N-1: CAPTJACK-KFALLS 500 KV	0.74	-2479	0.82	-1104	0.71	-3580	0.86	-2558	0.97	-2629	0.85	-4915	0.87	-3469	0.75	-603	0.75	-338
N-1: CASCADE CROSSING 500 KV	0.74	-2621	0.82	-1119	0.83	-3349	0.84	-2194	0.97	-2346	0.87	-4446	0.90	-3078	0.74	-613	0.76	-347

Appendix G - 16hs2a_2250idnw_N_wom Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Brownlee		Malin		Marion		John Day		Hanford		McNary		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: CHIEF JO-COULEE 500 KV	0.74	-2654	0.82	-1142	0.80	-3726	0.82	-2809	0.97	-3646	0.85	-4865	0.88	-3469	0.74	-616	0.76	-348
N-1: CHIEF JO-MONROE 500 KV	0.74	-2751	0.82	-1140	0.80	-3714	0.83	-2784	0.97	-2733	0.85	-4720	0.88	-3437	0.74	-613	0.76	-346
N-1: CHIEF JO-SICKLER 500 KV	0.74	-2747	0.82	-1141	0.80	-3726	0.83	-2802	0.97	-2762	0.86	-4759	0.88	-3457	0.75	-610	0.76	-345
N-1: COULEE-HANFORD 500 KV	0.74	-2750	0.82	-1137	0.80	-3739	0.83	-2773	0.97	-2752	0.84	-4317	0.88	-3422	0.75	-593	0.75	-335
N-1: COULEE-SCHULTZ 500 KV	0.74	-2753	0.82	-1136	0.80	-3705	0.83	-2770	0.97	-2716	0.85	-4568	0.88	-3412	0.75	-602	0.76	-340
N-1: COVINGTON4-RAVER 500 KV	0.74	-2744	0.82	-1144	0.80	-3731	0.83	-2813	0.97	-2783	0.85	-4903	0.88	-3477	0.74	-618	0.76	-349
N-1: COVINGTON5-RAVER 500 KV	0.74	-2752	0.82	-1144	0.80	-3731	0.83	-2812	0.97	-2783	0.85	-4901	0.88	-3477	0.74	-618	0.76	-349
N-1: COYOTE-LONGHORN 500 KV	0.74	-2752	0.82	-1125	0.80	-3689	0.83	-2774	0.97	-2673	0.85	-4824	0.88	-3071	0.75	-608	0.76	-342
N-1: CUSTERW-MONROE 500 KV	0.74	-2756	0.82	-1142	0.80	-3738	0.83	-2810	0.97	-2777	0.86	-4787	0.88	-3467	0.75	-609	0.76	-346
N-1: DIXONVILLE-MERIDIAN 500 KV	0.75	-2753	0.82	-1089	0.85	-2841	0.83	-2563	0.97	-2489	0.85	-4759	0.88	-3334	0.75	-596	0.75	-333
N-1: DRYCREEK-LOLO 230 KV	0.74	-2592	0.82	-1142	0.80	-3727	0.82	-2812	0.97	-2778	0.85	-4937	0.88	-3473	0.74	-617	0.76	-348
N-1: DRYCREEK-N LEWISTON 230 KV	0.74	-2750	0.82	-1143	0.80	-3725	0.82	-2810	0.97	-2775	0.85	-4929	0.88	-3470	0.74	-617	0.76	-348
N-1: DRYCREEK-WALA AVA 230 KV	0.74	-2752	0.82	-1144	0.80	-3725	0.82	-2810	0.97	-2774	0.85	-4924	0.88	-3457	0.74	-616	0.76	-347
N-1: DWORSHAK-HATWAI 500 KV + RAS	0.74	-2752	0.82	-1170	0.80	-3790	0.82	-2859	0.97	-2847	0.86	-4760	0.88	-3526	0.75	-596	0.77	-301
N-1: DWORSHAK-TAFT 500 KV	0.74	-2778	0.82	-1156	0.80	-3754	0.82	-2829	0.97	-2808	0.86	-4817	0.88	-3496	0.79	-505	0.76	-310
N-1: ECHO LAKE-MAPLE VALLEY 500 KV	0.74	-2761	0.82	-1144	0.80	-3732	0.83	-2794	0.97	-2773	0.85	-4808	0.88	-3467	0.74	-619	0.76	-349
N-1: ECHO LAKE-RAVER 500 KV	0.74	-2754	0.82	-1141	0.80	-3725	0.83	-2806	0.97	-2762	0.85	-4859	0.88	-3459	0.74	-614	0.76	-347
N-1: ECHO LAKE-SCHULTZ 500 KV	0.74	-2750	0.82	-1140	0.80	-3696	0.83	-2781	0.97	-2721	0.85	-4768	0.88	-3432	0.74	-615	0.76	-348
N-1: ECHO LAKE-SNOK TAP 500 KV	0.74	-2746	0.82	-1140	0.80	-3729	0.83	-2791	0.97	-2755	0.86	-4695	0.88	-3449	0.75	-608	0.76	-345
N-1: GARRISON-TAFT #2 500 KV	0.74	-2750	0.82	-1146	0.80	-3739	0.82	-2822	0.97	-2792	0.85	-4947	0.88	-3483	0.76	-588	0.76	-340
N-1: GOLDHILL-PLACER 115 KV	0.74	-2756	0.82	-1145	0.80	-3759	0.82	-2829	0.97	-2800	0.85	-4963	0.88	-3486	0.74	-619	0.76	-348
N-1: GRASSLAND-COYOTE 500 KV	0.74	-2755	0.81	-1113	0.80	-3625	0.83	-2684	0.97	-2578	0.86	-4695	0.88	-3054	0.75	-604	0.75	-339
N-1: GRASSLAND-SLATT 500 KV	0.74	-2737	0.82	-1141	0.80	-3721	0.82	-2800	0.97	-2688	0.85	-4909	0.88	-3395	0.74	-619	0.76	-349
N-1: GRIZZLY-JOHN DAY #2 500 KV	0.75	-2713	0.82	-1076	0.82	-3170	0.84	-2446	0.97	-2282	0.86	-4573	0.89	-3149	0.75	-588	0.75	-328
N-1: GRIZZLY-MALIN 500 KV	0.75	-2570	0.83	-1065	0.81	-2968	0.85	-2366	0.97	-2275	0.87	-4499	0.89	-3130	0.75	-589	0.75	-329
N-1: GRIZZLY-PONDEROSA A-SUMMER L 500 KV	0.76	-2510	0.83	-1029	0.81	-3106	0.85	-2419	0.97	-2318	0.86	-4557	0.89	-3143	0.76	-569	0.76	-314
N-1: GRIZZLY-PONDEROSA B-CAPT JACK 500 KV	0.75	-2433	0.83	-1062	0.81	-2943	0.85	-2343	0.97	-2252	0.87	-4479	0.89	-3118	0.75	-588	0.75	-328
N-1: GRIZZLY-ROUND BU 500 KV	0.74	-2498	0.82	-1142	0.80	-3713	0.83	-2798	0.97	-2734	0.85	-4920	0.88	-3461	0.74	-617	0.76	-348
N-1: HANFORD-LOW MON 500 KV	0.74	-2745	0.82	-1131	0.80	-3687	0.83	-2765	0.97	-2701	0.84	-4697	0.88	-3319	0.75	-611	0.76	-345
N-1: HANFORD-VANTAGE 500 KV	0.74	-2735	0.82	-1138	0.80	-3703	0.83	-2769	0.97	-2720	0.82	-4379	0.88	-3410	0.74	-611	0.76	-345
N-1: HANFORD-WAUTOMA 500 KV	0.74	-2750	0.82	-1137	0.80	-3698	0.83	-2776	0.97	-2721	0.84	-4769	0.88	-3422	0.74	-614	0.76	-346
N-1: HATWAI 500/230 KV XFMR + RAS	0.73	-2742	0.82	-1181	0.80	-3658	0.83	-2761	0.97	-2697	0.85	-4799	0.88	-3410	0.75	-609	0.76	-341
N-1: HATWAI-LOLO 230 KV	0.74	-2775	0.82	-1146	0.80	-3711	0.83	-2798	0.97	-2756	0.85	-4898	0.88	-3455	0.74	-614	0.76	-346
N-1: HATWAI-LOW GRAN 500 KV	0.74	-2755	0.82	-1120	0.80	-3747	0.82	-2825	0.97	-2804	0.85	-4723	0.88	-3470	0.76	-570	0.75	-331
N-1: HATWAI-N LEWISTON 230 KV	0.74	-2740	0.82	-1145	0.80	-3725	0.82	-2810	0.97	-2774	0.85	-4926	0.88	-3471	0.74	-616	0.76	-348
N-1: HELLS CANYON-BROWNLEE 230 KV	0.75	-2753	0.81	-1019	0.80	-3540	0.84	-2649	0.97	-2565	0.86	-4653	0.89	-3194	0.75	-589	0.75	-332
N-1: HELLS CANYON-WALLA WALLA 230 KV	0.73	-2651	0.83	-1170	0.80	-3620	0.83	-2739	0.97	-2673	0.85	-4792	0.89	-3284	0.75	-608	0.76	-342
N-1: HEMINGWAY-GRASSLAND 500 KV	0.80	-2761	0.84	-815	0.83	-2683	0.87	-2122	0.97	-1919	0.89	-4102	0.90	-2834	0.80	-463	0.78	-241
N-1: HEMINGWAY-GRASSLAND 500 KV + FACRI	0.76	-1897	0.82	-1008	0.81	-4194	0.82	-3008	0.97	-3934	0.85	-5034	0.88	-3545	0.76	-558	0.76	-308
N-1: HEMINGWAY-GRASSLAND 500 KV + PTSN SHUNT	0.80	-2299	0.83	-871	0.83	-2759	0.87	-2167	0.97	-1982	0.89	-4174	0.90	-2869	0.79	-479	0.77	-248
N-1: HEMINGWAY-SUMMER LAKE 500 KV	0.75	-2040	0.84	-1044	0.80	-3390	0.83	-2761	0.97	-3577	0.85	-4904	0.88	-3437	0.75	-596	0.75	-334
N-1: HILL TOP 345/230 XFMR	0.74	-1977	0.82	-1119	0.80	-3637	0.83	-2808	0.97	-2775	0.85	-4930	0.88	-3466	0.74	-610	0.76	-344
N-1: HORSE HV-MCNARY 230 KV	0.74	-2655	0.82	-1130	0.80	-3693	0.83	-2756	0.97	-2696	0.85	-4822	0.89	-3267	0.74	-616	0.76	-347
N-1: HOT SPRINGS-TAFT 500 KV	0.74	-2733	0.82	-1141	0.80	-3728	0.82	-2810	0.97	-2775	0.85	-4895	0.88	-3467	0.75	-587	0.76	-343
N-1: HUMBOLDT-COYOTE CK 345 KV	0.74	-2748	0.82	-1166	0.81	-3371	0.84	-2662	0.97	-2615	0.85	-4804	0.88	-3404	0.74	-625	0.75	-355

Appendix G - 16hs2a_2250idnw_N_wom Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Brownlee		Malin		Marion		John Day		Hanford		McNary		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: HUNTINGTON-PINTO-FOUR CORNERS 345 KV	0.74	-2696	0.81	-1153	0.80	-3703	0.82	-2811	0.97	-2779	0.85	-4951	0.88	-3480	0.74	-625	0.75	-353
N-1: ING500-CUSTERW 500 KV	0.74	-2777	0.82	-1143	0.80	-3731	0.82	-2811	0.97	-2776	0.85	-4877	0.88	-3470	0.74	-614	0.76	-347
N-1: JOHN DAY-MARION 500 KV	0.74	-2752	0.82	-1131	0.81	-3552	0.81	-2368	0.97	-2510	0.86	-4732	0.89	-3288	0.74	-614	0.76	-347
N-1: JOHN DAY-ROCK CK 500 KV	0.75	-2716	0.82	-1103	0.82	-3539	0.84	-2540	0.97	-2332	0.86	-4408	0.89	-3121	0.75	-585	0.75	-326
N-1: JOHN DAY-SLATT 500 KV	0.74	-2680	0.82	-1124	0.81	-3628	0.83	-2646	0.97	-2259	0.86	-4657	0.88	-3215	0.74	-614	0.76	-347
N-1: KFALLS-MERIDIAN 500 KV	0.74	-2677	0.82	-1132	0.77	-3733	0.91	-1841	0.97	-2664	0.86	-4761	0.88	-3399	0.74	-614	0.76	-346
N-1: KNIGHT-WAUTOMA 500 KV	0.75	-2719	0.82	-1101	0.82	-3492	0.84	-2466	0.97	-2304	0.86	-4305	0.89	-3061	0.75	-586	0.75	-328
N-1: LAGRANDE-NORTH POWDER 230 KV	0.74	-2669	0.83	-1094	0.80	-3665	0.83	-2772	0.97	-2719	0.85	-4888	0.88	-3391	0.74	-610	0.76	-344
N-1: LANES-MARION 500 KV	0.74	-2739	0.82	-1133	0.81	-3516	0.83	-2612	0.97	-2630	0.85	-4784	0.88	-3364	0.74	-614	0.76	-346
N-1: LIT GOOSE-CENTRAL FERRY 500 KV	0.74	-2722	0.82	-1141	0.80	-3727	0.82	-2810	0.97	-2773	0.85	-4911	0.88	-3465	0.74	-615	0.76	-347
N-1: LIT GOOSE-LOW MON 500 KV	0.74	-2750	0.82	-1138	0.80	-3726	0.83	-2801	0.97	-2761	0.85	-4859	0.88	-3439	0.74	-612	0.76	-345
N-1: LOW GRAN-CENTRAL FERRY 500 KV	0.74	-2748	0.82	-1139	0.80	-3730	0.82	-2810	0.97	-2775	0.85	-4888	0.88	-3459	0.75	-611	0.76	-345
N-1: LOW MON-SAC TAP 500 KV	0.74	-2749	0.82	-1132	0.80	-3698	0.82	-2732	0.97	-2693	0.85	-4302	0.87	-2994	0.76	-582	0.76	-324
N-1: MALIN 500/230 XFMR	0.74	-2748	0.82	-1131	0.82	-3561	0.83	-2679	0.97	-2728	0.85	-4884	0.88	-3442	0.74	-614	0.76	-347
N-1: MALIN-HILLTOP 230 KV	0.74	-2704	0.82	-1116	0.80	-3649	0.83	-2797	0.97	-2757	0.85	-4915	0.88	-3457	0.75	-609	0.76	-343
N-1: MALIN-ROUND MTN #1 500 KV	0.74	-2643	0.82	-1109	0.80	-3087	0.84	-2604	0.97	-2551	0.85	-4761	0.88	-3347	0.75	-605	0.76	-339
N-1: MALIN-ROUND MTN #2 500 KV	0.74	-2618	0.82	-1107	0.80	-3058	0.84	-2592	0.97	-2538	0.86	-4753	0.88	-3341	0.75	-604	0.75	-339
N-1: MALIN-SUMMER LAKE 500 KV	0.74	-2611	0.82	-1139	0.80	-3082	0.84	-2536	0.97	-2504	0.86	-4702	0.88	-3304	0.74	-618	0.76	-349
N-1: MAPLE VLY-ROCKY RH 345 KV	0.74	-2577	0.82	-1141	0.80	-3723	0.83	-2801	0.97	-2759	0.85	-4825	0.88	-3457	0.74	-616	0.76	-348
N-1: MARION-PEARL 500 KV	0.74	-2750	0.82	-1139	0.83	-3321	0.80	-1978	0.97	-2604	0.85	-4800	0.89	-3282	0.74	-617	0.76	-348
N-1: MARION-SANTIAM 500 KV	0.74	-2725	0.82	-1148	0.80	-3782	0.82	-2911	0.97	-2861	0.84	-5002	0.89	-3360	0.74	-619	0.76	-349
N-1: MCLOUGLIN-OSTRANDER 230 KV	0.74	-2766	0.82	-1143	0.80	-3725	0.83	-2775	0.97	-2782	0.85	-4922	0.88	-3467	0.74	-618	0.76	-349
N-1: MCNARY 500/230 KV XFMR	0.75	-2752	0.82	-1056	0.80	-3789	0.86	-2701	0.97	-2856	0.86	-4861	0.80	-3600	0.74	-618	0.76	-349
N-1: MCNARY S2-MCNARY S3 230 KV	0.74	-2720	0.82	-1143	0.80	-3727	0.82	-2813	0.97	-2777	0.85	-4924	0.89	-3351	0.74	-617	0.76	-348
N-1: MCNARY-BOARD T1 230 KV	0.74	-2751	0.82	-1135	0.80	-3678	0.83	-2785	0.97	-2740	0.85	-4922	0.88	-3452	0.74	-616	0.76	-346
N-1: MCNARY-JOHN DAY 500 KV	0.75	-2730	0.82	-1098	0.81	-3572	0.84	-2561	0.97	-2355	0.86	-4493	0.89	-2735	0.75	-606	0.76	-342
N-1: MCNARY-LONGHORN 500 KV	0.75	-2657	0.82	-1099	0.80	-3701	0.83	-2739	0.97	-2645	0.85	-4662	0.87	-2159	0.75	-602	0.75	-337
N-1: MCNARY-ROSS 345 KV	0.74	-2743	0.82	-1127	0.80	-3659	0.83	-2694	0.97	-2645	0.86	-4757	0.89	-3234	0.74	-617	0.76	-348
N-1: MCNARY-ROUNDUP 230 KV	0.75	-2726	0.85	-991	0.80	-3600	0.83	-2720	0.97	-2655	0.85	-4824	0.88	-3326	0.75	-605	0.76	-340
N-1: MCNARY-SAC TAP-LOW MON 500 KV	0.74	-2682	0.82	-1123	0.80	-3660	0.83	-2673	0.97	-2617	0.85	-4246	0.87	-2919	0.76	-580	0.76	-322
N-1: MIDPOINT-HEMINGWAY 500 KV	0.70	-2181	0.84	-1003	0.80	-3430	0.83	-2747	0.97	-2711	0.85	-4901	0.88	-3446	0.77	-541	0.77	-297
N-1: MIDPOINT-HEMINGWAY 500 KV + PTSN SHUNT	0.70	-2189	0.84	-1008	0.80	-3440	0.83	-2753	0.97	-2720	0.85	-4918	0.88	-3454	0.77	-553	0.76	-300
N-1: MIDPOINT-HUMBOLDT 345 KV	0.74	-2220	0.81	-1203	0.81	-3374	0.84	-2673	0.97	-2635	0.85	-4834	0.88	-3423	0.74	-629	0.75	-355
N-1: NAPAVINE-PAUL 500 KV	0.74	-2811	0.82	-1139	0.80	-3693	0.83	-2764	0.97	-2718	0.85	-4865	0.88	-3429	0.74	-614	0.76	-346
N-1: OLYMPIA-PAUL 500 KV	0.74	-2744	0.82	-1145	0.80	-3744	0.82	-2840	0.97	-2807	0.84	-4958	0.88	-3493	0.74	-619	0.76	-349
N-1: ONTARIO-CALDWELL 230 KV	0.74	-2756	0.83	-1100	0.80	-3698	0.83	-2792	0.97	-2747	0.85	-4910	0.88	-3454	0.74	-614	0.76	-346
N-1: OSTRANDER-KNIGHT 500 KV	0.74	-2639	0.82	-1135	0.80	-3635	0.83	-2622	0.97	-2586	0.85	-4763	0.88	-3360	0.74	-614	0.76	-347
N-1: OSTRANDER-PEARL 500 KV	0.74	-2730	0.82	-1142	0.80	-3717	0.81	-2736	0.97	-2725	0.85	-4921	0.88	-3460	0.74	-618	0.76	-349
N-1: OSTRANDER-TROUTDALE 500 KV	0.74	-2748	0.82	-1145	0.80	-3730	0.83	-2767	0.97	-2780	0.85	-4913	0.88	-3473	0.74	-619	0.76	-349
N-1: OXBOW-BROWNLEE #2 230 KV	0.74	-2755	0.82	-1129	0.80	-3722	0.82	-2808	0.97	-2771	0.85	-4931	0.88	-3468	0.74	-617	0.76	-348
N-1: OXBOW-LOLO 230 KV	0.73	-2743	0.83	-1127	0.80	-3572	0.83	-2681	0.97	-2604	0.86	-4692	0.88	-3327	0.75	-596	0.75	-329
N-1: PAUL-SATSOP 500 KV	0.74	-2746	0.82	-1143	0.80	-3725	0.83	-2790	0.97	-2769	0.86	-4870	0.88	-3468	0.74	-618	0.76	-349
N-1: PEARL-KEELER 500 KV	0.74	-2751	0.82	-1138	0.81	-3580	0.83	-2558	0.97	-2606	0.85	-4802	0.88	-3380	0.74	-612	0.76	-345
N-1: PEARL-KEELER 500 KV + RAS	0.74	-2739	0.82	-1138	0.81	-3580	0.83	-2558	0.97	-2606	0.85	-4802	0.88	-3380	0.74	-612	0.76	-345
N-1: PINTO-FOUR CORNER 345 KV	0.74	-2739	0.82	-1146	0.80	-3698	0.82	-2804	0.97	-2768	0.85	-4932	0.88	-3471	0.74	-620	0.76	-350

Appendix G - 16hs2a_2250idnw_N_wom Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Brownlee		Malin		Marion		John Day		Hanford		McNary		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: PONDEROSA A 500/230 KV XFMR	0.74	-2756	0.82	-1143	0.80	-3722	0.83	-2809	0.97	-2777	0.85	-4937	0.88	-3474	0.74	-618	0.76	-349
N-1: PONDEROSA B 500/230 KV XFMR	0.74	-2751	0.82	-1142	0.80	-3727	0.83	-2812	0.97	-2779	0.85	-4939	0.88	-3474	0.74	-617	0.76	-348
N-1: RAVER-PAUL 500 KV	0.74	-2749	0.82	-1112	0.81	-3512	0.84	-2504	0.97	-2348	0.87	-4195	0.89	-3088	0.75	-590	0.75	-333
N-1: RAVER-TACOMA 500 KV	0.74	-2683	0.82	-1142	0.80	-3723	0.83	-2796	0.97	-3636	0.85	-4842	0.88	-3462	0.74	-617	0.76	-348
N-1: RED BUTTE-HARRY ALLEN 345 KV	0.74	-2750	0.81	-1152	0.80	-3643	0.83	-2783	0.97	-2741	0.85	-4910	0.88	-3459	0.74	-624	0.75	-354
N-1: ROBINSON-HARRY ALLEN 500 KV	0.75	-2779	0.82	-1121	0.80	-3747	0.82	-2818	0.97	-2786	0.85	-4941	0.88	-3472	0.74	-613	0.76	-346
N-1: ROCK CK-WAUTOMA 500 KV	0.75	-2645	0.82	-1103	0.82	-3545	0.84	-2536	0.97	-2357	0.86	-4325	0.89	-3111	0.75	-583	0.75	-325
N-1: ROUND MTN-TABLE MTN 500 KV	0.74	-2682	0.82	-1120	0.80	-3339	0.83	-2703	0.97	-2654	0.85	-4845	0.88	-3409	0.75	-608	0.76	-342
N-1: ROUNDUP-LAGRANDE 230 KV	0.74	-2671	0.83	-1078	0.80	-3624	0.83	-2744	0.97	-2677	0.85	-4847	0.88	-3335	0.75	-607	0.76	-342
N-1: SCHULTZ-SICKLER 500 KV	0.74	-2732	0.82	-1140	0.80	-3734	0.83	-2797	0.97	-2760	0.85	-4697	0.88	-3448	0.75	-611	0.76	-346
N-1: SCHULTZ-VANTAGE 500 KV	0.74	-2752	0.82	-1143	0.80	-3723	0.83	-2801	0.97	-2763	0.84	-4698	0.88	-3453	0.74	-615	0.76	-347
N-1: SCHULTZ-WAUTOMA 500 KV	0.74	-2751	0.82	-1136	0.80	-3686	0.83	-2735	0.97	-2669	0.84	-4515	0.88	-3381	0.75	-606	0.76	-342
N-1: SIGURD-GLEN CANYON 230 KV	0.74	-2745	0.82	-1142	0.80	-3728	0.82	-2814	0.97	-2780	0.85	-4939	0.88	-3474	0.74	-617	0.76	-348
N-1: SLATT 500/230 KV XFMR	0.74	-2747	0.81	-1155	0.80	-3888	0.83	-2844	0.97	-2815	0.85	-4801	0.88	-3434	0.74	-617	0.75	-357
N-1: SLATT-LONGHORN 500 KV	0.74	-2823	0.82	-1127	0.80	-3670	0.82	-2728	0.97	-2650	0.85	-4785	0.88	-3143	0.74	-615	0.76	-347
N-1: SNOK TAP-SNOKING 500 KV	0.74	-2721	0.82	-1143	0.80	-3732	0.83	-2811	0.97	-2778	0.85	-4882	0.88	-3473	0.74	-617	0.76	-348
N-1: TABLE MTN-TESLA 500 KV	0.74	-2752	0.82	-1124	0.80	-3449	0.83	-2763	0.97	-2717	0.85	-4885	0.88	-3439	0.75	-608	0.76	-342
N-1: TABLE MTN-VACA DIXON 500 KV	0.74	-2689	0.82	-1114	0.81	-3228	0.83	-2714	0.97	-2660	0.85	-4846	0.88	-3411	0.75	-604	0.75	-339
N-1: VANTAGE 500/230 KV XFMR #1	0.74	-2648	0.82	-1142	0.80	-3727	0.82	-2809	0.97	-2775	0.84	-4953	0.88	-3470	0.74	-618	0.76	-348
N-1: VANTAGE 500/230 KV XFMR #2	0.74	-2751	0.82	-1142	0.80	-3727	0.82	-2809	0.97	-2774	0.84	-4953	0.88	-3470	0.74	-618	0.76	-348
N-1: WALLA WALLA-TALBOT 230 KV	0.74	-2751	0.82	-1150	0.80	-3723	0.82	-2805	0.97	-2765	0.85	-4882	0.88	-3460	0.74	-610	0.76	-345
N-1: WALLA WALLA-WALLULA 230 KV	0.74	-2751	0.82	-1132	0.80	-3714	0.83	-2801	0.97	-2764	0.85	-4925	0.89	-3330	0.74	-616	0.76	-348
N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.76	-2752	0.82	-1042	0.85	-3067	0.87	-1959	0.98	-1733	0.88	-3418	0.90	-2539	0.77	-536	0.77	-295
N-2: ASHE-MARION & BUCKLEY-MARION 500 KV	0.75	-2561	0.82	-1085	0.84	-3082	0.83	-1780	0.98	-1845	0.88	-3987	0.91	-2705	0.75	-590	0.75	-333
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.76	-2584	0.83	-1017	0.87	-2702	0.88	-1694	0.98	-1395	0.91	-3457	0.91	-2390	0.76	-562	0.76	-313
N-2: ASHE-MARION & SLATT-COYOTE TAP-LONGHORN 500 KV	0.75	-2390	0.82	-1080	0.83	-3235	0.85	-2143	0.97	-2059	0.87	-4083	0.90	-2636	0.75	-588	0.75	-331
N-2: ASHE-MARION & SLATT-JOHN DAY 500 KV	0.75	-2592	0.83	-1072	0.84	-3163	0.85	-2053	0.97	-2635	0.88	-3926	0.90	-2652	0.75	-587	0.75	-330
N-2: ASHE-SLATT & MCNARY-JOHN DAY 500 KV	0.76	-2533	0.82	-1059	0.83	-3374	0.85	-2320	0.97	-2972	0.87	-3835	0.89	-2491	0.76	-569	0.76	-316
N-2: ASHE-SLATT & SLATT-COYOTE TAP-LONGHORN 500 KV	0.75	-2606	0.82	-1083	0.82	-3474	0.85	-2443	0.97	-3192	0.86	-4040	0.89	-2804	0.76	-575	0.76	-319
N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.74	-2664	0.81	-1189	0.79	-4029	0.81	-3027	0.97	-3049	0.85	-5066	0.87	-3711	0.86	-300	0.77	-237
N-2: BETHEL-CEDAR SP 500KV & BETHEL-ROUND BUTTE 230 KV	0.74	-2683	0.81	-1128	0.81	-3513	0.84	-2256	0.97	-3385	0.86	-4601	0.89	-3242	0.74	-617	0.76	-349
N-2: BETHEL-CEDAR SP 500KV & BETHEL-SANTIAM 230KV	0.74	-2682	0.81	-1126	0.81	-3521	0.84	-2348	0.97	-3388	0.86	-4636	0.89	-3260	0.74	-616	0.76	-349
N-2: BETHEL-CEDAR SP 500KV & SANTIAM-MIKKALO 500KV	0.74	-2659	0.82	-1120	0.83	-3361	0.84	-2202	0.98	-3151	0.87	-4465	0.90	-3125	0.74	-614	0.76	-347
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-CHEMAWA 230 KV	0.74	-2836	0.82	-1139	0.80	-3647	0.82	-2616	0.97	-2613	0.85	-4818	0.88	-3391	0.74	-617	0.76	-349
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-TROUTDALE 230 KV	0.74	-2737	0.82	-1140	0.80	-3666	0.82	-2668	0.97	-3490	0.85	-4836	0.88	-3413	0.74	-618	0.76	-349
N-2: BOISE BENCH-BROWNLEE #1 & #2 230 KV	0.77	-2740	0.80	-849	0.80	-3554	0.83	-2685	0.97	-3483	0.85	-4774	0.88	-3361	0.75	-598	0.75	-333
N-2: BOISE BENCH-BROWNLEE #3 & BOISE BENCH-HORSEFLAT#4 230 KV	0.77	-2275	0.80	-848	0.80	-3550	0.83	-2682	0.97	-2608	0.85	-4771	0.88	-3358	0.75	-598	0.75	-333
N-2: BRIDGER-POPULUS #1 & #2 345 KV	0.75	-2270	0.82	-1105	0.80	-3679	0.83	-2780	0.97	-2729	0.85	-4878	0.88	-3434	0.73	-621	0.74	-374
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV	0.79	-2436	0.83	-1076	0.80	-3633	0.83	-2761	0.97	-2698	0.85	-4844	0.88	-3412	0.73	-594	0.74	-379
N-2: BROADVIEW-GARRISONT #1 & #2 500 KV + RAS	0.73	-2132	0.81	-1172	0.78	-4376	0.80	-3215	0.96	-3463	0.84	-5459	0.87	-3915	0.70	-599	0.82	-413
N-2: BROWNLEE-HELLS CANYON & OXBOW-LOLO 230 KV	0.74	-2927	0.82	-1045	0.83	-3205	0.85	-2393	0.97	-2254	0.87	-4240	0.90	-2880	0.76	-550	0.76	-299
N-2: BROWNLEE-OXBOW & BROWNLEE-HELLS CANYON 230 KV	0.75	-2562	0.81	-1010	0.80	-3533	0.84	-2644	0.97	-2558	0.86	-4646	0.89	-3189	0.75	-588	0.75	-331
N-2: BUCKLEY-MARION & JOHN DAY-MARION 500 KV	0.74	-2640	0.82	-1123	0.82	-3350	0.80	-1831	0.97	-2322	0.87	-4448	0.90	-3088	0.74	-613	0.76	-347
N-2: CHIEF JO-MONROE & CHIEF JO-SICKLER 500 KV	0.74	-2674	0.82	-1137	0.80	-3697	0.83	-2761	0.97	-2704	0.87	-4455	0.88	-3405	0.75	-603	0.76	-342
N-2: CHIEF JO-MONROE 500 KV & CHIEF JO-SNOHOMS4 345 KV	0.74	-2744	0.82	-1138	0.80	-3697	0.83	-2765	0.97	-2710	0.86	-4586	0.88	-3418	0.75	-610	0.76	-345

Appendix G - 16hs2a_2250idnw_N_wom Case VQ Results

V is the voltage at Qm. Qm is the Reactive Margin

Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Brownlee		Malin		Marion		John Day		Hanford		McNary		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: CHIEF JO-MONROE 500 KV & MONROE-SAMMAMSH 230 KV	0.74	-2745	0.82	-1140	0.80	-3715	0.83	-2778	0.97	-2732	0.85	-4671	0.88	-3435	0.74	-612	0.76	-346
N-2: CHIEF JO-SICKLER 500 KV & CHIEF J3-SNOHOMS3 345 KV	0.74	-2748	0.82	-1140	0.80	-3720	0.83	-2788	0.97	-2744	0.86	-4650	0.88	-3442	0.75	-608	0.76	-344
N-2: COULEE-CHIEF JO 500 KV & CHIEF J4-SNOHOMS4 345 KV	0.74	-2748	0.82	-1142	0.80	-3723	0.83	-2801	0.97	-2760	0.86	-4775	0.88	-3458	0.74	-615	0.76	-348
N-2: COULEE-HANFORD & HANFORD-VANTAGE 500 KV	0.74	-2750	0.82	-1127	0.80	-3731	0.84	-2700	0.97	-2708	0.82	-3623	0.88	-3342	0.76	-574	0.75	-324
N-2: COULEE-SCHULTZ #1 & #2 500 KV	0.74	-2751	0.82	-1121	0.80	-3665	0.83	-2633	0.97	-2564	0.88	-3797	0.88	-3215	0.76	-559	0.76	-317
N-2: CUSTERW-ING500 & CUSTERW-MONROE 500 KV	0.74	-2719	0.82	-1141	0.80	-3739	0.83	-2802	0.97	-2773	0.86	-4725	0.88	-3462	0.75	-605	0.76	-345
N-2: CUSTERW-MONROE #1 & #2 500 KV + RAS	0.73	-2753	0.81	-1204	0.77	-4472	0.79	-3277	0.96	-3523	0.84	-5495	0.87	-3911	0.73	-656	0.75	-396
N-2: DC-BIPOLE	0.77	-3010	0.84	-986	0.82	-2749	0.84	-2669	0.93	-3067	0.86	-4915	0.88	-3522	0.75	-584	0.75	-351
N-2: DOUBLE PALO VERDE	0.79	-2387	0.84	-666	0.86	-3126	0.87	-2345	0.97	-2283	0.90	-3503	0.89	-2947	0.78	-490	0.76	-300
N-2: ECHOLAKE-MAPLE VLY 500 KV & COVINGTON-MAPLE VLY 230 KV	0.74	-2357	0.82	-1144	0.80	-3732	0.83	-2794	0.97	-3646	0.85	-4806	0.88	-3466	0.74	-619	0.76	-349
N-2: ECHOLAKE-MAPLE VLY 500 KV & ROCKY RH-MAPLE VLY 345 KV	0.74	-2754	0.82	-1142	0.80	-3722	0.83	-2772	0.97	-2740	0.86	-4667	0.88	-3439	0.74	-617	0.76	-348
N-2: GARRISON-TAFT #1 & #2 500 KV + RAS	0.73	-2752	0.81	-1165	0.79	-4012	0.81	-3005	0.97	-3015	0.84	-5126	0.87	-3688	0.83	-466	0.74	-451
N-2: GRASSLAND-CEDAR SP 500KV & SLATT-BUCKLEY 500KV	0.75	-2438	0.83	-1047	0.86	-2881	0.88	-1755	0.98	-2428	0.91	-3760	0.91	-2648	0.76	-589	0.75	-332
N-2: GRASSLAND-COYOTE 500KV & SLATT-LONGHORN 500KV	0.77	-2619	0.82	-1000	0.84	-3255	0.88	-2187	0.98	-2642	0.89	-3584	0.91	-1451	0.76	-564	0.76	-314
N-2: GRIZZLY-MALIN & GRIZZLY-CAPTAIN JACK 500 KV + RAS	0.75	-2860	0.82	-1077	0.80	-3097	0.84	-2628	0.97	-2732	0.86	-5027	0.88	-3562	0.73	-632	0.74	-390
N-2: GRIZZLY-MALIN & GRIZZLY-SUMMER LAKE 500 KV + RAS	0.76	-2646	0.82	-1040	0.79	-3404	0.82	-2746	0.97	-2811	0.86	-5102	0.88	-3608	0.74	-616	0.75	-375
N-2: GRIZZLY-MALIN & MALIN-SUMMER LAKE 500 KV + RAS	0.74	-2581	0.82	-1171	0.78	-3141	0.83	-2791	0.97	-2954	0.83	-5527	0.88	-3710	0.73	-659	0.74	-413
N-2: HANFORD-ASHE & HANFORD-LOW MON 500 KV	0.74	-2757	0.82	-1124	0.81	-3572	0.83	-2584	0.97	-2593	0.80	-3960	0.89	-2923	0.74	-611	0.76	-346
N-2: HANFORD-WAUTOMA #1 & #2 500 KV	0.75	-2700	0.82	-1101	0.81	-3574	0.84	-2547	0.97	-2453	0.82	-3991	0.89	-3085	0.75	-593	0.75	-331
N-2: JOHN DAY-BIG EDDY #1 & #2 500 KV	0.74	-2674	0.82	-1157	0.80	-3515	0.86	-2495	0.89	-2651	0.89	-4408	0.89	-3296	0.74	-630	0.75	-360
N-2: JOHN DAY-BIG EDDY & JOHN DAY-MARION 500 KV	0.74	-2741	0.82	-1132	0.81	-3512	0.81	-2344	0.96	-3370	0.86	-4670	0.89	-3259	0.74	-615	0.76	-348
N-2: JOHN DAY-GRIZZLY #1 & #2 500 KV + RAS	0.76	-2711	0.82	-1038	0.82	-3233	0.82	-2495	0.97	-2404	0.87	-4800	0.89	-3308	0.74	-608	0.75	-365
N-2: JOHN DAY-GRIZZLY #2 & BUCKLEY-GRIZZLY 500 KV + RAS	0.75	-2601	0.82	-1061	0.81	-3337	0.83	-2525	0.97	-2340	0.86	-4776	0.88	-3317	0.74	-603	0.74	-390
N-2: JOHN DAY-MARION & BUCKLEY-MARION 500 KV	0.74	-2612	0.82	-1123	0.82	-3350	0.80	-1831	0.97	-2322	0.87	-4448	0.90	-3088	0.74	-613	0.76	-347
N-2: JOHN DAY-MARION & MARION-PEARL 500 KV	0.74	-2674	0.82	-1120	0.86	-2942	0.79	-1416	0.97	-2330	0.86	-4500	0.90	-3019	0.75	-609	0.76	-344
N-2: JOHN DAY-ROCK CREEK 500 KV & MCNARY-ROSS 345 KV	0.75	-2659	0.82	-1085	0.83	-3443	0.85	-2410	0.97	-2195	0.87	-4220	0.90	-2879	0.75	-584	0.75	-325
N-2: KEELER-PEARL 500 & SHERWOOD-CARLTON 230 KV	0.74	-2647	0.82	-1137	0.81	-3570	0.83	-2538	0.97	-2602	0.85	-4786	0.88	-3375	0.74	-612	0.76	-345
N-2: KNIGHT-OSTRANDER & OSTRANDER-BIG EDDY 500 KV	0.74	-2736	0.82	-1131	0.82	-3513	0.85	-2361	0.98	-2256	0.87	-4600	0.89	-3234	0.74	-615	0.76	-348
N-2: KNIGHT-OSTRANDER 500 KV & MCNARY-ROSS 345 KV	0.74	-2711	0.82	-1117	0.81	-3521	0.84	-2489	0.97	-2427	0.87	-4558	0.90	-3063	0.74	-613	0.76	-346
N-2: KNIGHT-OSTRANDER 500 KV & MIDWAY-BONNEVILLE 230 KV	0.74	-2695	0.82	-1127	0.81	-3570	0.84	-2568	0.97	-3362	0.86	-4631	0.89	-3238	0.75	-610	0.76	-344
N-2: LOWER GRANITE-CENTRAL FERRY #1 & #2 500 KV	0.73	-2713	0.81	-1194	0.77	-4465	0.79	-3290	0.96	-4460	0.83	-5257	0.87	-3967	0.73	-654	0.74	-392
N-2: MALIN-ROUND MTN #1 & #2 500 KV	0.74	-3009	0.82	-1145	0.79	-2501	0.83	-2941	0.96	-3293	0.85	-5469	0.87	-3905	0.73	-651	0.74	-389
N-2: MCNARY-JOHN DAY & ROCK CREEK-JOHN DAY 500 KV	0.76	-2679	0.82	-1040	0.84	-3256	0.86	-2178	0.98	-2637	0.88	-3816	0.90	-2364	0.76	-567	0.76	-313
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-HORSE HEAVEN 230 KV	0.75	-2534	0.82	-1078	0.82	-3493	0.84	-2467	0.97	-2255	0.87	-4287	0.90	-2509	0.75	-604	0.76	-340
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-ROSS 345 KV	0.75	-2617	0.82	-1076	0.82	-3445	0.85	-2409	0.97	-2208	0.87	-4253	0.90	-2497	0.75	-605	0.76	-341
N-2: MCNARY-ROSS 345 KV & MCNARY-HORSE HEAVEN 230 KV	0.74	-2609	0.82	-1110	0.81	-3596	0.83	-2622	0.97	-2542	0.86	-4620	0.90	-2997	0.74	-614	0.76	-347
N-2: MIDPOINT-SUMMER LAKE 500 KV & MIDPOINT-KING 230 KV	0.70	-2177	0.84	-999	0.81	-3410	0.83	-2741	0.97	-2703	0.85	-4891	0.88	-3442	0.77	-532	0.77	-294
N-2: MONROE-CUSTERW & CHIEF JO-MONROE 500 KV	0.74	-2203	0.82	-1138	0.80	-3710	0.83	-2767	0.97	-2725	0.87	-4512	0.88	-3421	0.75	-604	0.76	-344
N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV + RAS	0.74	-2748	0.81	-1133	0.88	-3455	0.90	-1688	0.99	-1787	0.91	-3476	0.91	-2644	0.74	-602	0.75	-374
N-2: PAUL-NAPAVINE & PAUL-ALLSTON #2 500 KV + RAS	0.74	-2897	0.81	-1133	0.88	-3504	0.90	-1732	0.99	-1828	0.91	-3513	0.91	-2686	0.74	-602	0.75	-374
N-2: PAUL-RAVER & RAVER-COVINGT4 500 KV	0.74	-2899	0.82	-1112	0.81	-3507	0.85	-2476	0.97	-2339	0.87	-4127	0.89	-3081	0.75	-590	0.75	-332
N-2: PEARL-KEELER 500 KV & PEARL-SHERWOOD 230 KV + RAS	0.74	-2681	0.82	-1139	0.81	-3577	0.83	-2550	0.97	-3479	0.85	-4799	0.88	-3382	0.74	-613	0.76	-345
N-2: PEARL-OSTRANDER 500 KV & BIG EDDY-MCLOUGLN 230 KV	0.74	-2740	0.82	-1141	0.80	-3693	0.81	-2683	0.97	-2703	0.85	-4902	0.88	-3446	0.74	-618	0.76	-349
N-2: PEARL-OSTRANDER 500 KV & OSTRANDER-MCLOUGLN 230 KV	0.74	-2745	0.82	-1142	0.80	-3694	0.83	-2632	0.97	-2732	0.85	-4892	0.88	-3444	0.74	-618	0.76	-349
N-2: RAVER-COVINGTON #1 & #2 500 KV	0.74	-2745	0.82	-1145	0.80	-3739	0.83	-2803	0.97	-2789	0.85	-4838	0.88	-3479	0.74	-620	0.76	-349

Appendix G - 16hs2a_2250idnw_N_wom Case VQ Results V is the voltage at Qm. Qm is the Reactive Margin Yellow highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Hemingway		Brownlee		Malin		Marion		John Day		Hanford		McNary		Mill Creek		Yellowtail	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: RAVER-ECHO LAKE & RAVER-SCHULTZ 500 KV	0.74	-2755	0.82	-1139	0.80	-3700	0.83	-2776	0.97	-2720	0.85	-4726	0.88	-3428	0.74	-611	0.76	-346
N-2: RAVER-PAUL & NAPAVINE-PAUL 500 KV	0.74	-2745	0.82	-1111	0.81	-3499	0.85	-2468	0.97	-2330	0.87	-4182	0.89	-3076	0.75	-589	0.75	-332
N-2: RAVER-PAUL 500 KV & COULEE-OLYMPIA 300 KV	0.73	-2679	0.81	-1205	0.78	-4651	0.80	-3191	0.97	-4156	0.87	-4821	0.87	-3812	0.73	-653	0.74	-408
N-2: RAVER-PAUL 500 KV & TACOMA A-CHEHALIS 230 KV	0.73	-3080	0.81	-1205	0.78	-4634	0.80	-3170	0.97	-3257	0.87	-4884	0.87	-3795	0.73	-653	0.74	-408
N-2: RAVER-SCHULTZ #1 & #2 500 KV	0.74	-3076	0.82	-1132	0.80	-3641	0.83	-2682	0.97	-2583	0.86	-4406	0.88	-3308	0.75	-610	0.76	-345
N-2: RAVER-TACOMA & RAVER-COVINGT4 500 KV	0.74	-2730	0.82	-1143	0.80	-3726	0.83	-2784	0.97	-2761	0.86	-4766	0.88	-3458	0.74	-618	0.76	-349
N-2: RAVER-TACOMA 500 KV & TACOMA-CHRISTOP-COVINGTON 230 KV	0.74	-2752	0.82	-1142	0.80	-3723	0.83	-2791	0.97	-2758	0.85	-4820	0.88	-3459	0.74	-617	0.76	-348
N-2: ROUND MTN-TABLE MTN #1 & #2 500 KV + RAS	0.74	-2750	0.81	-1187	0.77	-2896	0.81	-3247	0.96	-3654	0.84	-5787	0.86	-4137	0.72	-663	0.74	-394
N-2: SCHULTZ-WAUTOMA & VANTAGE-SCHULTZ 500 KV + RAS	0.74	-2784	0.82	-1137	0.80	-3685	0.84	-2698	0.97	-3523	0.84	-3996	0.88	-3332	0.75	-595	0.75	-336
N-2: SICKLER-SCHULTZ & SCHULTZ-VANTAGE 500 KV + RAS	0.74	-2747	0.82	-1140	0.80	-3725	0.83	-2785	0.97	-2738	0.85	-4494	0.88	-3419	0.75	-609	0.76	-345
N-2: TABLE MTN-TESLA & TABLE MTN-VACA DIXON 500 KV	0.74	-2751	0.82	-1132	0.78	-3924	0.80	-3139	0.96	-3388	0.88	-4824	0.87	-3861	0.73	-636	0.74	-410
N-2: TAFT-BELL 500 KV & BELL-LANCASTER 230 KV	0.74	-2964	0.82	-1134	0.80	-3747	0.82	-2817	0.97	-2778	0.85	-4857	0.88	-3438	0.80	-475	0.76	-312
N-2: TAFT-BELL 500KV & BELL-BOUNDARY #3 230KV	0.74	-2742	0.82	-1141	0.80	-3742	0.82	-2818	0.97	-2785	0.85	-4885	0.88	-3464	0.78	-537	0.75	-334
N-2: TAFT-BELL 500KV & BELL-LANCASTER 230KV	0.74	-2752	0.82	-1134	0.80	-3747	0.82	-2817	0.97	-2778	0.85	-4857	0.88	-3438	0.80	-475	0.76	-312
N-2: TAFT-BELL 500KV & BELL-TRENTWOOD #2 115KV	0.74	-2742	0.82	-1140	0.80	-3733	0.82	-2814	0.97	-2778	0.85	-4923	0.88	-3459	0.78	-538	0.75	-333
N-2: TAFT-BELL 500KV & LANCASTER-NOXON 230KV	0.74	-2748	0.82	-1139	0.80	-3736	0.82	-2815	0.97	-2778	0.85	-4917	0.88	-3454	0.78	-521	0.75	-327
N-2: TAFT-DWORSHAK & GARRISON-TAFT #1 500KV	0.74	-2746	0.82	-1158	0.80	-3763	0.82	-2837	0.97	-2818	0.85	-4828	0.88	-3503	0.79	-500	0.76	-303
N-2: WAUTOMA-ROCK CK 500 KV & MIDWAY-BIG EDDY 230 KV	0.75	-2764	0.82	-1092	0.82	-3500	0.84	-2465	0.97	-2285	0.86	-4206	0.89	-3033	0.76	-577	0.76	-320
N-2: WAUTOMA-ROCK CK 500 KV & SPRINGCREEK-BIG EDDY 230 KV	0.75	-2663	0.82	-1092	0.82	-3500	0.84	-2465	0.97	-2285	0.86	-4205	0.89	-3033	0.76	-577	0.76	-320
N-3: SCHULTZ-RAVER #1 & #2 & #3 500 KV	0.74	-2663	0.82	-1129	0.80	-3602	0.83	-2632	0.97	-2515	0.86	-4225	0.88	-3236	0.75	-607	0.76	-343

Appendix G – 16lhs2a_2250idnw_wom Base Case Transient Stability Plots

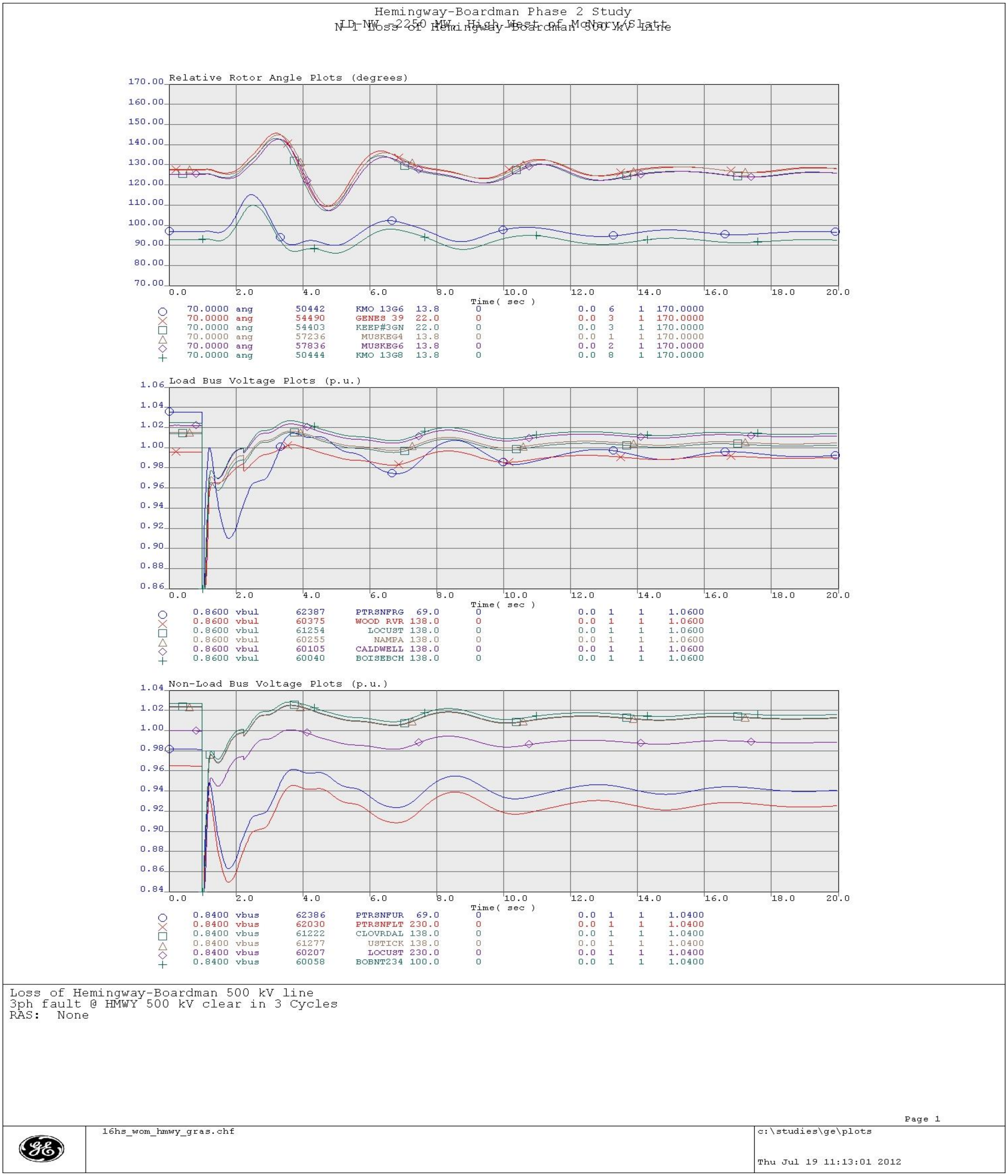


Figure G8: N-1 Loss of Hemingway-Boardman 500 kV Line (Angle & Voltage Plots)

Appendix G – 16lhs2a_2250idnw_wom Base Case Transient Stability Plots

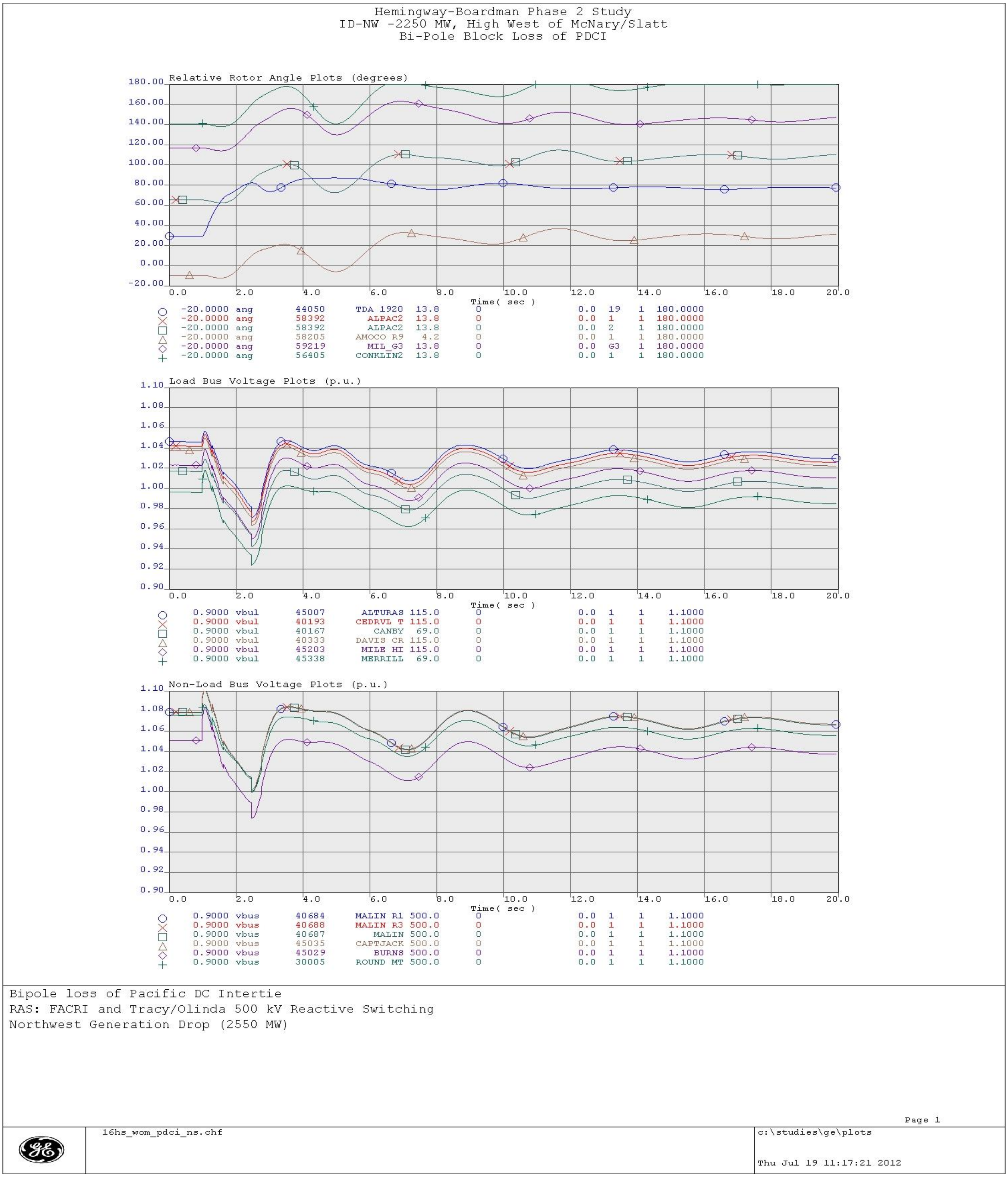
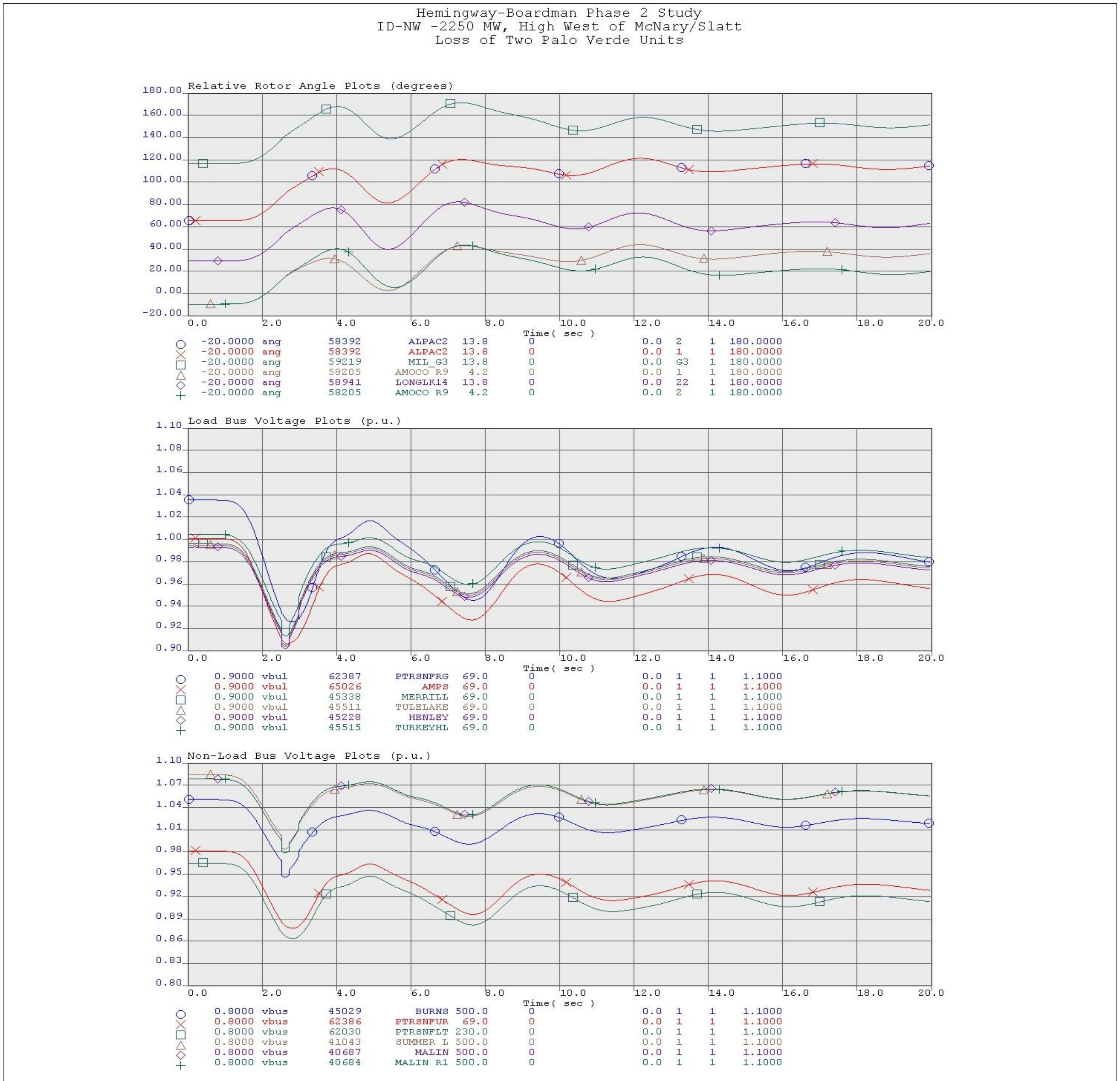


Figure G9: Bi-Pole Block – Pacific DC Intertie (Angle & Voltage Plots)

Appendix G – 16lhs2a_2250idnw_wom Base Case Transient Stability Plots



Loss of 2 Palo Verde Units
RAS: With Phoenix Area Load Tripping RAS
FACRI Reactive Switching

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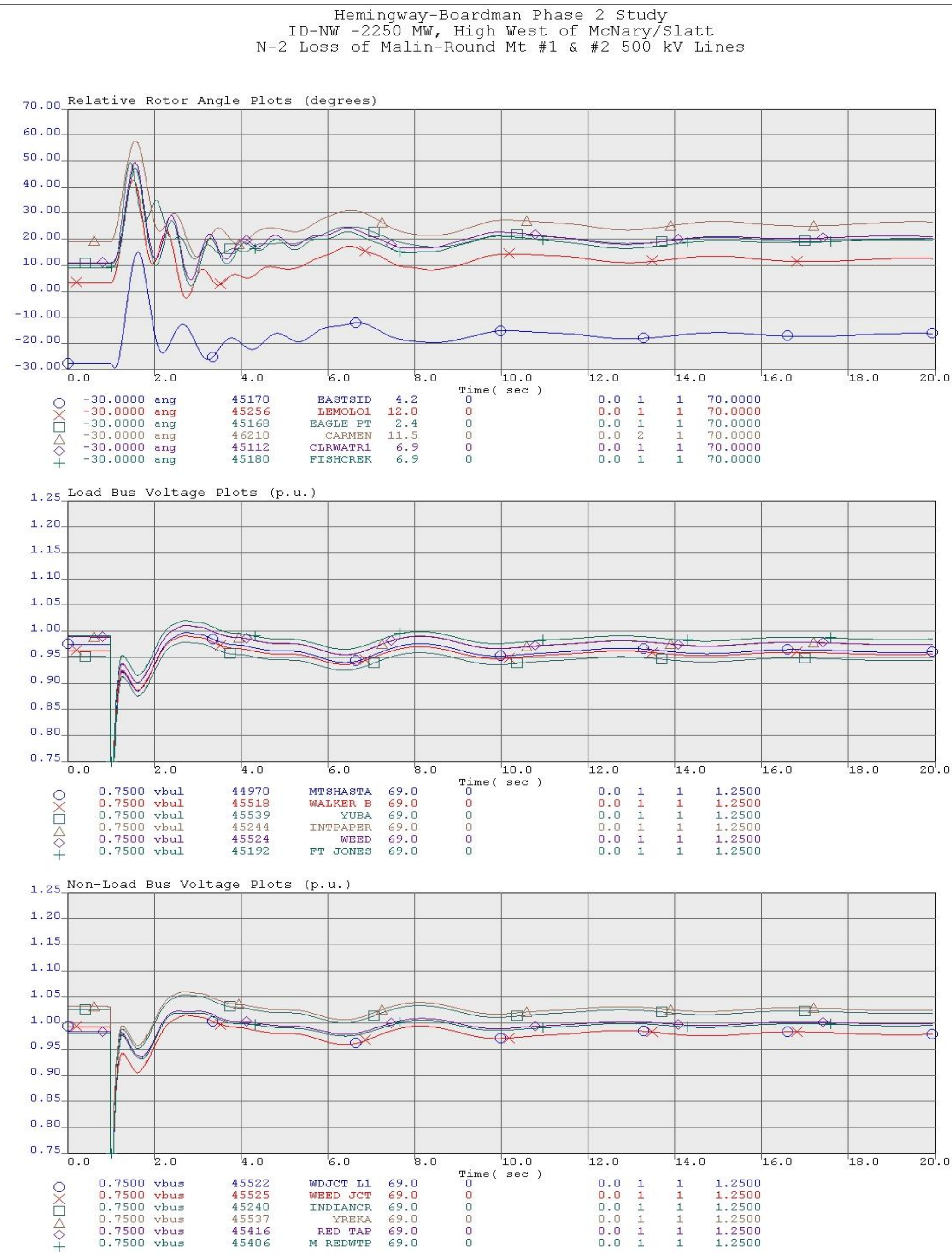
Figure G10: Loss of Two Palo Verde Units (Angle & Voltage Plots)

Appendix G – 16lhs2a_2250idnw_wom Base Case Transient Stability Plots



3-Phase Fault @ Malin 500 kV with 4 Cycle Clearing
Loss of Malin-Round Mtn #1 & #2 500 kV Lines
Opens Round Mtn-Table Mtn #2 500 kV Line
RAS: FACRI and Tracy/Olinda 500 kV Reactive Switching
NW Gen Drop 2400 MW

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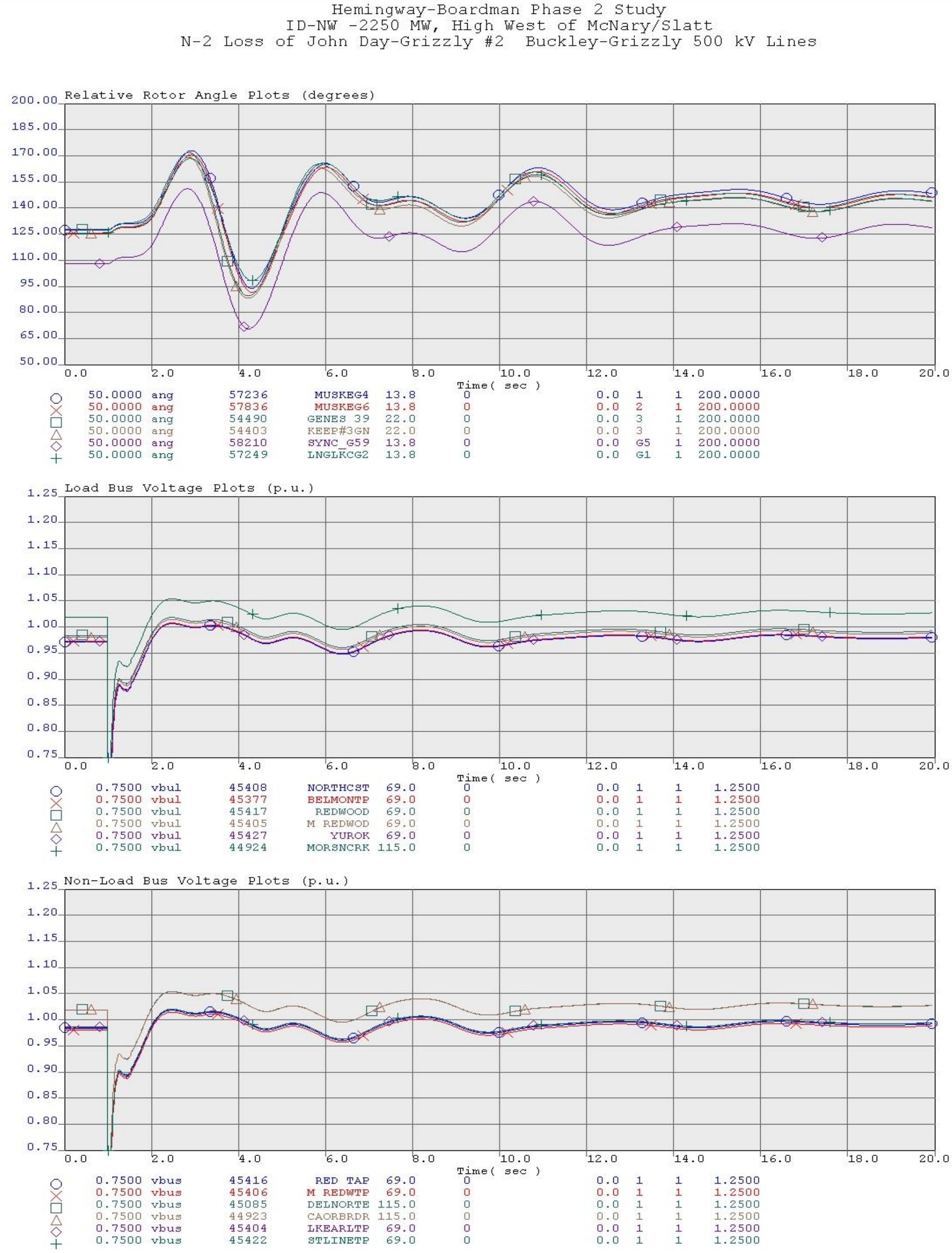
Figure G11: N-2 Loss of Malin-Round Mtn #1 & #2 500 kV Lines (Angle & Voltage Plots)

Appendix G – 16lhs2a_2250idnw_wom Base Case Transient Stability Plots



3-Phase Fault @ Grizzly 500 kV with 4 Cycle Clearing
Loss of John Day-Grizzly #2 and
Buckley-Grizzly 500 kV
RAS: NW Gen Drop 2400 MW

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Figure G12: N-2 Loss of John Day-Grizzly #2 & Buckley-Grizzly 500 kV Lines (Angle & Voltage Plots)

Appendix G – 16lhs2a_2250idnw_wom Base Case Transient Stability Plots

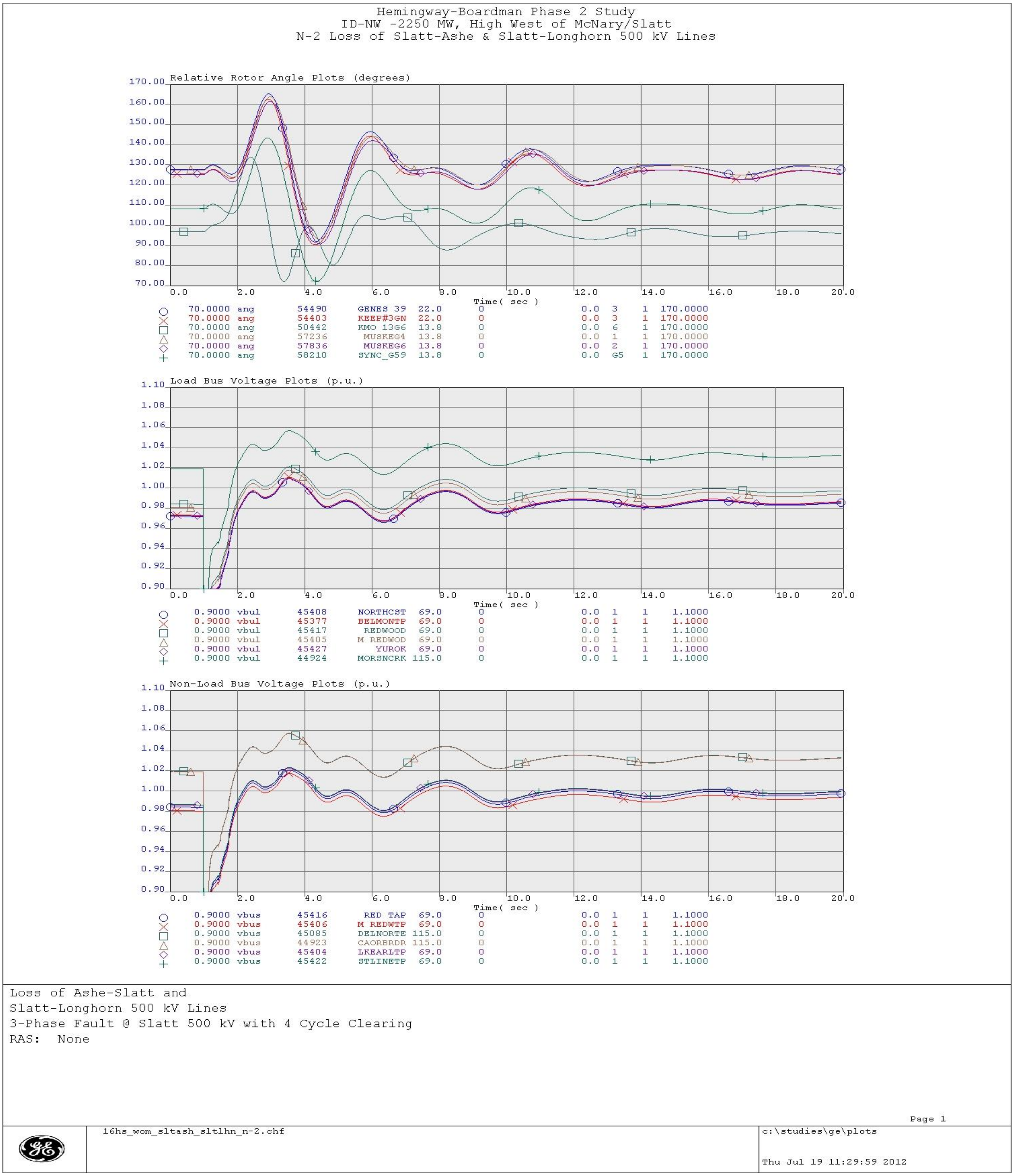

Figure G13: N-2 Loss of Slatt-Ashe & Slatt-Longhorn 500 kV Lines (Angle & Voltage Plots)

Appendix F - 16hs2a_2250idnw_wom Base Case Transient Stability Results

Fault	Disturbance/Outage	RAS Actions		Largest Swing Voltage Bus	Lowest Swing Voltage Bus	Largest Swing Voltage Load Bus	Lowest Load Bus Frequency	Comments
		Cycles	Remedial Action	(% change)	(absolute value)	(% change)	(Hz)	
N-1 3 Cy 3PH Hemingway 500 kV	Hemingway-Grassland 500 kV	Var	FACRI insert of Ft Rock Series Caps	Ptrsnfrg 69 12.2%	Ptrsnflt 230 0.850	Ptrsnfrg 69 12.2%	Bridger1 22 59.878	Stable & Damped
Bi-pole Block	PDCI Bipole	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt CapC1 Tracy&Olinda React Switching NW 2550 MW Gen Drop	Malin R1 500 7.2%	Wbk 1t3 138 0.888	Alturas 115 7.2%	Lnglkcg2 13.8 59.764	Stable & Damped
N-2	Loss of 2 Palo Verde units	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1&C2, CaptJack Shunt Cap C1	Ptrsnfrg 69 10.6%	Ptrsnflt 230 0.864	Ptrsnfrg 69 10.6%	Muskeg4 13.8 59.754	Stable & Damped
N-2 4 Cy 3PH Malin 500 kV	Malin-Round Mt #1 500 kV Malin-Round Mt #2 500 kV Round Mt-Table Mt #2 500 kV	Var	Chief Jo Braking Resistor Tracy&Olinda React Switching NW 2400 MW Gen Drop FACRI insert Ft Rock Series Caps Flash Malin-Round Mt S-Caps	Mtshasta 16.6%	Yuba 69 0.796	Mtshasta 16.6%	Kmo 13g6 13.8 59.761	Stable & Damped
N-2 4 Cy 3PH Grizzly 500 kV	John Day-Grizzly #2 500 kV Buckley-Grizzly 500 kV	Var	FACRI insert Ft Rock Series Caps, Malin C1, CaptJack C1 NW 2400 MW Gen Drop	Northcst 69 20.6%	Northcst 69 0.772	Northcst 69 20.6%	Kmo 13g6 13.8 59.645	Stable & Damped
N-2 4 Cy 3PH Slatt 500 kV	Slatt-Ashe 500 kV Slatt-Longhorn 500 kV	Var	FACRI insertion of Ft Rock Series Caps, Malin Shunt Cap C1 & CaptJack Sh Cap C1	Northcst 69 19.4%	Northcst 69 0.783	Northcst 69 19.4%	Kmo 13g6 13.8 59.766	Stable & Damped

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Shunt HANFORD_500.0 (40499) #s
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Bus MALIN R3_500.0 (40688)
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Bus HOT SPR_500.0 (40553)
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HERMCALP_500.0 (47638)

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP S1_ 18.0 (47641)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G2_ 18.0 (47640)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G1_ 18.0 (47639)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 2
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN Bus ASHE R1_500.0 (40062)
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Bus SANTIAM_500.0 (40941)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Shunt OSTRNDER_500.0 (40809) #s
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	CLOSE MultiSectionLine PEARL_500.0 (40827) TO KNIGHT_500.0 (41450) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOK TAP_500.0 (41001)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOKING_500.0 (41007)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt MONROE_500.0 (40749) #s
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR G2_ 20.0 (47744)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2AX_ 4.2 (47746)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2FG_ 13.8 (47747)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR G1_ 20.0 (47740)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1AX_ 4.2 (47742)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1FG_ 13.8 (47743)
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Transformer TONO_115.0 (42806) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Shunt OLY E_230.0 (40794) #s
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 52.2 MVR
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN Shunt MONROE_500.0 (40749) #s
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Transformer ALLSTON_500.0 (40045) TO ALLSTN E_230.0 (40043) CKT 2
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Bus HATWAI_500.0 (40521)
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Bus HATWAI_230.0 (40519)
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line NPULLMAN_115.0 (48291) TO SHAWNEE_115.0 (48383) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line MOSCITYT_115.0 (48245) TO SPULLMAN_115.0 (48413) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS HOT SPR_500.0 (40553) TO -148.3 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	CLOSE Line LEON_115.0 (48183) TO MOSCCITY_115.0 (48243) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line MOSCCITY_115.0 (48243) TO MOSCITYT_115.0 (48245) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS N LEWIST_115.0 (48253) TO 44.4 MVR
BF 4708 Hatwai 500 kV Bus	OPEN Bus HATWAI_500.0 (40521)
BF 4708 Hatwai 500 kV Bus	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4708 Hatwai 500 kV Bus	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Transformer CHIEF JO_500.0 (40233) TO CHIEF J2_230.0 (40232) CKT 3

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Contingency Studied	Actions Taken in the Contingency
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN InjectionGroup RAS Lower Granite Gen Drop
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Transformer BIG EDDY_500.0 (40111) TO BIGEDDY1_230.0 (41341) CKT 2
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Bus CGS_ 25.0 (40063)
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN Bus BURNS_500.0 (45029)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R3_500.0 (40688)
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN Bus ROUND BU_500.0 (43485)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Bus MAPLE VL_500.0 (40693)
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M1_500.0 (43115)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 52.2 MVR
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJAWEA_500.0 (40913)

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G1_ 18.0 (47639) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G2_ 18.0 (47640) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP S1_ 18.0 (47641) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
BF 5266 Slatt-Buckly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Bus BURNS_500.0 (45029)
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF Lolo 230kV	OPEN Bus LOLO_230.0 (48197)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1G_ 18.0 (45454)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1S_ 13.8 (45455)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2G_ 18.0 (45456)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2S_ 13.8 (45457)
BF McNary 230 kV SECT 1	OPEN Bus MCN 01_ 13.8 (44101)
BF McNary 230 kV SECT 1	OPEN Bus MCN 02_ 13.8 (44102)
BF McNary 230 kV SECT 1	OPEN Bus MCN 03_ 13.8 (44103)
BF McNary 230 kV SECT 1	OPEN Bus MCN 04_ 13.8 (44104)
BF McNary 230 kV SECT 1	OPEN Bus BOARD T1_230.0 (40121)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_230.0 (40129)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_115.0 (40127)
BF McNary 230 kV SECT 1	OPEN Bus MORROW 1_115.0 (47334)
BF McNary 230 kV SECT 1	OPEN Bus PORT MOR_115.0 (47335)
BF McNary 230 kV SECT 1	OPEN Bus MORRO G1_ 13.8 (47658)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN T_ 69.0 (40608)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN_ 69.0 (47332)
BF McNary 230 kV SECT 1	OPEN Bus KINZ WW_ 12.5 (47331)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_ 69.0 (40125)
BF McNary 230 kV SECT 1	OPEN Bus IONE_ 69.0 (40575)
BF McNary 230 kV SECT 1	OPEN Bus TOWER RD_115.0 (41324)
BF McNary 230 kV SECT 1	OPEN Bus ALKALI C_115.0 (41319)
BF McNary 230 kV SECT 1	OPEN Bus HERMISTN_230.0 (45137)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH1_230.0 (44122)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH2_230.0 (44123)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX1_100.0 (44115)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX2_100.0 (44116)
BF McNary 230 kV SECT 2	OPEN Bus MCNRY S2_230.0 (41352)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH34_230.0 (44125)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH3_230.0 (44124)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH4_230.0 (44126)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX3_100.0 (44117)
BF McNary 230 kV SECT 2	OPEN Bus MCN 05_ 13.8 (44105)
BF McNary 230 kV SECT 2	OPEN Bus MCN 06_ 13.8 (44106)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX4_100.0 (44118)
BF McNary 230 kV SECT 2	OPEN Bus MCN 07_ 13.8 (44107)
BF McNary 230 kV SECT 2	OPEN Bus MCN 08_ 13.8 (44108)
BF McNary 230 kV SECT 2	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 52.2 MVR
BF McNary 230 kV SECT 3	OPEN Bus MCNRY S3_230.0 (41353)
BF McNary 230 kV SECT 3	OPEN Bus MCN PH5_230.0 (44127)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX5_100.0 (44119)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX6_100.0 (44120)

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF McNary 230 kV SECT 3	OPEN Bus MCN 09_ 13.8 (44109)
BF McNary 230 kV SECT 3	OPEN Bus MCN 10_ 13.8 (44110)
BF McNary 230 kV SECT 3	OPEN Bus MCN 11_ 13.8 (44111)
BF McNary 230 kV SECT 3	OPEN Bus MCN 12_ 13.8 (44112)
BF McNary 230 kV SECT 3	OPEN Bus MCNARY_345.0 (40721)
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	CLOSE Shunt QUARTZ_138.0 (60305) #c1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	CLOSE Shunt QUARTZ_138.0 (60305) #c1
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	SET SWITCHED SHUNT AT BUS N POWDER_34.5 (60313) TO 18 MVR
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	SET SWITCHED SHUNT AT BUS HEMINWAY_500 (60155) TO 400 MVR
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	SET SWITCHED SHUNT AT BUS DILLON S_69.0 (62345) TO 27.9 MVR
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Gen BOARD CT_ 18.5 (43044) #1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Transformer BOARD ST_ 16.0 (43045) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Transformer BOARD CT_ 18.5 (43044) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Gen BOARD ST_ 16.0 (43045) #1
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
BF PGE Grassland-Slatt 500kV & Boardman Plant	OPEN Transformer BOARD F_ 24.0 (43047) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Slatt 500kV & Boardman Plant	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
Bus: Alvey 500 kV + RAS	OPEN Bus ALVEY_500.0 (40051)
Bus: Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
Bus: Bell BPA 500 kV	OPEN Bus BELL BPA_500.0 (40091)
Bus: Bell BPA 500 kV	OPEN Bus COULE R1_500.0 (40288)
Bus: Bell BPA 500 kV	OPEN Bus BELL SC_500.0 (40096)
Bus: Buckley 500 kV	OPEN Bus BUCKLEY_500.0 (40155)
Bus: Dixonville 500 kV	OPEN Bus DIXONVLE_500.0 (45095)
Bus: Dixonville 500 kV	SET SWITCHED SHUNT AT BUS GRANT PS_230.0 (45123) TO 147.4 MVR
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #2
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #3
Bus: Hot Springs 500 kV	OPEN Bus HOT SPR_500.0 (40553)
Bus: Keeler 500 kV + RAS	OPEN Bus KEELER_500.0 (40601)
Bus: Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
Bus: Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_500.0 (41401)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_230.0 (41402)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_230.0 (47386)
Bus: Rock Creek 500 kV	OPEN Bus ENRGZR T_230.0 (47823)
Bus: Rock Creek 500 kV	OPEN Bus WHITE CK_230.0 (47827)
Bus: Rock Creek 500 kV	OPEN Bus IMRIE_230.0 (47822)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_ 34.5 (47387)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC C1_ 34.5 (47388)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC W1_ 0.7 (47389)
Bus: Rock Creek 500 kV	OPEN Bus DOOLEY T_230.0 (47465)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 3_ 34.5 (47496)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 2_ 34.5 (47493)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C2_ 34.5 (47494)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W2_ 0.7 (47495)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C3_ 34.5 (47497)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W3_ 0.7 (47498)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE 1_ 34.5 (47829)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 1_ 34.5 (47825)
Bus: Rock Creek 500 kV	OPEN Bus WILLIS T_230.0 (47824)
Bus: Rock Creek 500 kV	OPEN Bus TULMN 1_ 34.5 (47826)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C1_ 34.5 (47936)
Bus: Rock Creek 500 kV	OPEN Bus TULMN C1_ 34.5 (47938)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 2_ 34.5 (47903)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 1_ 34.5 (47902)
Bus: Rock Creek 500 kV	OPEN Bus MILLRA S_230.0 (47857)

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
Bus: Rock Creek 500 kV	OPEN Bus GDNOE C1_ 34.5 (47865)
Bus: Rock Creek 500 kV	OPEN Bus MILLR 1_ 34.5 (47966)
Bus: Rock Creek 500 kV	OPEN Bus HARVST W_230.0 (47858)
Bus: Rock Creek 500 kV	OPEN Bus HRVST 1_ 34.5 (47979)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE W1_ 0.6 (47866)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C1_ 34.5 (47904)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C2_ 34.5 (47905)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W1_ 0.7 (47906)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W2_ 0.7 (47907)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W1_ 0.7 (47937)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W2_ 0.6 (47940)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W1_ 0.7 (47939)
Bus: Rock Creek 500 kV	OPEN Bus MILLR C1_ 34.5 (47967)
Bus: Rock Creek 500 kV	OPEN Bus MILLR W1_ 0.6 (47968)
Bus: Rock Creek 500 kV	OPEN Bus HRVST C1_ 34.5 (47980)
Bus: Rock Creek 500 kV	OPEN Bus HRVST W1_ 0.7 (47981)
Bus: Sickler 500 kV	OPEN Bus SICKLER_500.0 (40973)
Bus: Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
Bus: Summer Lake 500 kV	OPEN Bus SUMMER L_500.0 (41043)
Bus: Summer Lake 500 kV	OPEN Bus BURNS_500.0 (45029)
Bus: Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-1: Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
N-1: Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
N-1: Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
N-1: Allston-Napavine 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-1: Allston-Paul #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-1: Alvery-Dixonville 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO DIXONVLE_500.0 (45095) CKT 1
N-1: Alvery-Dixonville 500 kV	SET SWITCHED SHUNT AT BUS DELNORTE_115.0 (45085) TO 7.5 MVR
N-1: Alvey-Marion 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
N-1: Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-1: Ashe-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
N-1: Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-1: Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-1: Bell-Coulee 500 kV	OPEN Bus COULE R1_500.0 (40288)
N-1: Bell-Taft 500 kV	OPEN Bus BELL SC_500.0 (40096)
N-1: Big Eddy-Celilo 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO CELILO1_500.0 (41311) CKT 1
N-1: Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-1: Big Eddy-Knight 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO KNIGHT_500.0 (41450) CKT 1
N-1: Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-1: Boise Bench-Brownlee #3 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-1: Brady-Antelope 230 kV	OPEN Line BRADY_230.0 (60073) TO ANTLOPE_230.0 (65075) CKT 1
N-1: Broadview-Garrison #1 500 kV	OPEN Bus GAR1EAST_500.0 (40451)
N-1: Broadview-Garrison #1 500 kV	OPEN Bus TOWN1_500.0 (62013)
N-1: Brownlee-Ontario 230 kV	OPEN MultiSectionLine BROWNLEE_230.0 (60095) TO ONTARIO_230.0 (60265) CKT 1
N-1: Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-1: Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-1: Buckley-Slatt 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-1: Captain Jack-Olinda 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO OLINDA_500.0 (30020) CKT 1
N-1: CaptJack-Kfalls 500 kV	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
N-1: Cascade Crossing 500 kV	OPEN Bus CDR SPRG_500.0 (43950)
N-1: Cascade Crossing 500 kV	OPEN Bus CDRSBET1_500.0 (43951)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHCRS1_500.0 (43491)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHEL5_500.0 (43041)
N-1: Chief Jo-Coulee 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-1: Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-1: Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-1: Coulee-Hanford 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-1: Coulee-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Covington4-Raver 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-1: Covington5-Raver 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
N-1: Coyote-Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
N-1: CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Dixonville-Meridian 500 kV	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
N-1: Drycreek-Lolo 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO LOLO_230.0 (48197) CKT 1
N-1: Drycreek-N Lewiston 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO N LEWIST_230.0 (48255) CKT 1
N-1: Drycreek-Wala Ava 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO WALA AVA_230.0 (48451) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Dworshak-Taft 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-1: Echo Lake-Maple Valley 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO MAPLE VL_500.0 (40693) CKT 1
N-1: Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-1: Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Echo Lake-Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
N-1: Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-1: Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSHE1_115.0 (32229)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSESHE_115.0 (32230)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTL1_115.0 (32233)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_115.0 (32234)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_ 13.2 (32460)
N-1: Goldhill-Placer 115 kV	OPEN Bus FLINT1_115.0 (32236)
N-1: Grassland-Coyote 500 kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-1: Grassland-Slatt 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
N-1: Grizzly-John Day #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-1: Grizzly-Malin 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN MultiSectionLine PONDROSA_500.0 (40837) TO SUMMER L_500.0 (41043) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZ R3_500.0 (40488) TO PONDROSA_500.0 (40837) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO GRIZZ R3_500.0 (40488) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Grizzly-Round Bu 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO ROUND BU_500.0 (43485) CKT 1
N-1: Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-1: Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-1: Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Transformer HATWAI_500.0 (40521) TO HATWAI_230.0 (40519) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 67.1 MVR
N-1: Hatwai-Lolo 230 kV	OPEN Line HATWAI_230.0 (40519) TO LOLO_230.0 (48197) CKT 1
N-1: Hatwai-Low Gran 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Hatwai-N Lewiston 230 kV	OPEN Line HATWAI_230.0 (40519) TO N LEWIST_230.0 (48255) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO HURICANE_230.0 (45103) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN MultiSectionLine HURICANE_230.0 (45103) TO WALAWALA_230.0 (45327) CKT 1
N-1: Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt MALIN_500.0 (40687) #s
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Hemingway-Summer Lake 500 kV	OPEN Line HEMINWAY_500.0 (60155) TO BURNS_500.0 (45029) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN MultiSectionLine BURNS_500.0 (45029) TO SUMMER L_500.0 (41043) CKT 1
N-1: Hill Top 345/230 Xfmr	OPEN Transformer HIL TOP_230.0 (40537) TO HIL TOP_345.0 (64058) CKT 1
N-1: Horse Hv-McNary 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-1: Hot Springs-Taft 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line COYOTECR_345.0 (64032) TO HUMBOLDT_345.0 (64059) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line MAGGIECR_120.0 (64070) TO CARLIN_120.0 (64169) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt EIGHTMFK_120.0 (64457) #b
N-1: Humboldt-Coyote Ck 345 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 10.8 MVR
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt MIDPOINT_345.0 (60235) #2
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO &1_345.0 (67582)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO_345.0 (66225)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #2_ 99.0 (65014)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #3_ 99.0 (65017)
N-1: Ing500-CusterW 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-1: John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-1: John Day-Rock Ck 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-1: John Day-Slatt 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-1: Kfalls-Meridian 500 kV	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
N-1: Knight-Wautoma 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
N-1: LaGrande-North Powder 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO N POWDER_230.0 (60312) CKT 1
N-1: Lanes-Marion 500 kV	OPEN Line LANE_500.0 (40629) TO MARION_500.0 (40699) CKT 1
N-1: Lit Goose-Central Ferry 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
N-1: Lit Goose-Low Mon 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
N-1: Low Gran-Central Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Low Mon-Sac Tap 500 kV	OPEN Line LOW MON_500.0 (40683) TO SACJWA T_500.0 (40917) CKT 1
N-1: Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
N-1: Malin-Hilltop 230 kV	OPEN Line CANBYTAP_230.0 (40171) TO HIL TOP_230.0 (40537) CKT 1
N-1: Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-1: Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-1: Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-1: Maple Vly-Rocky RH 345 kV	OPEN MultiSectionLine MAPLE VL_345.0 (40691) TO ROCKY RH_345.0 (40891) CKT 1
N-1: Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Line MARION_500.0 (40699) TO SANTIAM_500.0 (40941) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Shunt SANTIAM_230.0 (40939) #s
N-1: McLouglin-Ostrander 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-1: McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 26.1 MVR
N-1: McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS N POWDER_ 34.5 (60313) TO 27 MVR
N-1: McNary S2-McNary S3 230 kV	OPEN Line MCNRY S2_230.0 (41352) TO MCNRY S3_230.0 (41353) CKT 1
N-1: McNary-Board T1 230 kV	OPEN Line BOARD T1_230.0 (40121) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-1: McNary-Longhorn 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
N-1: McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-1: McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-1: McNary-Roundup 230 kV	OPEN Line MCNRY S1_230.0 (41351) TO ROUNDUP_230.0 (40905) CKT 1
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJWA T_500.0 (40917)
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
N-1: McNary-Sac Tap-Low Mon 500 kV	CLOSE Gen ICE H1-2_ 13.8 (40559) #1
N-1: Midpoint-Hemingway 500 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Midpoint-Humboldt 345 kV	OPEN Bus IDAHO-NV_345.0 (64061)
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS HIL TOP_230.0 (40537) TO 52.2 MVR
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 10.8 MVR
N-1: Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Olympia-Paul 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
N-1: Ontario-Caldwell 230 kV	OPEN MultiSectionLine CALDWELL_230.0 (60110) TO LANGLEY_230.0 (60266) CKT 1
N-1: Ostrander-Knight 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-1: Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-1: Ostrander-Troutdale 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO TROUTDAL_500.0 (41095) CKT 1
N-1: Oxbow-Brownlee #2 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 2
N-1: Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-1: Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-1: Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO SATSOP_500.0 (40949) CKT 1
N-1: Pearl-Keeler 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-1: Pinto-Four Corner 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Ponderosa A 500/230 kV Xfmr	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Ponderosa B 500/230 kV Xfmr	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Raver-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-1: Raver-Tacoma 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus H ALLEN_345.0 (18001)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus HA PS_345.0 (18002)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus UTAH-NEV_345.0 (67657)
N-1: Robinson-Harry Allen 500 kV	OPEN Line ROBINSON_500.0 (64895) TO H ALLEN_500.0 (18450) CKT 1
N-1: Rock Ck-Wautoma 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Round Mtn-Table Mtn 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-1: Roundup-Lagrande 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO ROUNDUP_230.0 (40905) CKT 1
N-1: Schultz-Sickler 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-1: Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-1: Schultz-Wautoma 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Sigurd-Glen Canyon 230 kV	OPEN Bus SIGURDPS_230.0 (66355)
N-1: Slatt 500/230 kV Xfmr	OPEN Transformer SLATT_500.0 (40989) TO SLATT_230.0 (40986) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-1: Snok Tap-Snoking 500 kV	OPEN Line SNOK TAP_500.0 (41001) TO SNOKING_500.0 (41007) CKT 1
N-1: Table Mtn-Tesla 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-1: Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-1: Vantage 500/230 kV Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
N-1: Vantage 500/230 kV Xfmr #2	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 2
N-1: Walla Walla-Talbot 230 kV	OPEN Line TALBOT_230.0 (44912) TO WALAWALA_230.0 (45327) CKT 1
N-1: Walla Walla-Wallula 230 kV	OPEN Line WALAWALA_230.0 (45327) TO WALLULA_230.0 (45331) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Line BETHEL_230.0 (43039) TO ROUNDB N_230.0 (43483) CKT 1

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	CLOSE Shunt BETHEL5_500.0 (43041) #1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN MultiSectionLine BETHEL_230.0 (43039) TO SANTIAM_230.0 (40939) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	CLOSE Shunt BETHEL5_500.0 (43041) #1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap MIKKALO_500.0 (43970) TO MKLOSNT2_500.0 (43971) CKT 2
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	OPEN Series Cap SANTIAM_500.0 (40941) TO SANTMKO2_500.0 (43492) CKT 2
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN MultiSectionLine BIGEDDY2_230.0 (41342) TO CHEMAWA_230.0 (40213) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Bus PARKDALE_230.0 (40813)
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 2
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIHOR41_230.0 (61995) CKT 4 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO HORSEFLT_230.0 (60102) CKT 4
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO11_230.0 (61998) CKT 1 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO21_230.0 (61997) CKT 2 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 1
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine BRIDGER_345.0 (60085) TO 3MIKNOLL_345.0 (60084) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	CLOSE Shunt KINPORT_345.0 (60190) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Series Cap GAR1EAST_500.0 (40451) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line GAR1EAST_500.0 (40451) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Series Cap GAR2EAST_500.0 (40453) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line GAR2EAST_500.0 (40453) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 2_ 22.0 (62049) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt PTRSNFLT_230.0 (62030) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt OREBASIN_230.0 (66145) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt FRANNIE2_ 34.5 (67145) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS ROSEBUD_230.0 (63012) TO -10 MVR
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt GARLAND1_ 34.5 (67147) #1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Transformer HELLSCYN_230.0 (60150) TO HELSCYN1_ 14.4 (60151) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN Line MONROE_230.0 (40747) TO NOVELTY_230.0 (42304) CKT 1

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus CHIEF J3_345.0 (40223)
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus SNOHOMS3_345.0 (40993)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #I
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO3_ 13.8 (41216) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO4_ 13.8 (41217) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO5_ 13.8 (41218) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO6_ 13.8 (41219) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO7_ 13.8 (41220) #F
N-2: DC-BIPOLE	OPEN Shunt MALIN_500.0 (40687) #s
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: DC-BIPOLE	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: DC-BIPOLE	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: DC-BIPOLE	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: DC-BIPOLE	CHANGE INJECTION GROUP RAS PDCI Gen Drop Units BY 'PDCI_gen_drop_value_less300' MW in generator merit order by opening
N-2: DC-BIPOLE	OPEN Bus SYLMAR1_230.0 (26097)
N-2: DC-BIPOLE	OPEN Bus SYLMAR2_230.0 (26099)
N-2: DC-BIPOLE	OPEN Shunt SYLMAR S_230.0 (24147) #b
N-2: DC-BIPOLE	OPEN Shunt SYLMARLA_230.0 (26094) #b
N-2: DC-BIPOLE	OPEN Shunt BIGEDDY2_230.0 (41342) #s
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #b
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS ANTELOPE_230.0 (24401) TO 158.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt BARRE_230.0 (24016) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS BARRE_230.0 (24016) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt CHINO_230.0 (24025) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS CHINO_230.0 (24025) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt DEVERS_230.0 (24804) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS DEVERS_230.0 (24804) TO 316.8 MVR
N-2: DC-BIPOLE	CLOSE Shunt EL NIDO_230.0 (24040) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS EL NIDO_230.0 (24040) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt GOULD_230.0 (24059) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS GOULD_230.0 (24059) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LCIENEGA_230.0 (24082) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LCIENEGA_230.0 (24082) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LAGUBELL_230.0 (24076) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LAGUBELL_230.0 (24076) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOMW_230.0 (24093) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOMW_230.0 (24093) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOME_230.0 (25656) #ei

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOME_230.0 (25656) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRAGE_230.0 (24806) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRAGE_230.0 (24806) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MOORPARK_230.0 (24099) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MOORPARK_230.0 (24099) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_230.0 (24100) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS OLINDA_230.0 (24100) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt PADUA_230.0 (24112) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PADUA_230.0 (24112) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt PARDEE_230.0 (24114) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PARDEE_230.0 (24114) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt RIOHONDO_230.0 (24126) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS RIOHONDO_230.0 (24126) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt SANBRDNO_230.0 (24132) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS SANBRDNO_230.0 (24132) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt S.CLARA_230.0 (24128) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS S.CLARA_230.0 (24128) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #b
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #2
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VALLEYSC_115.0 (24160) TO 187.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt VILLA PK_230.0 (24154) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VILLA PK_230.0 (24154) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VINCENT_230.0 (24155) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VINCENT_230.0 (24155) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VSTA_230.0 (24901) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VSTA_230.0 (24901) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt WALNUT_230.0 (24158) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS WALNUT_230.0 (24158) TO 79.2 MVR
N-2: DC-BIPOLE	OPEN Bus CELILO4_230.0 (41314)
N-2: DC-BIPOLE	OPEN Bus CELILO3_230.0 (41313)
N-2: DC-BIPOLE	OPEN Bus CELILO2_500.0 (41312)
N-2: DC-BIPOLE	OPEN Bus CELILO1_500.0 (41311)
N-2: Double Palo Verde	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-2: Double Palo Verde	OPEN Shunt MALIN_500.0 (40687) #s
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: Double Palo Verde	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: Double Palo Verde	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: Double Palo Verde	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: Double Palo Verde	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: Double Palo Verde	OPEN Gen PALOVRD2_ 24.0 (14932) #1
N-2: Double Palo Verde	OPEN Gen PALOVRD1_ 24.0 (14931) #1
N-2: Double Palo Verde	CHANGE LOAD AT BUS AGUAFAPS_ 69.0 (14400) BY -120 MW (cnst pf)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Line COVINGTN_230.0 (40303) TO MAPLEV12_230.0 (40692) CKT 2
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_345.0 (40691)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus ROCKY RH_345.0 (40891)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN Bus PONDROSB_500.0 (40834)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus PONDROSA_500.0 (40837)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus GRIZZ R3_500.0 (40488)
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus CASCADTP_230.0 (40185)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus WINDSHAR_230.0 (41155)
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus ALFALFA_230.0 (40039)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus OUTLOOK_230.0 (45229)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN InjectionGroup RAS Lower Granite Gen Drop
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN InjectionGroup Libby Gen
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #6
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG2_ 13.2 (38755) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #3

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #10
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #11
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine MCNARY_345.0 (40721) TO ROSS_345.0 (40901) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN Line KING_230.0 (60177) TO MIDPOINT_230.0 (60232) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line PEARL #_230.0 (43773) TO SHERWOOD_230.0 (43527) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN MultiSectionLine BIGEDDY3_230.0 (41343) TO MCLOUGLN_230.0 (43313) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT5_500.0 (40306)
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus COULEE_300.0 (40285)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus OLYMPIA_300.0 (40795)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening

Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Bus CENTR SS_230.0 (47748)
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN Bus CHRISTOP_230.0 (42505)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 2
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Transformer ROUND MT_500.0 (30005) TO RD MT 1M_500.0 (30065) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_DLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_SLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 1_ 12.5 (38825)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 2_ 12.5 (38830)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 3_ 12.5 (38835)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 4_ 12.5 (38840)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 5_ 12.5 (38845)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT1_ 13.8 (38700)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT2_ 13.8 (38705)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT3_ 13.8 (38710)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT4_ 13.8 (38715)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 4-5_ 13.8 (31782)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS2_ 13.2 (38780)

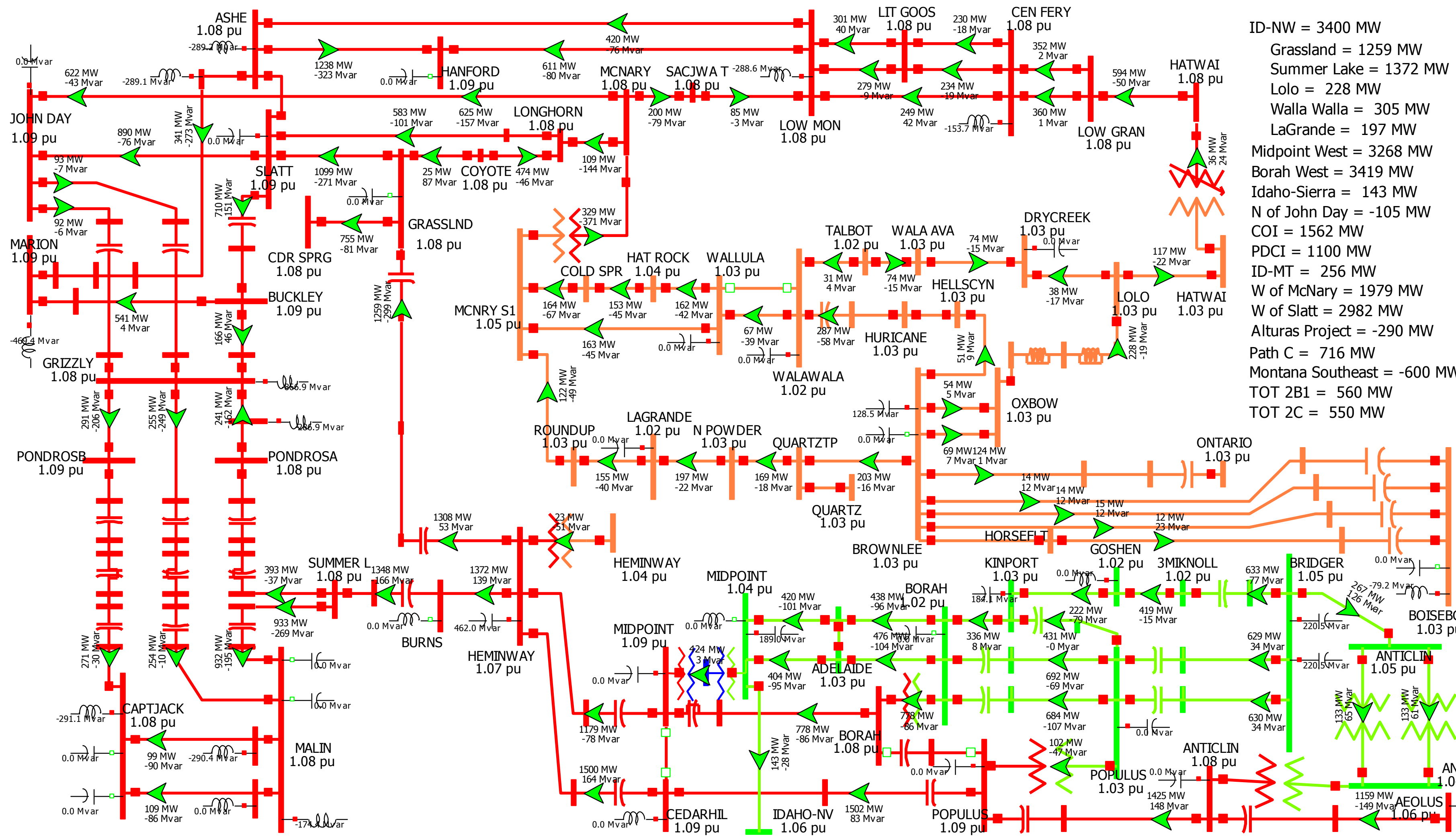
Appendix G - 16hs2a_2250idnw_N_wom Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBOU2-3_ 11.5 (31808)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 1_ 11.5 (31810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 1_ 18.0 (34600)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 2_ 18.0 (34602)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 3_ 18.0 (34604)
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus ADDY N_230.0 (40021)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Line BELL BPA_115.0 (40087) TO BIGELOW_115.0 (40113) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine LANCASTR_230.0 (40624) TO NOXONBPA_230.0 (40787) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4

Appendix H

16la1sa_3400idnw_Path76 Base Case (Alturas Project, Path 76)

Appendix H – 16la1sa_3400idnw_Path76 Base Case Post-Transient Contingency Results



ID-NW = 3400 MW
Grassland = 1259 MW
Summer Lake = 1372 MW
Lolo = 228 MW
Walla Walla = 305 MW
LaGrande = 197 MW
Midpoint West = 3268 MW
Borah West = 3419 MW
Idaho-Sierra = 143 MW
N of John Day = -105 MW
COI = 1562 MW
PDCI = 1100 MW
ID-MT = 256 MW
W of McNary = 1979 MW
W of Slatt = 2982 MW
Alturas Project = -290 MW
Path C = 716 MW
Montana Southeast = -600 MW
TOT 2B1 = 560 MW
TOT 2C = 550 MW

Figure H1: 16la1sa_3400idnw_Path76 Base Case **Pre-Contingency**

Appendix H – 16la1sa_3400idnw_Path76 Base Case Post-Transient Contingency Results

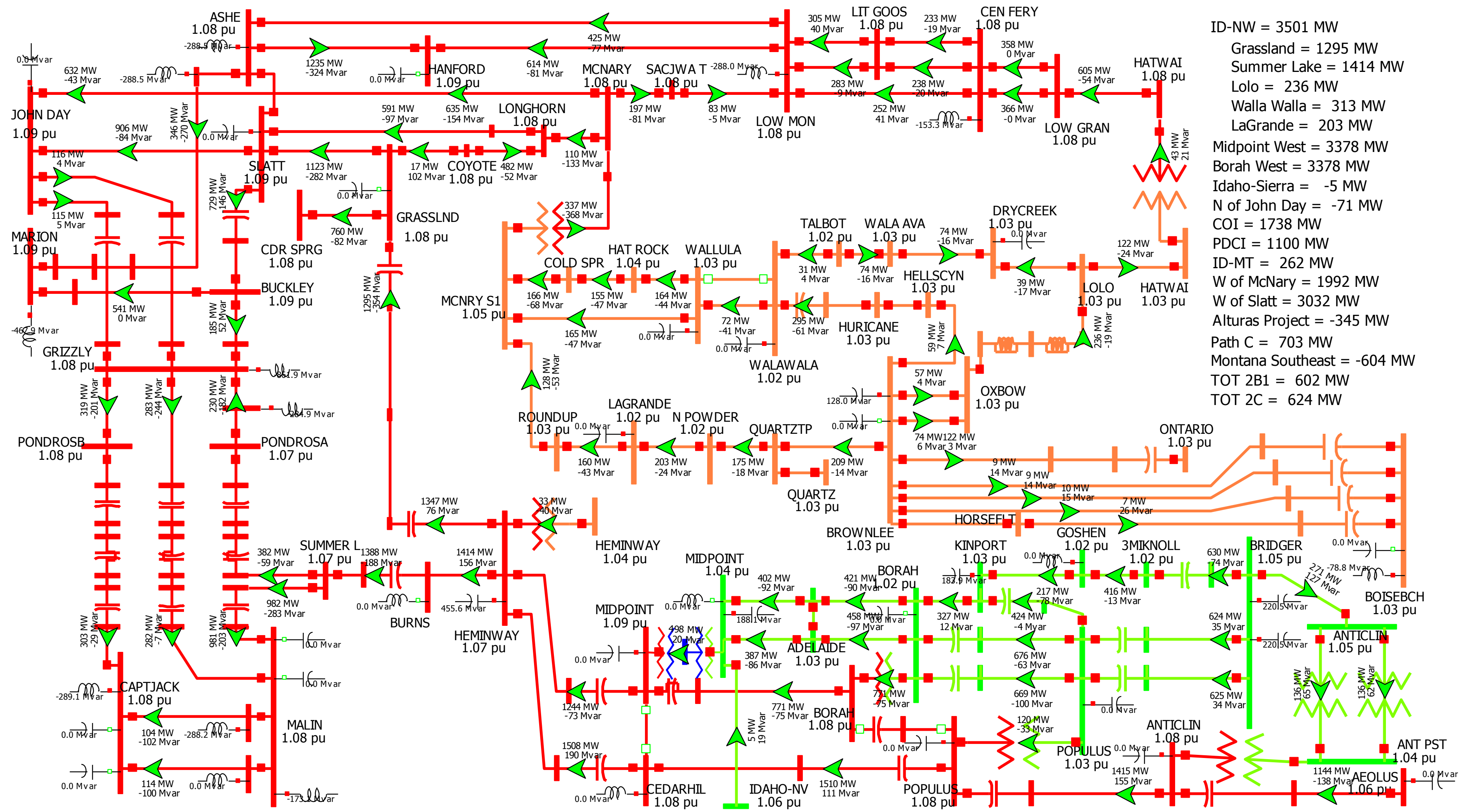


Figure H2: 16la1sa_3400idnw_Path76 Base Case after the contingency **N-1: Robinson-Harry Allen 500 kV**

Appendix H – 16la1sa_3400idnw_Path76 Base Case Post-Transient Contingency Results

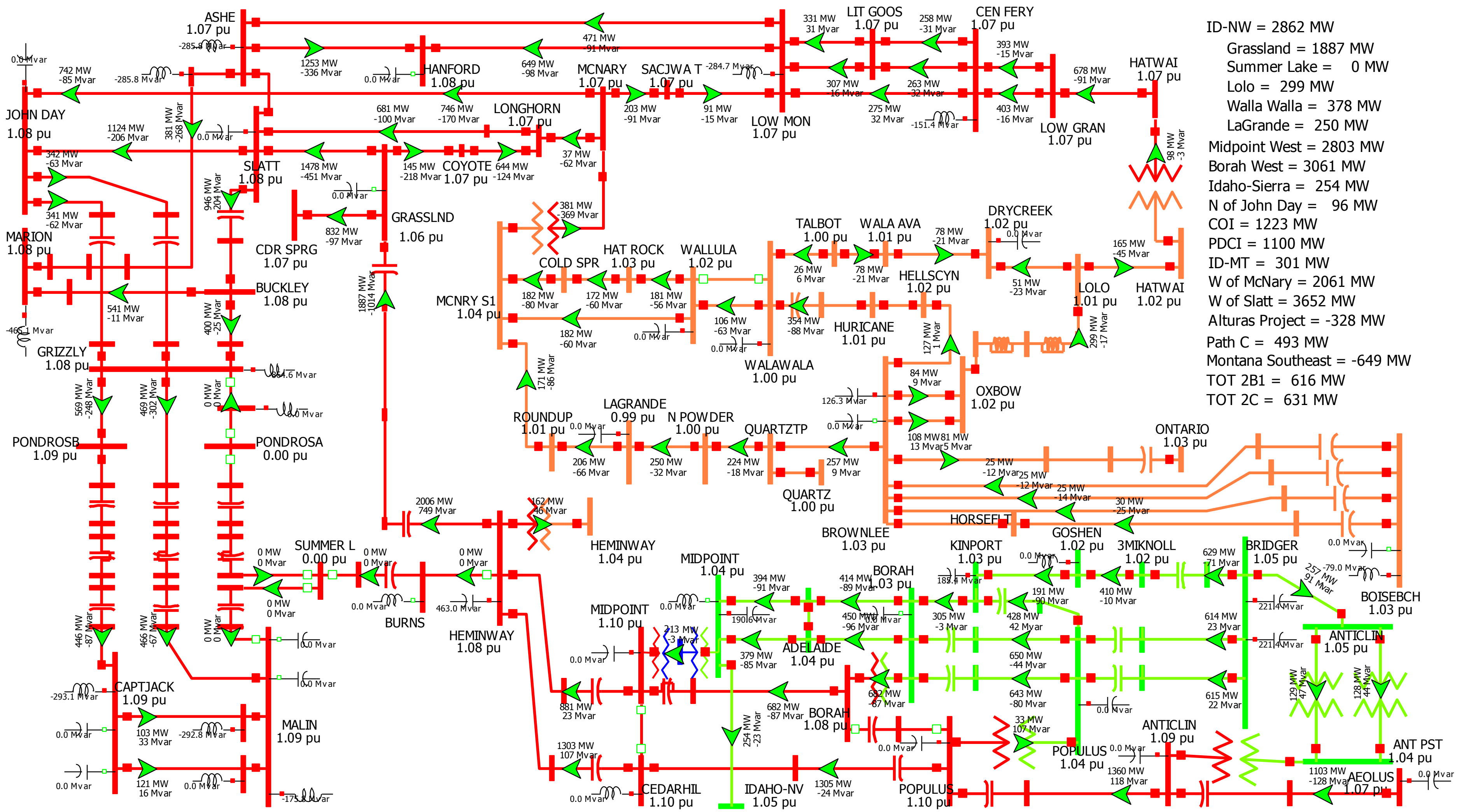


Figure H3: 16la1sa_3400idnw_Path76 Base Case after the contingency **Bus: Summer Lake 500 kV**

Appendix H – 16la1sa_3400idnw_Path76 Base Case Post-Transient Contingency Results

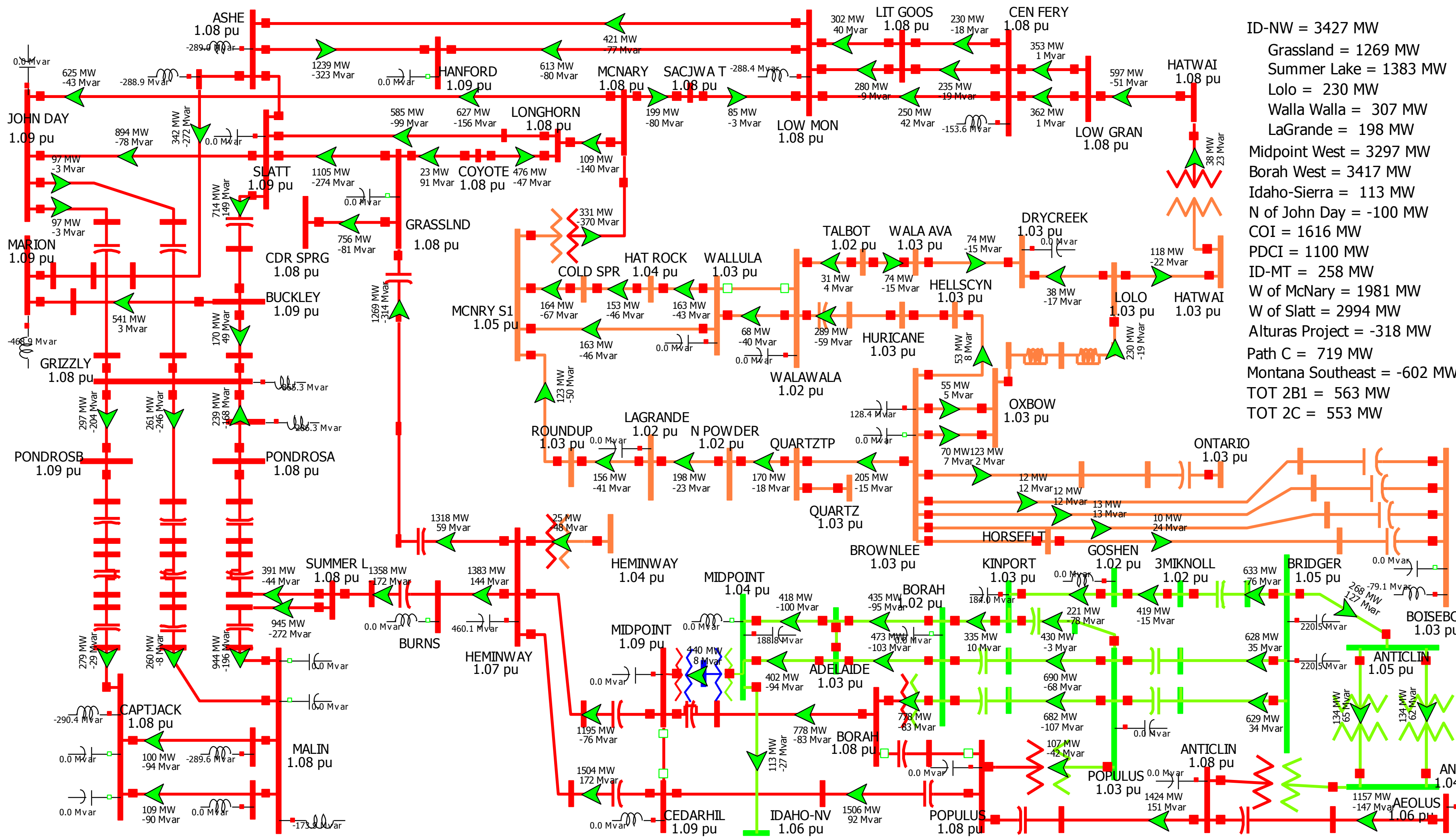


Figure H4: 16la1sa_3400idnw_Path76 Base Case after the contingency **N-1: Cal Sub 120 kV Phase Shifter**

Appendix H – 16la1sa_3400idnw_Path76 Base Case Post-Transient Contingency Results

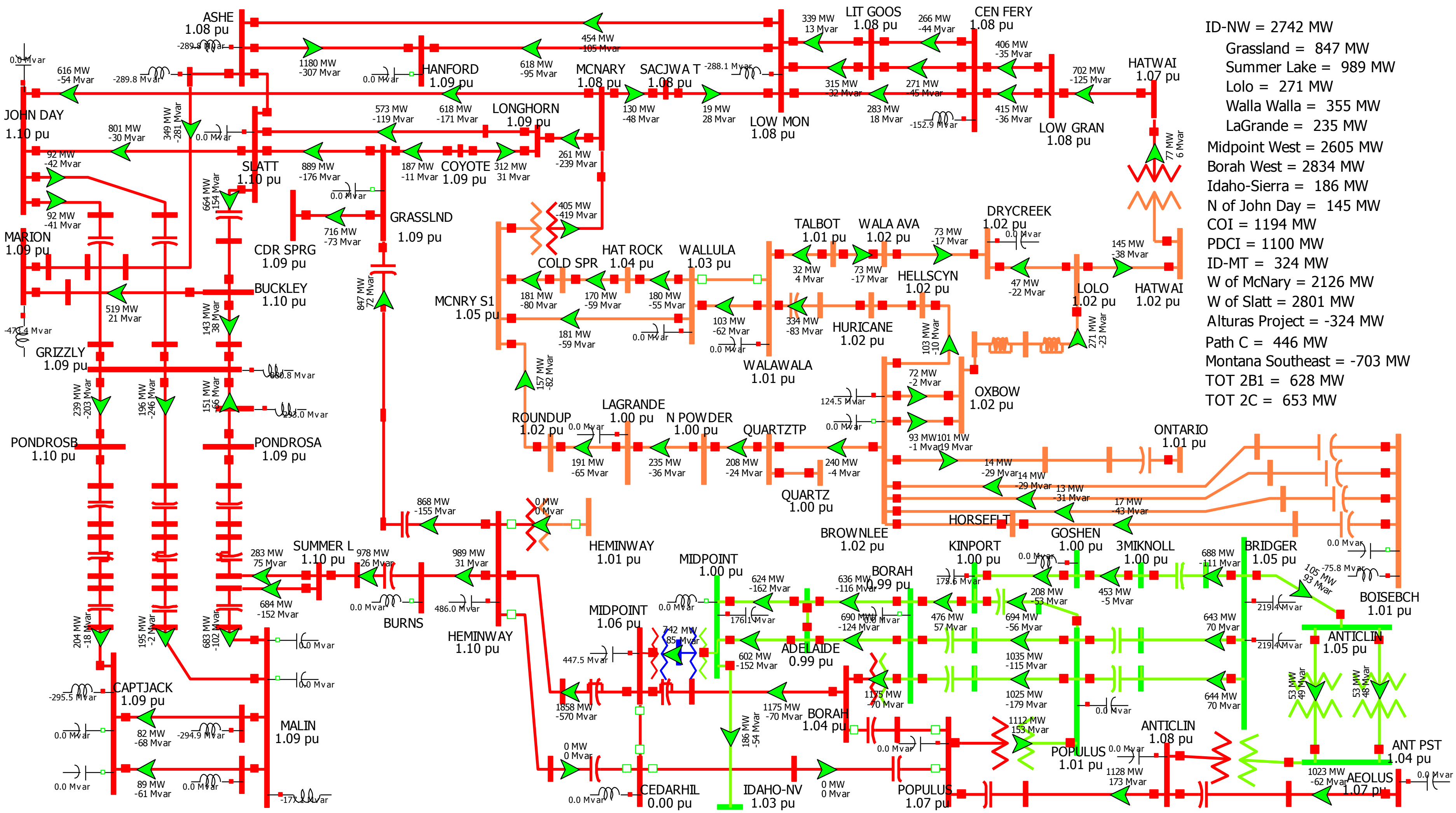


Figure H5: 16la1sa_3400idnw_Path76 Base Case after the contingency **BF IPC Populus-Chill-Hem 500 kV & Hem 500/230 Xfmr + RAS**

Appendix H - 16la1sa_3400idnw_Path76 Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	304.5	300.0	101.5%	370.0	82.3%
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	304.2	300.0	101.4%	370.0	82.2%
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	No Violations							
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	No Violations							
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4028 Taft-Dworshak & Taft Reactor 500kV	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	No Violations							
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	No Violations							
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	No Violations							
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	No Violations							
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.7	300.0	100.2%	370.0	81.3%
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	306.9	300.0	102.3%	370.0	82.9%
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	300.6	300.0	100.2%	370.0	81.3%
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations							
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.4	300.0	100.1%	370.0	81.2%
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	No Violations							
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	305.9	300.0	102.0%	370.0	82.7%
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	No Violations							
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV	No Violations							
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations							
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	No Violations							
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations							
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations							
BF 4502 Paul-Allston & Allston-Keeler 500 kV	No Violations							
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							

Appendix H - 16la1sa_3400idnw_Path76 Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV	No Violations							
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations							
BF 4542 Paul-Allston 500 kV & Center G2	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	308.3	300.0	102.8%	370.0	83.3%
BF 4542 Paul-Allston 500 kV & Center G2	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	302.0	300.0	100.7%	370.0	81.6%
BF 4542 Paul-Napavine 500 kV & Center G1	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	307.6	300.0	102.5%	370.0	83.1%
BF 4542 Paul-Napavine 500 kV & Center G1	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	301.4	300.0	100.5%	370.0	81.5%
BF 4550 Olympia-Paul & Paul-Allston 500 kV	No Violations							
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	No Violations							
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	FRANKLIN (40443) -> FRANKL E (40440) CKT 1 at FRANKLIN	Branch MVA	193.1	266.5	254.0	104.9%	307.0	86.8%
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	302.9	300.0	101.0%	370.0	81.9%
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations							
BF 4708 Hatwai 500 kV Bus	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.7	300.0	100.2%	370.0	81.3%
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	301.4	300.0	100.5%	370.0	81.5%
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.8	300.0	100.3%	370.0	81.3%
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	312.9	300.0	104.3%	370.0	84.6%
BF 4888 Ashe-Slatt & CGS 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	306.3	300.0	102.1%	370.0	82.8%
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.9	52.2	50.0	104.3%	55.0	94.9%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	338.7	300.0	112.9%	370.0	91.5%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	330.4	300.0	110.1%	370.0	89.3%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	311.0	300.0	103.7%	370.0	84.0%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	311.0	300.0	103.7%	370.0	84.0%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.4	321.2	315.0	102.0%	394.0	81.5%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.4	320.6	315.0	101.8%	394.0	81.4%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1401.9	2206.3	2000.1	110.3%	3000.0	73.5%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1420.6	2181.0	2000.1	109.0%	3000.0	72.7%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.9	52.7	50.0	105.4%	55.0	95.8%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	338.0	300.0	112.7%	370.0	91.3%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	329.8	300.0	109.9%	370.0	89.1%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	309.0	300.0	103.0%	370.0	83.5%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	309.0	300.0	103.0%	370.0	83.5%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.4	319.8	315.0	101.5%	394.0	81.2%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.4	319.2	315.0	101.3%	394.0	81.0%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1401.9	2202.4	2000.1	110.1%	3000.0	73.4%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1420.6	2171.5	2000.1	108.6%	3000.0	72.4%
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	302.2	300.0	100.7%	370.0	81.7%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	305.6	300.0	101.9%	370.0	82.6%
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations							
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	No Violations							
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	No Violations							
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations							
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations							
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations							
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	304.7	300.0	101.6%	370.0	82.4%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	FRANKLIN (40443) -> FRANKL E (40440) CKT 1 at FRANKLIN	Branch MVA	193.1	266.2	254.0	104.8%	307.0	86.7%
BF 5214 Low Mon-McNary & Calpine PH 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	306.0	300.0	102.0%	370.0	82.7%
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	331.3	300.0	110.4%	370.0	89.5%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	322.6	300.0	107.5%	370.0	87.2%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	306.3	300.0	102.1%	370.0	82.8%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	306.3	300.0	102.1%	370.0	82.8%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	89.7	118.6	112.0	105.9%	146.7	80.8%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.4	317.9	315.0	100.9%	394.0	80.7%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.4	317.4	315.0	100.7%	394.0	80.5%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1503.2	2312.2	1732.1	133.5%	2338.3	98.9%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	PTRSNFUR (62386)	% Δ Volts	0.993	0.929				6.45%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts	0.991	0.931				6.05%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	AMPS (65025)	% Δ Volts	0.992	0.942				5.04%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.9	51.1	50.0	102.2%	55.0	92.9%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	336.8	300.0	112.3%	370.0	91.0%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	328.7	300.0	109.6%	370.0	88.8%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	308.9	300.0	103.0%	370.0	83.5%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	308.9	300.0	103.0%	370.0	83.5%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.4	319.7	315.0	101.5%	394.0	81.1%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.4	319.1	315.0	101.3%	394.0	81.0%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1401.9	2260.2	2000.1	113.0%	3000.0	75.3%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1420.6	2232.1	2000.1	111.6%	3000.0	74.4%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.9	50.4	50.0	100.9%	55.0	91.7%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	334.2	300.0	111.4%	370.0	90.3%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	326.1	300.0	108.7%	370.0	88.1%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	CEDARHIL (60159) -> CEDHEM21 (61992) CKT 2 at CEDARHIL	Branch Amp	1599.8	2376.2	2309.4	102.9%	3464.1	68.6%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	POPULUS (67794) -> POPCED21 (61963) CKT 2 at POPULUS	Branch Amp	1607.7	2352.0	2309.4	101.8%	3464.1	67.9%

Appendix H - 16la1sa_3400idnw_Path76 Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	316.8	300.0	105.6%	370.0	85.6%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	310.2	300.0	103.4%	370.0	83.8%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	304.7	300.0	101.6%	370.0	82.3%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	304.7	300.0	101.6%	370.0	82.3%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.4	315.6	315.0	100.2%	394.0	80.1%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.4	315.2	315.0	100.1%	394.0	80.0%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1283.7	2361.9	1732.1	136.4%	2338.3	101.0%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	BORPOP11 (61970) -> BORAH (60060) CKT 1 at BORAH	Branch Amp	1146.4	1838.2	1701.6	108.0%	2108.6	87.2%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	BORPOP21 (61969) -> BORAH (60060) CKT 2 at BORAH	Branch Amp	1130.8	1819.8	1650.1	110.3%	2227.4	81.7%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	POPULUS (67790) -> BORPOP11 (61970) CKT 1 at POPULUS	Branch Amp	1136.5	1831.9	1492.7	122.7%	2264.2	80.9%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	333.7	300.0	111.2%	370.0	90.2%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	326.3	300.0	108.8%	370.0	88.2%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	321.6	300.0	107.2%	370.0	86.9%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	321.6	300.0	107.2%	370.0	86.9%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.4	328.5	315.0	104.3%	394.0	83.4%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.4	327.7	315.0	104.0%	394.0	83.2%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	89.7	120.0	112.0	107.2%	146.7	81.8%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BORPOP11 (61970) -> BORAH (60060) CKT 1 at BORAH	Branch Amp	1146.4	1755.4	1701.6	103.2%	2108.6	83.3%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BORPOP21 (61969) -> BORAH (60060) CKT 2 at BORAH	Branch Amp	1130.8	1739.9	1650.1	105.4%	2227.4	78.1%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	POPULUS (67790) -> BORPOP11 (61970) CKT 1 at POPULUS	Branch Amp	1136.5	1751.8	1492.7	117.4%	2264.2	77.4%
BF Lolo 230kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	301.3	300.0	100.4%	370.0	81.4%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.9	50.6	50.0	101.2%	55.0	92.0%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	332.0	300.0	110.7%	370.0	89.7%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	323.2	300.0	107.7%	370.0	87.4%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	306.2	300.0	102.1%	370.0	82.8%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	306.2	300.0	102.1%	370.0	82.8%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.4	317.7	315.0	100.9%	394.0	80.6%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.4	317.2	315.0	100.7%	394.0	80.5%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	89.7	117.3	112.0	104.8%	146.7	80.0%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1503.2	2262.6	1732.1	130.6%	2338.3	96.8%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PTRSNFUR (62386)	% Δ Volts	0.993	0.931				6.24%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PTRSNFLT (62030)	% Δ Volts	0.991	0.934				5.75%
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	No Violations							
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	307.6	300.0	102.5%	370.0	83.1%
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	301.4	300.0	100.5%	370.0	81.5%
Bus: Alvey 500 kV	No Violations							
Bus: Bell BPA 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	304.2	300.0	101.4%	370.0	82.2%
Bus: Buckley 500 kV	No Violations							
Bus: Dixonville 500 kV	No Violations							
Bus: Hot Springs 500 kV	No Violations							
Bus: Keeler 500 kV	No Violations							
Bus: Rock Creek 500 kV	No Violations							
Bus: Sickler 500 kV	No Violations							
Bus: Summer Lake 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.9	52.6	50.0	105.3%	55.0	95.7%
Bus: Summer Lake 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	339.1	300.0	113.0%	370.0	91.7%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
Bus: Summer Lake 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	330.8	300.0	110.3%	370.0	89.4%
Bus: Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	311.0	300.0	103.7%	370.0	84.1%
Bus: Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	311.0	300.0	103.7%	370.0	84.1%
Bus: Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.4	321.2	315.0	102.0%	394.0	81.5%
Bus: Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.4	320.7	315.0	101.8%	394.0	81.4%
Bus: Summer Lake 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1401.9	2205.2	2000.1	110.3%	3000.0	73.5%
Bus: Summer Lake 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1420.6	2180.1	2000.1	109.0%	3000.0	72.7%
N-1: Allston-Keeler 500 kV	No Violations							
N-1: Allston-Napavine 500 kV	No Violations							
N-1: Allston-Paul #2 500 kV	No Violations							
N-1: Alvery-Dixonville 500 kV	No Violations							
N-1: Alvey-Marion 500 kV	No Violations							
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Bell-Coulee 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.3	300.0	100.1%	370.0	81.2%
N-1: Bell-Taft 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	304.0	300.0	101.3%	370.0	82.2%
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	301.0	300.0	100.3%	370.0	81.4%
N-1: Broadview-Garrison #1 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.5	300.0	100.2%	370.0	81.2%
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Cal Sub 120 kV Phase Shifter	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	327.6	300.0	109.2%	370.0	88.5%
N-1: Cal Sub 120 kV Phase Shifter	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	319.8	300.0	106.6%	370.0	86.4%
N-1: Captain Jack-Olinda 500 kV	No Violations							
N-1: CaptJack-Kfalls 500 kV	No Violations							
N-1: Cascade Crossing 500 kV	No Violations							
N-1: Chief Jo-Coulee 500 kV	No Violations							
N-1: Chief Jo-Monroe 500 kV	No Violations							
N-1: Chief Jo-Sickler 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Covington4-Raver 500 kV	No Violations							
N-1: Covington5-Raver 500 kV	No Violations							
N-1: Coyote-Longhorn 500 kV	No Violations							
N-1: CusterW-Monroe 500 kV	No Violations							
N-1: Dixonville-Meridian 500 kV	No Violations							
N-1: Drycreek-Lolo 230 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV	No Violations							
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Echo Lake-Maple Valley 500 kV	No Violations							
N-1: Echo Lake-Raver 500 kV	No Violations							
N-1: Echo Lake-Schultz 500 kV	No Violations							
N-1: Echo Lake-Snok Tap 500 kV	No Violations							
N-1: Garrison-Taft #2 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.7	300.0	100.2%	370.0	81.3%
N-1: Goldhill-Placer 115 kV	No Violations							
N-1: Grassland-Coyote 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.7	300.0	100.2%	370.0	81.3%
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Harry Allen 345 kV Phase Shifter	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.4	344.5	315.0	109.4%	394.0	87.4%
N-1: Harry Allen 345 kV Phase Shifter	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.4	343.5	315.0	109.0%	394.0	87.2%
N-1: Hatwai 500/230 kV Xfmr	No Violations							
N-1: Hatwai-Lolo 230 kV	No Violations							
N-1: Hatwai-Low Gran 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.8	300.0	100.3%	370.0	81.3%
N-1: Hatwai-N Lewiston 230 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	No Violations							
N-1: Hells Canyon-Walla Walla 230 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	302.7	300.0	100.9%	370.0	81.8%
N-1: Hemingway-Grassland 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.9	50.0	50.0	100.0%	55.0	90.9%
N-1: Hemingway-Grassland 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	330.9	300.0	110.3%	370.0	89.4%
N-1: Hemingway-Grassland 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	322.3	300.0	107.4%	370.0	87.1%
N-1: Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	304.9	300.0	101.6%	370.0	82.4%
N-1: Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	304.9	300.0	101.6%	370.0	82.4%
N-1: Hemingway-Grassland 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	89.7	119.7	112.0	106.9%	146.7	81.6%
N-1: Hemingway-Grassland 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.4	316.8	315.0	100.6%	394.0	80.4%
N-1: Hemingway-Grassland 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.4	316.3	315.0	100.4%	394.0	80.3%
N-1: Hemingway-Grassland 500 kV	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1503.2	2252.3	1732.1	130.0%	2338.3	96.3%
N-1: Hemingway-Summer Lake 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.9	52.8	50.0	105.7%	55.0	96.1%
N-1: Hemingway-Summer Lake 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	337.2	300.0	112.4%	370.0	91.1%
N-1: Hemingway-Summer Lake 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	329.0	300.0	109.7%	370.0	88.9%
N-1: Hemingway-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	308.8	300.0	102.9%	370.0	83.5%
N-1: Hemingway-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	308.8	300.0	102.9%	370.0	83.5%
N-1: Hemingway-Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.4	319.6	315.0	101.5%	394.0	81.1%
N-1: Hemingway-Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.4	319.1	315.0	101.3%	394.0	81.0%
N-1: Hemingway-Summer Lake 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1401.9	2211.1	2000.1	110.6%	3000.0	73.7%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Hemingway-Summer Lake 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1420.6	2186.1	2000.1	109.3%	3000.0	72.9%
N-1: Hill Top 345/230 Xfmr	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	108.4	177.5	150.0	118.3%	180.0	98.6%
N-1: Hill Top 345/230 Xfmr	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	315.0	435.5	415.7	104.8%	483.5	90.1%
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: Hot Springs-Taft 500 kV	No Violations							
N-1: Humboldt-Coyote Ck 345 kV	No Violations							
N-1: Huntington-Pinto-Four Corners 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	335.1	300.0	111.7%	370.0	90.6%
N-1: Huntington-Pinto-Four Corners 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	335.1	300.0	111.7%	370.0	90.6%
N-1: Huntington-Pinto-Four Corners 345 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.3	300.0	100.1%	370.0	81.2%
N-1: Ing500-CusterW 500 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Kfalls-Meridian 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.9	52.3	50.0	104.7%	55.0	95.2%
N-1: LaGrande-North Powder 230 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.8	300.0	100.3%	370.0	81.3%
N-1: Lanes-Marion 500 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-Sac Tap 500 kV	No Violations							
N-1: Malin 500/230 Xfmr	No Violations							
N-1: Malin-Hilltop 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	108.4	152.8	150.0	101.9%	180.0	84.9%
N-1: Malin-Round Mtn #1 500 kV	No Violations							
N-1: Malin-Round Mtn #2 500 kV	No Violations							
N-1: Malin-Summer Lake 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	305.3	300.0	101.8%	370.0	82.5%
N-1: Maple Vly-Rocky RH 345 kV	No Violations							
N-1: Marion-Pearl 500 kV	No Violations							
N-1: Marion-Santiam 500 kV	No Violations							
N-1: McLouglin-Ostrander 230 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Longhorn 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	No Violations							
N-1: McNary-Sac Tap-Low Mon 500 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	326.7	300.0	108.9%	370.0	88.3%
N-1: Midpoint-Hemingway 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	319.1	300.0	106.4%	370.0	86.3%
N-1: Midpoint-Humboldt 345 kV	No Violations							
N-1: Napavine-Paul 500 kV	No Violations							
N-1: Olympia-Paul 500 kV	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	301.4	300.0	100.5%	370.0	81.4%
N-1: Paul-Satsop 500 kV	No Violations							
N-1: Pearl-Keeler 500 kV	No Violations							
N-1: Pinto-Four Corner 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	332.2	300.0	110.7%	370.0	89.8%
N-1: Pinto-Four Corner 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	332.2	300.0	110.7%	370.0	89.8%
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Populus-Cedar Hill-Hemingway 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	315.1	300.0	105.0%	370.0	85.2%
N-1: Populus-Cedar Hill-Hemingway 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	308.6	300.0	102.9%	370.0	83.4%
N-1: Populus-Cedar Hill-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	303.4	300.0	101.1%	370.0	82.0%
N-1: Populus-Cedar Hill-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	303.4	300.0	101.1%	370.0	82.0%
N-1: Populus-Cedar Hill-Hemingway 500 kV	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1283.7	2191.5	1732.1	126.5%	2338.3	93.7%
N-1: Populus-Cedar Hill-Hemingway 500 kV	BORPOP11 (61970) -> BORAH (60060) CKT 1 at BORAH	Branch Amp	1146.4	1840.3	1701.6	108.2%	2108.6	87.3%
N-1: Populus-Cedar Hill-Hemingway 500 kV	BORPOP21 (61969) -> BORAH (60060) CKT 2 at BORAH	Branch Amp	1130.8	1821.8	1650.1	110.4%	2227.4	81.8%
N-1: Populus-Cedar Hill-Hemingway 500 kV	POPULUS (67790) -> BORPOP11 (61970) CKT 1 at POPULUS	Branch Amp	1136.5	1834.0	1492.7	122.9%	2264.2	81.0%
N-1: Raver-Paul 500 kV	No Violations							
N-1: Raver-Tacoma 500 kV	No Violations							
N-1: Red Butte-Harry Allen 345 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.4	344.4	315.0	109.3%	394.0	87.4%
N-1: Red Butte-Harry Allen 345 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.4	343.3	315.0	109.0%	394.0	87.1%
N-1: Robinson-Harry Allen 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	358.5	300.0	119.5%	370.0	96.9%
N-1: Robinson-Harry Allen 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	347.4	300.0	115.8%	370.0	93.9%
N-1: Robinson-Harry Allen 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	108.4	162.9	150.0	108.6%	180.0	90.5%
N-1: Robinson-Harry Allen 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	307.5	300.0	102.5%	370.0	83.1%
N-1: Robinson-Harry Allen 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	307.5	300.0	102.5%	370.0	83.1%
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Round Mtn-Table Mtn 500 kV	No Violations							
N-1: Roundup-Lagrande 230 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.9	50.4	50.0	100.8%	55.0	91.6%
N-1: Roundup-Lagrande 230 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.2	300.0	100.1%	370.0	81.1%
N-1: Schultz-Sickler 500 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Sigurd-Glen Canyon 230 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Slatt-Longhorn 500 kV	No Violations							
N-1: Snok Tap-Snoking 500 kV	No Violations							
N-1: Table Mtn-Tesla 500 kV	No Violations							
N-1: Table Mtn-Vaca Dixon 500 kV	No Violations							
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Buckley 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.8	300.0	100.3%	370.0	81.3%
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	300.1	300.0	100.0%	370.0	81.1%
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	320.4	300.0	106.8%	370.0	86.6%
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	313.2	300.0	104.4%	370.0	84.7%
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	No Violations							
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Bridger-Populus #1 & #2 345 kV	BRIDGER (60085) -> BRI3MI11 (61999) CKT 1 at BRIDGER	Branch Amp	1056.3	1735.1	1600.0	108.4%	1840.0	94.3%
N-2: Bridger-Populus #1 & #2 345 kV	BRI3MI11 (61999) -> 3MIKNOLL (60084) CKT 1 at 3MIKNOLL	Branch Amp	1056.3	1709.2	1650.1	103.6%	2227.4	76.7%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	BRIDGER (60085) -> POPBRI11 (61968) CKT 1 at BRIDGER	Branch Amp	1003.7	1779.0	1492.7	119.2%	1849.2	96.2%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	POPBRI11 (61968) -> POPULUS (67790) CKT 1 at POPULUS	Branch Amp	991.9	1762.1	1650.1	106.8%	2227.6	79.1%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	319.5	300.0	106.5%	370.0	86.4%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	89.7	125.3	112.0	111.9%	146.7	85.4%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	312.5	300.0	104.2%	370.0	84.5%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	ABSAROKE (62201)	% Δ Volts	0.955	0.877				8.17%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLBUSAT (62224)	% Δ Volts	0.975	0.900				7.69%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLUMBUS (62015)	% Δ Volts	0.978	0.903				7.67%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	BGTMBERA (62250)	% Δ Volts	1.009	0.936				7.23%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLRPLJE (62220)	% Δ Volts	1.000	0.929				7.10%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	DUCKCR-R (62325)	% Δ Volts	1.015	0.944				7.00%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	WILSALL (62019)	% Δ Volts	1.036	0.965				6.85%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLRPLJE (62205)	% Δ Volts	1.000	0.937				6.30%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	WILSALL (62016)	% Δ Volts	1.033	0.968				6.29%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	CLYDE P (62108)	% Δ Volts	1.026	0.966				5.85%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	THRRIVER (62331)	% Δ Volts	1.032	0.979				5.14%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	STANFRDM (62231)	% Δ Volts	1.033	0.980				5.13%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	KINGHILL (62170)	% Δ Volts	1.045	0.992				5.07%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	UTICA (62238)	% Δ Volts	1.029	0.977				5.05%
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	304.9	300.0	101.6%	370.0	82.4%
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTNPS	Branch MVA	297.8	300.0	300.0	100.0%	370.0	81.1%
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations							
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations							
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							

Appendix H - 16la1sa_3400idnw_Path76 Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations							
N-2: CusterW-Monroe #1 & #2 500 kV	No Violations							
N-2: DC-BIPOLE	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	302.2	300.0	100.7%	370.0	81.7%
N-2: DC-BIPOLE	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	302.2	300.0	100.7%	370.0	81.7%
N-2: Double Palo Verde	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	270.7	345.6	300.0	115.2%	370.0	93.4%
N-2: Double Palo Verde	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	270.7	345.6	300.0	115.2%	370.0	93.4%
N-2: Double Palo Verde	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO	Branch MVA	290.4	364.7	315.0	115.8%	394.0	92.6%
N-2: Double Palo Verde	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO	Branch MVA	290.4	363.3	315.0	115.3%	394.0	92.2%
N-2: Double Palo Verde	CR_NEST1 (54458) -> CBK 500 (50791) CKT 1 at CR_NEST1	Branch Amp	430.1	1104.4	1085.4	101.8%	1199.7	92.1%
N-2: Double Palo Verde	CHOLLA (14000) -> CHOSAG11 (14014) CKT 1 at CHOSAG11	Branch Amp	970.5	1065.0	1026.0	103.8%	1538.1	69.2%
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations							
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations							
N-2: Garrison-Taft #1 & #2 500 kV + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	319.6	300.0	106.5%	370.0	86.4%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	312.5	300.0	104.2%	370.0	84.5%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	PLACIDLK (62344)	% Δ Volts	1.026	0.962				6.24%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	DIXON MV (40348)	% Δ Volts	1.026	0.969				5.56%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	RATTLE S (40867)	% Δ Volts	1.025	0.970				5.37%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	DIAMNDMT (62295)	% Δ Volts	1.022	0.968				5.28%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	SUPERRMT (62296)	% Δ Volts	1.022	0.968				5.28%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	TARKIO-R (62294)	% Δ Volts	1.025	0.971				5.27%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	ST REGIS (62297)	% Δ Volts	1.020	0.967				5.20%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	ALBERTON (62293)	% Δ Volts	1.029	0.976				5.15%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	HUSON-R (62300)	% Δ Volts	1.032	0.980				5.04%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	HAMLTNMT (62074)	% Δ Volts	1.014	0.963				5.03%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	HAUGEN (62298)	% Δ Volts	1.018	0.967				5.01%
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	303.1	300.0	101.0%	370.0	81.9%
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	No Violations							
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	No Violations							
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	No Violations							
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	309.0	300.0	103.0%	370.0	83.5%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	302.5	300.0	100.8%	370.0	81.7%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	BENTNAVA (48039) -> TAUNTON (48425) CKT 1 at BENTNAVA	Branch Amp	226.0	267.0	252.0	105.9%	271.1	98.5%
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	303.2	300.0	101.1%	370.0	82.0%
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV	No Violations							
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	No Violations							
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	No Violations							
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							

Appendix H - 16la1sa_3400idnw_Path76 Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	301.4	300.0	100.5%	370.0	81.5%
N-2: Malin-Round Mtn #1 & #2 500 kV	No Violations							
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	327.6	300.0	109.2%	370.0	88.6%
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	320.0	300.0	106.7%	370.0	86.5%
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations							
N-2: Napavine-Allston & Paul-Allston #2 500 kV	No Violations							
N-2: Paul-Napavine & Paul-Allston #2 500 kV	No Violations							
N-2: Paul-Raver & Raver-Covingt4 500 kV	No Violations							
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	No Violations							
N-2: Raver-Covington #1 & #2 500 kV	No Violations							
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations							
N-2: Raver-Paul & Napavine-Paul 500 kV	No Violations							
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations							
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations							
N-2: Raver-Schultz #1 & #2 500 kV	No Violations							
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations							
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations							
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	No Violations							
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	BENTNAVA (48039) -> TAUNTON (48425) CKT 1 at BENTNAVA	Branch Amp	226.0	255.1	252.0	101.2%	271.1	94.1%
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	No Violations							
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	304.0	300.0	101.3%	370.0	82.2%
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	307.8	300.0	102.6%	370.0	83.2%
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	292.0	301.5	300.0	100.5%	370.0	81.5%
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	BENTNAVA (48039) -> TAUNTON (48425) CKT 1 at BENTNAVA	Branch Amp	226.0	254.4	252.0	100.9%	271.1	93.8%
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	304.0	300.0	101.3%	370.0	82.2%
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	305.5	300.0	101.8%	370.0	82.6%
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	297.8	302.2	300.0	100.7%	370.0	81.7%
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations							

Appendix H - 16la1sa_3400idnw_Path76 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hill top		Humboldt		Malin		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 11L12 MERIDIAN-KLAM FALLS 500 KV+KFGEN2+ST	0.70	-803	0.70	-1972	0.70	-344	0.70	-737	0.71	-4676	0.72	-1789	0.80	-1582	0.70	-918
BF 11L22 CAPT JACK-KLAM FALLS 500 KV+KFGEN2+ST	0.70	-804	0.70	-1982	0.70	-345	0.70	-737	0.71	-4610	0.72	-1797	0.79	-1588	0.70	-919
BF 11R1 MERIDIAN-KLAM FALLS 500 KV & MERIDIAN 500/230 KV XFMR	0.70	-809	0.70	-2024	0.70	-347	0.70	-741	0.71	-4795	0.71	-1837	0.79	-1632	0.70	-924
BF 11R6 MERIDIAN-DIXONVILLE 500 KV & MERIDIAN 500/230 KV XFMR	0.70	-809	0.70	-2040	0.70	-348	0.70	-740	0.70	-4750	0.71	-1850	0.79	-1644	0.70	-924
BF 4003 HANFORD-VANTAGE & HANFORD CAPS	0.70	-810	0.70	-2050	0.70	-351	0.70	-741	0.73	-4813	0.71	-1859	0.79	-1651	0.70	-925
BF 4019 CAPTJACK-MALIN #2 & MALIN 500/230 XFMR	0.70	-788	0.70	-2050	0.70	-249	0.70	-742	0.70	-4881	0.71	-1858	0.79	-1649	0.70	-904
BF 4028 TAFT-DWORSHAK & TAFT REACTOR 500KV	0.70	-809	0.70	-2006	0.70	-350	0.70	-737	0.73	-4835	0.72	-1819	0.79	-1614	0.70	-923
BF 4046 JOHN DAY-GRIZZLY #2 & GRIZZLY-MALIN #2 500 KV	0.70	-804	0.70	-2015	0.70	-340	0.70	-737	0.70	-4423	0.71	-1839	0.79	-1639	0.70	-919
BF 4064 CAPTJACK-MALIN & MALIN-ROUND MTN #1 500 KV	0.70	-813	0.70	-2071	0.70	-355	0.70	-741	0.71	-4555	0.71	-1877	0.79	-1669	0.70	-928
BF 4072 GRIZZLY-MALIN #2 & MALIN-ROUND MTN #2 500 KV	0.70	-805	0.70	-2028	0.70	-340	0.70	-737	0.71	-4089	0.71	-1853	0.79	-1653	0.70	-919
BF 4095 LOW MON-HANFORD & HANFORD-WAUTOMA 500 KV	0.70	-809	0.70	-2042	0.70	-350	0.70	-739	0.76	-4635	0.71	-1853	0.79	-1646	0.70	-924
BF 4104 ASHE-HANFORD & HANFORD-WAUTOMA 500 KV	0.70	-809	0.70	-2039	0.70	-350	0.70	-740	0.77	-4503	0.71	-1854	0.79	-1649	0.70	-924
BF 4111 HOT SPRINGS-TAFT & TAFT-DWORSHAK 500 KV	0.70	-809	0.70	-2009	0.70	-350	0.70	-738	0.73	-4845	0.72	-1822	0.79	-1616	0.70	-924
BF 4114 GARRISON-TAFT #1 +TAFT REACTOR 500KV	0.70	-807	0.70	-1962	0.70	-349	0.70	-734	0.75	-4611	0.72	-1781	0.79	-1575	0.70	-921
BF 4119 GARRISON-TAFT #1 & TAFT-BELL 500KV + RAS	0.70	-800	0.70	-1813	0.70	-343	0.70	-725	0.80	-4234	0.74	-1661	0.79	-1466	0.70	-914
BF 4131 SLATT-JOHN DAY & JOHN DAY-GRIZZLY #2 500 KV	0.70	-806	0.70	-2031	0.70	-346	0.70	-738	0.71	-4708	0.71	-1854	0.79	-1651	0.70	-921
BF 4143 (OR 4134) JOHN DAY-GRIZZLY #1 & JOHN DAY CAPS 500 KV	0.70	-808	0.70	-2039	0.70	-348	0.70	-739	0.70	-4774	0.71	-1852	0.79	-1646	0.70	-923
BF 4148 HOT SPRINGS-TAFT & GARRISON-TAFT #2 500 KV	0.70	-807	0.70	-1990	0.70	-350	0.70	-736	0.72	-4927	0.72	-1800	0.79	-1590	0.70	-922
BF 4170 JOHN DAY-MARION & JOHN DAY CAPS 500 KV	0.70	-809	0.70	-2040	0.70	-349	0.70	-740	0.76	-4581	0.71	-1853	0.79	-1647	0.70	-924
BF 4186 (OR 4582) MALIN-ROUND MTN 500 KV & MALIN 500/230 XFMR	0.70	-789	0.70	-2047	0.70	-249	0.70	-741	0.71	-4472	0.71	-1862	0.79	-1657	0.70	-904
BF 4194 ROCK CK-JOHN DAY & BIG EDDY-JOHN DAY 500 KV	0.70	-810	0.70	-2048	0.70	-350	0.70	-740	0.73	-4811	0.71	-1858	0.79	-1650	0.70	-925
BF 4197 JOHN DAY-BIG EDDY #1 & JOHN DAY CAPS 500 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-741	0.75	-4702	0.71	-1861	0.79	-1652	0.70	-925
BF 4202 JOHN DAY-BIG EDDY#2 & BIG EDDY-OSTRANDER 500 KV	0.70	-810	0.70	-2044	0.70	-350	0.70	-740	0.74	-4777	0.71	-1855	0.79	-1648	0.70	-925
BF 4231 MCNARY-LONGHORN 500 KV & MCNARY 500/230 KV XFMR	0.70	-810	0.70	-2019	0.70	-352	0.70	-740	0.78	-4639	0.71	-1849	0.79	-1647	0.70	-925
BF 4234 MCNARY-LONGHORN & MCNARY-HERMCALP 500 KV	0.70	-804	0.70	-1933	0.70	-347	0.70	-737	0.77	-4518	0.73	-1757	0.80	-1548	0.70	-919
BF 4247 LIT GOOS-LOW MON #2 & LOW MON-MCNARY 500 KV	0.70	-810	0.70	-2045	0.70	-351	0.70	-740	0.74	-4794	0.71	-1856	0.79	-1649	0.70	-925
BF 4259 LIT GOOS-LOW MON #2 & LOW MON-HANFORD 500 KV	0.70	-809	0.70	-2040	0.70	-350	0.70	-739	0.75	-4626	0.71	-1852	0.79	-1645	0.70	-924
BF 4268 MONROE-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.70	-810	0.70	-2053	0.70	-351	0.70	-740	0.73	-4887	0.71	-1860	0.79	-1651	0.70	-925
BF 4276 ING500-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.70	-810	0.70	-2055	0.70	-351	0.70	-740	0.72	-4915	0.71	-1861	0.79	-1652	0.70	-925
BF 4280 KEELER-PEARL & PEARL-MARION 500 KV	0.70	-812	0.70	-2049	0.70	-353	0.70	-741	0.74	-4740	0.71	-1858	0.79	-1650	0.70	-927
BF 4280 KEELER-PEARL & PEARL-OSTRANDER 500 KV	0.70	-810	0.70	-2056	0.70	-352	0.70	-741	0.73	-4820	0.71	-1862	0.79	-1653	0.70	-925
BF 4287 PEARL-OSTRANDER 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.70	-810	0.70	-2057	0.70	-351	0.70	-741	0.75	-4722	0.71	-1862	0.79	-1652	0.70	-925
BF 4293 SCHULTZ-RAVER & RAVER COVINGTON5 500 KV	0.70	-810	0.70	-2052	0.70	-351	0.70	-740	0.73	-4851	0.71	-1859	0.79	-1650	0.70	-925
BF 4336 CHIEF JO-SICKLER 500 KV & SICKLER 500/230 XFMR	0.70	-810	0.70	-2054	0.70	-351	0.70	-740	0.72	-4912	0.71	-1860	0.79	-1651	0.70	-925
BF 4336 SICKLER-SCHULTZ 500 KV & SICKLER 500/230 XFMR	0.70	-810	0.70	-2054	0.70	-351	0.70	-740	0.75	-4723	0.71	-1860	0.79	-1651	0.70	-925
BF 4377 ASHE-MARION & MARION-ALVEY 500 KV	0.70	-807	0.70	-2034	0.70	-346	0.70	-738	0.76	-4386	0.71	-1851	0.79	-1645	0.70	-921
BF 4386 BUCKLEY-MARION & MARION-SANTIAM 500 KV	0.70	-809	0.70	-2038	0.70	-349	0.70	-740	0.76	-4533	0.71	-1853	0.79	-1647	0.70	-923
BF 4439 BIG EDDY-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.70	-810	0.70	-2044	0.70	-350	0.70	-740	0.74	-4778	0.71	-1855	0.79	-1648	0.70	-924
BF 4442 BIG EDDY-OSTRANDER 500 KV & OSTRANDER-MCLOUGHLIN 230 KV	0.70	-810	0.70	-2046	0.70	-350	0.70	-740	0.73	-4820	0.71	-1856	0.79	-1649	0.70	-925
BF 4448 KNIGHT-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.70	-809	0.70	-2041	0.70	-350	0.70	-740	0.74	-4731	0.71	-1853	0.79	-1647	0.70	-924
BF 4450 KNIGHT-OSTRANDER & OSTRANDER-PEARL 500 KV	0.70	-809	0.70	-2045	0.70	-350	0.70	-740	0.74	-4770	0.71	-1855	0.79	-1648	0.70	-924
BF 4502 PAUL-ALLSTON & ALLSTON-KEELER 500 KV	0.70	-810	0.70	-2051	0.70	-351	0.70	-740	0.74	-4745	0.71	-1859	0.79	-1650	0.70	-925
BF 4510 PEARL-MARION 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.70	-812	0.70	-2049	0.70	-353	0.70	-741	0.76	-4591	0.71	-1857	0.79	-1649	0.70	-927
BF 4526 CUSTERW-MONROE & MONROE-ECHO LAKE 500 KV	0.70	-810	0.70	-2051	0.70	-351	0.70	-740	0.76	-4659	0.71	-1858	0.79	-1650	0.70	-925
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-741	0.76	-4620	0.71	-1860	0.79	-1651	0.70	-925
BF 4540 PAUL-NAPAVINE & PAUL-SATSOP 500 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-740	0.73	-4869	0.71	-1860	0.79	-1651	0.70	-925
BF 4542 PAUL-ALLSTON 500 KV & CENTER G2	0.70	-801	0.70	-1918	0.70	-344	0.70	-734	0.78	-4429	0.73	-1733	0.80	-1523	0.70	-916
BF 4542 PAUL-NAPAVINE 500 KV & CENTER G1	0.70	-802	0.70	-1930	0.70	-345	0.70	-735	0.77	-4528	0.73	-1742	0.80	-1532	0.70	-917
BF 4550 OLYMPIA-PAUL & PAUL-ALLSTON 500 KV	0.70	-810	0.70	-2052	0.70	-351	0.70	-740	0.73	-4877	0.71	-1858	0.79	-1649	0.70	-925
BF 4554 OLYMPIA-PAUL 500 KV & TONO 500/115 XFMR	0.70	-810	0.70	-2056	0.70	-352	0.70	-741	0.72	-4951	0.71	-1861	0.79	-1651	0.70	-925
BF 4572 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.70	-810	0.70	-2035	0.70	-352	0.70	-740	0.77	-4648	0.71	-1852	0.79	-1648	0.70	-925
BF 4630 CEN FERRY-LIT GOOS #1 & LIT GOOS-LOW MON #1 500 KV	0.70	-810	0.70	-2051	0.70	-351	0.70	-740	0.75	-4719	0.71	-1858	0.79	-1650	0.70	-925

Appendix H - 16la1sa_3400idnw_Path76 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hill top		Humboldt		Malin		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 4652 TAFT-DWORSHAK & TAFT-HATWAI 500 KV + RAS	0.70	-806	0.70	-1981	0.70	-349	0.70	-737	0.72	-4949	0.72	-1785	0.79	-1574	0.70	-921
BF 4672 MONROE-CHIEF JO 500 KV & MONROE CAPS	0.70	-810	0.70	-2049	0.70	-351	0.70	-740	0.73	-4859	0.71	-1857	0.79	-1649	0.70	-925
BF 4676 LIT GOOS-LOW MON & LOW MON-ASHE 500 KV	0.70	-810	0.70	-2058	0.70	-351	0.70	-740	0.72	-4965	0.71	-1862	0.79	-1652	0.70	-925
BF 4690 PAUL-ALLSTON 500 KV & ALLSTON 500/230 XFMR	0.70	-810	0.70	-2052	0.70	-351	0.70	-740	0.73	-4843	0.71	-1859	0.79	-1651	0.70	-925
BF 4708 HATWAI 500 KV BUS	0.70	-807	0.70	-1990	0.70	-349	0.70	-735	0.73	-4859	0.72	-1807	0.79	-1600	0.70	-922
BF 4728 COULEE-CHIEF JO 500 KV & CHEIF JO 500/230 XFMR	0.70	-810	0.70	-2049	0.70	-351	0.70	-740	0.73	-4893	0.71	-1857	0.79	-1648	0.70	-925
BF 4775 CEN FERRY-LOW GRAN #1 & #2 500 KV	0.70	-806	0.70	-1990	0.70	-348	0.70	-735	0.74	-4785	0.72	-1813	0.79	-1607	0.70	-921
BF 4776 HATWAI-LOW GRAN & LOW GRAN-CEN FERRY 500 KV	0.70	-807	0.70	-1997	0.70	-349	0.70	-736	0.73	-4833	0.72	-1818	0.79	-1613	0.70	-921
BF 4870 JOHN DAY-BIG EDDY 500 KV & BIG EDDY 500/230 KV	0.70	-810	0.70	-2053	0.70	-351	0.70	-741	0.75	-4690	0.71	-1861	0.79	-1652	0.70	-925
BF 4888 ASHE-SLATT & CGS 500 KV	0.70	-798	0.71	-1849	0.70	-342	0.70	-733	0.77	-4485	0.74	-1673	0.80	-1465	0.70	-912
BF 4891 LOW MON-ASHE & ASHE-SLATT 500 KV	0.70	-809	0.70	-2034	0.70	-350	0.70	-740	0.74	-4760	0.71	-1851	0.79	-1646	0.70	-924
BF 4901 LOW MON-ASHE & ASHE-HANFORD 500 KV	0.70	-809	0.70	-2026	0.70	-349	0.70	-740	0.76	-4484	0.71	-1850	0.79	-1648	0.70	-924
BF 4940 LOW MON-ASHE & ASHE-MARION 500 KV	0.70	-808	0.70	-2031	0.70	-348	0.70	-738	0.76	-4471	0.71	-1847	0.79	-1642	0.70	-923
BF 4957 SUMMER L-MALIN & SUMMER L-HEMINGWAY 500 KV	0.70	-768	0.70	-1608	0.70	-327	0.70	-707	0.76	-4300	0.71	-1703	0.80	-1705	0.70	-879
BF 4959 GRIZZLY-SUMMER L & SUMMER L-MALIN 500 KV	0.70	-770	0.70	-1681	0.70	-329	0.70	-714	0.75	-4374	0.71	-1773	0.80	-1771	0.70	-882
BF 4996 CAPTJACK-MALIN #1 & #2 500 KV	0.70	-813	0.70	-2067	0.70	-355	0.70	-742	0.70	-4189	0.71	-1869	0.79	-1659	0.70	-928
BF 5003 SLATT-BUCKLEY & SLATT-BOARDMAN 500 KV	0.70	-805	0.70	-2020	0.70	-347	0.70	-737	0.73	-4709	0.71	-1862	0.79	-1663	0.70	-920
BF 5006 SLATT-LONGHORN & SLATT-GRASSLAND 500 KV	0.70	-802	0.70	-2013	0.70	-346	0.70	-735	0.76	-4479	0.71	-1869	0.79	-1679	0.70	-916
BF 5015 ASHE-SLATT & SLATT-BUCKLEY 500 KV	0.70	-807	0.70	-2036	0.70	-348	0.70	-738	0.76	-4484	0.71	-1859	0.79	-1655	0.70	-922
BF 5018 ASHE-SLATT & SLATT-JOHN DAY 500 KV	0.70	-807	0.70	-2033	0.70	-349	0.70	-739	0.74	-4730	0.71	-1862	0.79	-1659	0.70	-922
BF 5021 SLATT-JOHN DAY & SLATT-LONGHORN 500 KV	0.70	-808	0.70	-2042	0.70	-349	0.70	-739	0.73	-4814	0.71	-1862	0.79	-1656	0.70	-922
BF 5028 BUCKLEY-GRIZZLY & GRIZZLY-SUMMER LAKE 500 KV	0.70	-808	0.70	-2019	0.70	-348	0.70	-740	0.71	-4656	0.71	-1848	0.79	-1650	0.70	-923
BF 5040 GRIZZLY-JOHN DAY & GRIZZLY-ROUND BU 500 KV	0.70	-808	0.70	-2036	0.70	-347	0.70	-739	0.73	-4619	0.71	-1850	0.79	-1645	0.70	-923
BF 5114 ECHO LAKE-RAVER & ECHO LAKE- SNOK TAP 500 KV	0.70	-810	0.70	-2056	0.70	-351	0.70	-741	0.75	-4725	0.71	-1861	0.79	-1652	0.70	-925
BF 5117 ECHO LAKE-MAPLE VALLEY & ECHO LAKE-RAVER 500 KV	0.70	-810	0.70	-2050	0.70	-351	0.70	-740	0.73	-4858	0.71	-1858	0.79	-1649	0.70	-925
BF 5148 COULEE-SCHULTZ & ECHO LAKE-SCHULTZ 500 KV	0.70	-809	0.70	-2038	0.70	-350	0.70	-740	0.74	-4751	0.71	-1850	0.79	-1644	0.70	-924
BF 5170 WAUTOMA-SCHULTZ & SCHULTZ-RAVER 500 KV	0.70	-810	0.70	-2048	0.70	-351	0.70	-741	0.74	-4751	0.71	-1857	0.79	-1650	0.70	-925
BF 5179 VANTAGE-SCHULTZ & SCHULTZ-RAVER #4	0.70	-810	0.70	-2050	0.70	-351	0.70	-740	0.76	-4619	0.71	-1858	0.79	-1650	0.70	-925
BF 5187 MCNARY-LONGHORN & LONGHORN-SLATT 500 KV	0.70	-810	0.70	-2034	0.70	-351	0.70	-740	0.73	-4855	0.71	-1858	0.79	-1653	0.70	-925
BF 5193 GRASSLAND-COYOTE & COYOTE-LONGHORN 500 KV	0.70	-805	0.70	-1916	0.70	-347	0.70	-736	0.74	-4788	0.73	-1758	0.80	-1553	0.70	-919
BF 5211 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.70	-810	0.70	-2037	0.70	-352	0.70	-740	0.78	-4610	0.71	-1854	0.79	-1649	0.70	-925
BF 5214 LOW MON-MCNARY & CALPINE PH 500 KV	0.70	-804	0.70	-1920	0.70	-346	0.70	-736	0.78	-4388	0.73	-1748	0.80	-1540	0.70	-918
BF 5250 HANFORD-WAUTOMA#1 & WAUTOMA-KNIGHT 500 KV	0.70	-809	0.70	-2044	0.70	-350	0.70	-740	0.74	-4803	0.71	-1855	0.79	-1648	0.70	-924
BF 5259 HANFORD-WAUTOMA#2 & WAUTOMA-ROCK CK 500 KV	0.70	-810	0.70	-2046	0.70	-351	0.70	-740	0.73	-4798	0.71	-1857	0.79	-1649	0.70	-925
BF 5266 SLATT-BUCKLY 500 KV	0.70	-807	0.70	-2051	0.70	-349	0.70	-739	0.72	-4773	0.71	-1864	0.79	-1657	0.70	-922
BF 5339 VANTAGE-SCHULTZ 500 KV & VANTAGE 500/230 XFMR #1	0.70	-810	0.70	-2053	0.70	-351	0.70	-740	0.73	-4869	0.71	-1860	0.79	-1651	0.70	-925
BF 5345 VANTAGE-HANFORD 500 KV & VANTAGE 500/230 XFMR #1	0.70	-810	0.70	-2050	0.70	-351	0.70	-741	0.73	-4817	0.71	-1859	0.79	-1651	0.70	-925
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR	0.70	-768	0.70	-1177	0.70	-320	0.70	-696	0.76	-4370	0.72	-1447	0.82	-1474	0.70	-880
BF IPC HEMINGWAY-SUMMER L 500 KV & HEMINGWAY 500/230 XFMR	0.70	-770	0.70	-1416	0.70	-329	0.70	-709	0.78	-4357	0.71	-1659	0.81	-1651	0.70	-882
BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.70	-772	0.70	-1234	0.70	-329	0.70	-703	0.77	-4538	0.70	-1415	0.77	-1372	0.70	-884
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR	0.70	-793	0.70	-1531	0.70	-344	0.70	-708	0.76	-4783	0.71	-1413	0.80	-1264	0.70	-906
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR + RAS	0.70	-774	0.70	-1431	0.70	-335	0.70	-678	0.76	-4789	0.71	-1180	0.81	-1226	0.70	-882
BF LOLO 230KV	0.70	-806	0.70	-1998	0.70	-348	0.70	-736	0.73	-4865	0.71	-1839	0.79	-1642	0.70	-921
BF PGE GRASSLAND-CEDAR SPRING & HEMINGWAY-GRASSLAND 500 KV	0.70	-767	0.70	-1364	0.70	-319	0.70	-698	0.78	-4223	0.72	-1502	0.81	-1544	0.70	-879
BF PGE GRASSLAND-COYOTE 500 KV & CARTY GAS PROJECT	0.70	-810	0.70	-2014	0.70	-351	0.70	-740	0.72	-4909	0.71	-1846	0.79	-1643	0.70	-925
BF PGE SLATT-GRASSLAND 500 KV & BOARDMAN COAL GEN	0.70	-803	0.70	-1891	0.70	-346	0.70	-735	0.74	-4820	0.73	-1739	0.80	-1544	0.70	-917
BUS: ALVEY 500 KV	0.70	-808	0.70	-2040	0.70	-346	0.70	-739	0.71	-4630	0.71	-1853	0.79	-1647	0.70	-923
BUS: BELL BPA 500 KV	0.70	-802	0.70	-1874	0.70	-345	0.70	-728	0.77	-4522	0.73	-1719	0.79	-1524	0.70	-916
BUS: BUCKLEY 500 KV	0.70	-805	0.70	-2024	0.70	-345	0.70	-737	0.73	-4570	0.71	-1847	0.79	-1645	0.70	-920
BUS: DIXONVILLE 500 KV	0.70	-809	0.70	-2044	0.70	-348	0.70	-740	0.72	-4621	0.71	-1853	0.79	-1646	0.70	-924
BUS: HOT SPRINGS 500 KV	0.70	-810	0.70	-2059	0.70	-352	0.70	-741	0.72	-4944	0.71	-1864	0.79	-1655	0.70	-925
BUS: KEELER 500 KV	0.70	-810	0.70	-2051	0.70	-351	0.70	-740	0.76	-4512	0.71	-1859	0.79	-1650	0.70	-925

Appendix H - 16la1sa_3400idnw_Path76 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hill top		Humboldt		Malin		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BUS: ROCK CREEK 500 KV	0.70	-809	0.70	-2029	0.70	-349	0.70	-739	0.74	-4757	0.71	-1841	0.79	-1634	0.70	-923
BUS: SICKLER 500 KV	0.70	-810	0.70	-2051	0.70	-351	0.70	-740	0.73	-4880	0.71	-1859	0.79	-1650	0.70	-925
BUS: SUMMER LAKE 500 KV	0.70	-768	0.70	-1610	0.70	-328	0.70	-707	0.75	-4324	0.71	-1705	0.80	-1706	0.70	-879
N-1: ALLSTON-KEELER 500 KV	0.70	-810	0.70	-2051	0.70	-351	0.70	-740	0.74	-4756	0.71	-1859	0.79	-1650	0.70	-925
N-1: ALLSTON-NAPAVINE 500 KV	0.70	-810	0.70	-2052	0.70	-351	0.70	-740	0.73	-4843	0.71	-1859	0.79	-1650	0.70	-925
N-1: ALLSTON-PAUL #2 500 KV	0.70	-810	0.70	-2052	0.70	-351	0.70	-740	0.73	-4857	0.71	-1859	0.79	-1651	0.70	-925
N-1: ALVERY-DIXONVILLE 500 KV	0.70	-809	0.70	-2048	0.70	-348	0.70	-740	0.73	-4623	0.71	-1857	0.79	-1649	0.70	-924
N-1: ALVEY-MARION 500 KV	0.70	-808	0.70	-2052	0.70	-349	0.70	-740	0.74	-4600	0.71	-1860	0.79	-1652	0.70	-923
N-1: ASHE-HANFORD 500 KV	0.70	-809	0.70	-2041	0.70	-350	0.70	-740	0.76	-4527	0.71	-1855	0.79	-1650	0.70	-924
N-1: ASHE-LOW MON 500 KV	0.70	-810	0.70	-2047	0.70	-351	0.70	-740	0.73	-4876	0.71	-1856	0.79	-1648	0.70	-925
N-1: ASHE-MARION 500 KV	0.70	-808	0.70	-2039	0.70	-348	0.70	-739	0.74	-4727	0.71	-1852	0.79	-1646	0.70	-923
N-1: ASHE-SLATT 500 KV	0.70	-810	0.70	-2042	0.70	-351	0.70	-740	0.73	-4820	0.71	-1856	0.79	-1650	0.70	-925
N-1: BELL-COULEE 500 KV	0.70	-807	0.70	-2000	0.70	-349	0.70	-736	0.73	-4862	0.72	-1819	0.79	-1613	0.70	-922
N-1: BELL-TAFT 500 KV	0.70	-802	0.70	-1875	0.70	-345	0.70	-729	0.79	-4225	0.73	-1721	0.79	-1526	0.70	-916
N-1: BIG EDDY-CELILO 500 KV	0.70	-810	0.70	-2056	0.70	-351	0.70	-741	0.72	-4933	0.71	-1862	0.79	-1652	0.70	-925
N-1: BIG EDDY-JOHN DAY 500 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-741	0.72	-4905	0.71	-1861	0.79	-1652	0.70	-925
N-1: BIG EDDY-KNIGHT 500 KV	0.70	-810	0.70	-2052	0.70	-351	0.70	-740	0.73	-4891	0.71	-1859	0.79	-1651	0.70	-925
N-1: BIG EDDY-OSTRANDER 500 KV	0.70	-810	0.70	-2047	0.70	-350	0.70	-740	0.73	-4822	0.71	-1857	0.79	-1649	0.70	-925
N-1: BOISE BENCH-BROWNLEE #3 230 KV	0.70	-810	0.70	-2032	0.70	-351	0.70	-739	0.72	-4929	0.71	-1833	0.79	-1638	0.70	-925
N-1: BRADY-ANTELOPE 230 KV + RAS	0.70	-806	0.70	-1976	0.70	-349	0.70	-734	0.72	-4915	0.71	-1809	0.79	-1623	0.70	-921
N-1: BROADVIEW-GARRISON #1 500 KV	0.70	-807	0.72	-1920	0.70	-349	0.70	-735	0.76	-4662	0.73	-1762	0.80	-1547	0.70	-922
N-1: BROWNLEE-ONTARIO 230 KV	0.70	-810	0.70	-2016	0.70	-351	0.70	-739	0.72	-4921	0.71	-1824	0.79	-1632	0.70	-925
N-1: BUCKLEY-GRIZZLY 500 KV	0.70	-809	0.70	-2049	0.70	-348	0.70	-740	0.70	-4841	0.71	-1857	0.79	-1650	0.70	-923
N-1: BUCKLEY-MARION 500 KV	0.70	-809	0.70	-2040	0.70	-349	0.70	-740	0.74	-4752	0.71	-1854	0.79	-1648	0.70	-923
N-1: BUCKLEY-SLATT 500 KV	0.70	-807	0.70	-2051	0.70	-349	0.70	-739	0.72	-4774	0.71	-1864	0.79	-1657	0.70	-922
N-1: CAL SUB 120 KV PHASE SHIFTER	0.70	-771	0.70	-2027	0.70	-332	0.70	-742	0.72	-4868	0.71	-1844	0.79	-1640	0.70	-871
N-1: CAPTAIN JACK-OLINDA 500 KV	0.70	-811	0.70	-2060	0.70	-349	0.70	-739	0.72	-4219	0.71	-1877	0.79	-1673	0.70	-926
N-1: CAPTJACK-KFALLS 500 KV	0.70	-809	0.70	-2046	0.70	-349	0.70	-740	0.70	-4756	0.71	-1856	0.79	-1649	0.70	-924
N-1: CASCADE CROSSING 500 KV	0.70	-806	0.70	-2039	0.70	-347	0.70	-738	0.78	-4381	0.71	-1860	0.79	-1656	0.70	-921
N-1: CHIEF JO-COULEE 500 KV	0.70	-810	0.70	-2049	0.70	-351	0.70	-740	0.73	-4889	0.71	-1857	0.79	-1648	0.70	-925
N-1: CHIEF JO-MONROE 500 KV	0.70	-810	0.70	-2049	0.70	-351	0.70	-740	0.73	-4911	0.71	-1857	0.79	-1649	0.70	-925
N-1: CHIEF JO-SICKLER 500 KV	0.70	-810	0.70	-2053	0.70	-351	0.70	-740	0.75	-4721	0.71	-1860	0.79	-1651	0.70	-925
N-1: COULEE-HANFORD 500 KV	0.70	-810	0.70	-2049	0.70	-351	0.70	-740	0.73	-4637	0.71	-1858	0.79	-1651	0.70	-925
N-1: COULEE-SCHULTZ 500 KV	0.70	-810	0.70	-2046	0.70	-351	0.70	-740	0.73	-4843	0.71	-1855	0.79	-1648	0.70	-925
N-1: COVINGTON4-RAVER 500 KV	0.70	-810	0.70	-2056	0.70	-351	0.70	-741	0.72	-4913	0.71	-1862	0.79	-1652	0.70	-925
N-1: COVINGTON5-RAVER 500 KV	0.70	-810	0.70	-2056	0.70	-351	0.70	-741	0.72	-4912	0.71	-1861	0.79	-1652	0.70	-925
N-1: COYOTE-LONGHORN 500 KV	0.70	-810	0.70	-2048	0.70	-351	0.70	-741	0.72	-4918	0.71	-1864	0.79	-1657	0.70	-925
N-1: CUSTERW-MONROE 500 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-740	0.75	-4720	0.71	-1860	0.79	-1651	0.70	-925
N-1: DIXONVILLE-MERIDIAN 500 KV	0.70	-809	0.70	-2041	0.70	-348	0.70	-740	0.70	-4762	0.71	-1851	0.79	-1645	0.70	-924
N-1: DRYCREEK-LOLO 230 KV	0.70	-810	0.70	-2056	0.70	-351	0.70	-741	0.72	-4932	0.71	-1861	0.79	-1652	0.70	-925
N-1: DRYCREEK-N LEWISTON 230 KV	0.70	-810	0.70	-2056	0.70	-351	0.70	-740	0.72	-4949	0.71	-1861	0.79	-1652	0.70	-925
N-1: DRYCREEK-WALA AVA 230 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-740	0.75	-4735	0.71	-1861	0.79	-1652	0.70	-925
N-1: DWORSHAK-HATWAI 500 KV	0.70	-809	0.70	-2009	0.70	-350	0.70	-737	0.75	-4726	0.72	-1817	0.79	-1608	0.70	-923
N-1: DWORSHAK-TAFT 500 KV	0.70	-809	0.70	-2006	0.70	-350	0.70	-737	0.73	-4835	0.72	-1819	0.79	-1614	0.70	-923
N-1: ECHO LAKE-MAPLE VALLEY 500 KV	0.70	-810	0.70	-2051	0.70	-351	0.70	-740	0.73	-4884	0.71	-1858	0.79	-1650	0.70	-925
N-1: ECHO LAKE-RAVER 500 KV	0.70	-810	0.70	-2055	0.70	-351	0.70	-741	0.72	-4911	0.71	-1861	0.79	-1652	0.70	-925
N-1: ECHO LAKE-SCHULTZ 500 KV	0.70	-810	0.70	-2049	0.70	-351	0.70	-740	0.73	-4832	0.71	-1857	0.79	-1649	0.70	-925
N-1: ECHO LAKE-SNOK TAP 500 KV	0.70	-810	0.70	-2056	0.70	-352	0.70	-741	0.75	-4733	0.71	-1862	0.79	-1653	0.70	-925
N-1: GARRISON-TAFT #2 500 KV	0.70	-807	0.70	-1962	0.70	-349	0.70	-734	0.74	-4804	0.72	-1781	0.79	-1575	0.70	-921
N-1: GOLDHILL-PLACER 115 KV	0.70	-810	0.70	-2057	0.70	-351	0.70	-741	0.72	-4935	0.71	-1863	0.79	-1654	0.70	-925
N-1: GRASSLAND-COYOTE 500 KV	0.70	-810	0.70	-2014	0.70	-351	0.70	-740	0.72	-4927	0.71	-1846	0.79	-1643	0.70	-925
N-1: GRASSLAND-SLATT 500 KV	0.70	-807	0.70	-2027	0.70	-349	0.70	-739	0.73	-4865	0.71	-1863	0.79	-1662	0.70	-922

Appendix H - 16la1sa_3400idnw_Path76 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hill top		Humboldt		Malin		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: GRIZZLY-JOHN DAY #2 500 KV	0.70	-808	0.70	-2039	0.70	-348	0.70	-739	0.70	-4778	0.71	-1852	0.79	-1646	0.70	-923
N-1: GRIZZLY-MALIN 500 KV	0.70	-806	0.70	-2034	0.70	-344	0.70	-738	0.72	-4546	0.71	-1851	0.79	-1647	0.70	-921
N-1: GRIZZLY-PONDEROSA A-SUMMER L 500 KV	0.70	-810	0.70	-2025	0.70	-351	0.70	-741	0.72	-4733	0.71	-1850	0.79	-1651	0.70	-925
N-1: GRIZZLY-PONDEROSA B-CAPT JACK 500 KV	0.70	-806	0.70	-2033	0.70	-344	0.70	-738	0.72	-4560	0.71	-1851	0.79	-1647	0.70	-921
N-1: GRIZZLY-ROUND BU 500 KV	0.70	-810	0.70	-2053	0.70	-351	0.70	-740	0.72	-4918	0.71	-1860	0.79	-1651	0.70	-925
N-1: HANFORD-LOW MON 500 KV	0.70	-809	0.70	-2044	0.70	-351	0.70	-740	0.73	-4869	0.71	-1855	0.79	-1647	0.70	-924
N-1: HANFORD-VANTAGE 500 KV	0.70	-810	0.70	-2050	0.70	-351	0.70	-741	0.73	-4813	0.71	-1859	0.79	-1651	0.70	-925
N-1: HANFORD-WAUTOMA 500 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-740	0.72	-4911	0.71	-1860	0.79	-1651	0.70	-925
N-1: HARRY ALLEN 345 KV PHASE SHIFTER	0.70	-800	0.71	-1734	0.70	-347	0.70	-699	0.74	-4648	0.75	-1572	0.81	-1408	0.70	-912
N-1: HATWAI 500/230 KV XFMR	0.70	-810	0.70	-2056	0.70	-351	0.70	-740	0.72	-4926	0.71	-1862	0.79	-1653	0.70	-925
N-1: HATWAI-LOLO 230 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-740	0.72	-4947	0.71	-1861	0.79	-1652	0.70	-925
N-1: HATWAI-LOW GRAN 500 KV	0.70	-807	0.70	-1999	0.70	-349	0.70	-736	0.73	-4865	0.72	-1819	0.79	-1613	0.70	-921
N-1: HATWAI-N LEWISTON 230 KV	0.70	-810	0.70	-2056	0.70	-351	0.70	-741	0.72	-4951	0.71	-1862	0.79	-1652	0.70	-925
N-1: HELLS CANYON-BROWNLEE 230 KV	0.70	-808	0.70	-1971	0.70	-350	0.70	-739	0.72	-4970	0.72	-1813	0.79	-1627	0.70	-923
N-1: HELLS CANYON-WALLA WALLA 230 KV	0.70	-804	0.70	-1941	0.70	-347	0.70	-733	0.73	-4857	0.71	-1806	0.79	-1626	0.70	-919
N-1: HEMINGWAY-GRASSLAND 500 KV	0.70	-769	0.70	-1383	0.70	-321	0.70	-701	0.76	-4432	0.72	-1519	0.81	-1563	0.70	-881
N-1: HEMINGWAY-SUMMER LAKE 500 KV	0.70	-770	0.70	-1622	0.70	-329	0.70	-709	0.76	-4545	0.71	-1713	0.80	-1703	0.70	-882
N-1: HILL TOP 345/230 XFMR	0.70	-796	0.70	-1963	0.70	-232	0.70	-749	0.73	-4809	0.72	-1795	0.79	-1598	0.70	-913
N-1: HORSE HV-MCNARY 230 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-740	0.75	-4730	0.71	-1861	0.79	-1652	0.70	-925
N-1: HOT SPRINGS-TAFT 500 KV	0.70	-810	0.70	-2050	0.70	-351	0.70	-740	0.75	-4731	0.71	-1857	0.79	-1648	0.70	-925
N-1: HUMBOLDT-COYOTE CK 345 KV	0.70	-810	0.70	-1967	0.70	-356	0.70	-236	0.72	-4886	0.72	-1736	0.80	-1632	0.70	-912
N-1: HUNTINGTON-PINTO-FOUR CORNERS 345 KV	0.70	-800	0.71	-1750	0.70	-346	0.70	-706	0.74	-4674	0.74	-1592	0.81	-1435	0.70	-914
N-1: ING500-CUSTERW 500 KV	0.70	-810	0.70	-2055	0.70	-351	0.70	-740	0.72	-4917	0.71	-1861	0.79	-1652	0.70	-925
N-1: JOHN DAY-MARION 500 KV	0.70	-809	0.70	-2040	0.70	-349	0.70	-740	0.74	-4759	0.71	-1853	0.79	-1647	0.70	-924
N-1: JOHN DAY-ROCK CK 500 KV	0.70	-810	0.70	-2051	0.70	-351	0.70	-740	0.73	-4844	0.71	-1859	0.79	-1651	0.70	-925
N-1: JOHN DAY-SLATT 500 KV	0.70	-808	0.70	-2051	0.70	-350	0.70	-739	0.73	-4865	0.71	-1865	0.79	-1659	0.70	-923
N-1: KFALLS-MERIDIAN 500 KV	0.70	-809	0.70	-2023	0.70	-348	0.70	-741	0.71	-4806	0.72	-1836	0.79	-1632	0.70	-924
N-1: KNIGHT-WAUTOMA 500 KV	0.70	-809	0.70	-2046	0.70	-350	0.70	-740	0.74	-4817	0.71	-1856	0.79	-1648	0.70	-924
N-1: LAGRANDE-NORTH POWDER 230 KV	0.70	-807	0.70	-2007	0.70	-349	0.70	-737	0.75	-4699	0.71	-1841	0.79	-1642	0.70	-921
N-1: LANES-MARION 500 KV	0.70	-809	0.70	-2048	0.70	-350	0.70	-740	0.73	-4829	0.71	-1857	0.79	-1650	0.70	-924
N-1: LIT GOOSE-CENTRAL FERRY 500 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-740	0.72	-4923	0.71	-1860	0.79	-1651	0.70	-925
N-1: LIT GOOSE-LOW MON 500 KV	0.70	-810	0.70	-2053	0.70	-351	0.70	-740	0.72	-4922	0.71	-1859	0.79	-1651	0.70	-925
N-1: LOW GRAN-CENTRAL FERRY 500 KV	0.70	-810	0.70	-2052	0.70	-351	0.70	-740	0.72	-4922	0.71	-1859	0.79	-1650	0.70	-925
N-1: LOW MON-SAC TAP 500 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-741	0.75	-4715	0.71	-1861	0.79	-1652	0.70	-925
N-1: MALIN 500/230 XFMR	0.70	-789	0.70	-2052	0.70	-249	0.70	-742	0.71	-4931	0.71	-1859	0.79	-1650	0.70	-905
N-1: MALIN-HILLTOP 230 KV	0.70	-786	0.70	-1997	0.70	-181	0.70	-750	0.72	-4844	0.72	-1820	0.79	-1618	0.70	-904
N-1: MALIN-ROUND MTN #1 500 KV	0.70	-810	0.70	-2052	0.70	-348	0.70	-739	0.72	-4479	0.71	-1866	0.79	-1660	0.70	-924
N-1: MALIN-ROUND MTN #2 500 KV	0.70	-810	0.70	-2051	0.70	-348	0.70	-739	0.72	-4458	0.71	-1866	0.79	-1660	0.70	-924
N-1: MALIN-SUMMER LAKE 500 KV	0.70	-803	0.70	-2020	0.70	-347	0.70	-737	0.71	-4645	0.71	-1872	0.79	-1684	0.70	-917
N-1: MAPLE VLY-ROCKY RH 345 KV	0.70	-810	0.70	-2055	0.70	-351	0.70	-740	0.75	-4723	0.71	-1861	0.79	-1652	0.70	-925
N-1: MARION-PEARL 500 KV	0.70	-812	0.70	-2050	0.70	-353	0.70	-741	0.73	-4802	0.71	-1858	0.79	-1650	0.70	-927
N-1: MARION-SANTIAM 500 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-741	0.75	-4747	0.71	-1860	0.79	-1651	0.70	-925
N-1: MCLOUGLIN-OSTRANDER 230 KV	0.70	-810	0.70	-2056	0.70	-352	0.70	-741	0.72	-4977	0.71	-1861	0.79	-1652	0.70	-925
N-1: MCNARY 500/230 KV XFMR	0.70	-810	0.70	-2041	0.70	-352	0.70	-740	0.78	-4681	0.71	-1855	0.79	-1649	0.70	-925
N-1: MCNARY-BOARD T1 230 KV	0.70	-811	0.70	-2067	0.70	-352	0.70	-741	0.72	-4942	0.71	-1872	0.79	-1663	0.70	-926
N-1: MCNARY-JOHN DAY 500 KV	0.70	-808	0.70	-2043	0.70	-350	0.70	-739	0.73	-4798	0.71	-1857	0.79	-1650	0.70	-923
N-1: MCNARY-LONGHORN 500 KV	0.70	-811	0.70	-2039	0.70	-352	0.70	-741	0.72	-4905	0.71	-1858	0.79	-1651	0.70	-925
N-1: MCNARY-ROSS 345 KV	0.70	-809	0.70	-2047	0.70	-350	0.70	-740	0.73	-4827	0.71	-1857	0.79	-1649	0.70	-924
N-1: MCNARY-ROUNDUP 230 KV	0.70	-808	0.70	-2017	0.70	-350	0.70	-738	0.72	-4938	0.71	-1844	0.79	-1645	0.70	-923
N-1: MCNARY-SAC TAP-LOW MON 500 KV	0.70	-810	0.70	-2049	0.70	-351	0.70	-740	0.76	-4627	0.71	-1859	0.79	-1651	0.70	-925
N-1: MIDPOINT-HEMINGWAY 500 KV	0.70	-780	0.70	-1560	0.70	-334	0.70	-706	0.76	-4625	0.70	-1384	0.78	-1449	0.70	-892
N-1: MIDPOINT-HUMBOLDT 345 KV	0.70	-820	0.70	-1921	0.70	-361	0.70	-476	0.73	-4854	0.72	-1710	0.80	-1603	0.70	-926

Appendix H - 16la1sa_3400idnw_Path76 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hill top		Humboldt		Malin		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: NAPAVINE-PAUL 500 KV	0.70	-810	0.70	-2056	0.70	-351	0.70	-741	0.72	-4925	0.71	-1862	0.79	-1652	0.70	-925
N-1: OLYMPIA-PAUL 500 KV	0.70	-810	0.70	-2057	0.70	-352	0.70	-741	0.72	-4973	0.71	-1861	0.79	-1652	0.70	-925
N-1: ONTARIO-CALDWELL 230 KV	0.70	-810	0.70	-2046	0.70	-351	0.70	-740	0.72	-4932	0.71	-1851	0.79	-1647	0.70	-925
N-1: OSTRANDER-KNIGHT 500 KV	0.70	-809	0.70	-2044	0.70	-350	0.70	-740	0.74	-4798	0.71	-1855	0.79	-1648	0.70	-924
N-1: OSTRANDER-PEARL 500 KV	0.70	-810	0.70	-2058	0.70	-351	0.70	-741	0.75	-4732	0.71	-1862	0.79	-1653	0.70	-925
N-1: OSTRANDER-TROUTDALE 500 KV	0.70	-810	0.70	-2053	0.70	-351	0.70	-740	0.73	-4888	0.71	-1860	0.79	-1651	0.70	-925
N-1: OXBOW-BROWNLEE #2 230 KV	0.70	-810	0.70	-2052	0.70	-351	0.70	-740	0.72	-4932	0.71	-1859	0.79	-1652	0.70	-925
N-1: OXBOW-LOLO 230 KV	0.70	-806	0.70	-1993	0.70	-348	0.70	-736	0.73	-4877	0.71	-1836	0.79	-1640	0.70	-921
N-1: PAUL-SATSOP 500 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-740	0.73	-4883	0.71	-1860	0.79	-1652	0.70	-925
N-1: PEARL-KEELER 500 KV	0.70	-811	0.70	-2058	0.70	-352	0.70	-741	0.73	-4855	0.71	-1863	0.79	-1654	0.70	-926
N-1: PINTO-FOUR CORNER 345 KV	0.70	-801	0.70	-1774	0.70	-347	0.70	-709	0.76	-4533	0.74	-1614	0.81	-1453	0.70	-915
N-1: PONDEROSA A 500/230 KV XFMR	0.70	-810	0.70	-2056	0.70	-351	0.70	-741	0.72	-4928	0.71	-1862	0.79	-1653	0.70	-925
N-1: PONDEROSA B 500/230 KV XFMR	0.70	-810	0.70	-2054	0.70	-351	0.70	-740	0.72	-4951	0.71	-1860	0.79	-1651	0.70	-925
N-1: POPULUS-CEDAR HILL-HEMINGWAY 500 KV	0.70	-794	0.70	-1715	0.70	-344	0.70	-709	0.72	-5037	0.72	-1429	0.80	-1270	0.70	-907
N-1: RAVER-PAUL 500 KV	0.70	-811	0.70	-2056	0.70	-352	0.70	-741	0.73	-4894	0.71	-1861	0.79	-1652	0.70	-926
N-1: RAVER-TACOMA 500 KV	0.70	-810	0.70	-2055	0.70	-351	0.70	-740	0.73	-4893	0.71	-1861	0.79	-1652	0.70	-925
N-1: RED BUTTE-HARRY ALLEN 345 KV	0.70	-801	0.71	-1735	0.70	-347	0.70	-702	0.74	-4648	0.75	-1573	0.81	-1409	0.70	-914
N-1: ROBINSON-HARRY ALLEN 500 KV	0.70	-741	0.70	-1970	0.70	-307	0.70	-725	0.73	-4715	0.71	-1818	0.79	-1634	0.70	-850
N-1: ROCK CK-WAUTOMA 500 KV	0.70	-810	0.70	-2049	0.70	-351	0.70	-740	0.73	-4831	0.71	-1858	0.79	-1650	0.70	-925
N-1: ROUND MTN-TABLE MTN 500 KV	0.70	-811	0.70	-2060	0.70	-351	0.70	-740	0.72	-4715	0.71	-1868	0.79	-1660	0.70	-925
N-1: ROUNDUP-LAGRANDE 230 KV	0.70	-807	0.70	-2012	0.70	-349	0.70	-737	0.72	-4906	0.71	-1842	0.79	-1643	0.70	-922
N-1: SCHULTZ-SICKLER 500 KV	0.70	-810	0.70	-2055	0.70	-351	0.70	-740	0.72	-4906	0.71	-1861	0.79	-1652	0.70	-925
N-1: SCHULTZ-VANTAGE 500 KV	0.70	-810	0.70	-2053	0.70	-351	0.70	-740	0.73	-4876	0.71	-1860	0.79	-1651	0.70	-925
N-1: SCHULTZ-WAUTOMA 500 KV	0.70	-810	0.70	-2051	0.70	-351	0.70	-741	0.76	-4616	0.71	-1860	0.79	-1652	0.70	-925
N-1: SIGURD-GLEN CANYON 230 KV	0.70	-807	0.70	-1993	0.70	-350	0.70	-732	0.75	-4704	0.72	-1807	0.79	-1607	0.70	-922
N-1: SLATT 500/230 KV XFMR	0.70	-810	0.70	-2052	0.70	-351	0.70	-740	0.72	-4904	0.71	-1859	0.79	-1651	0.70	-925
N-1: SLATT-LONGHORN 500 KV	0.70	-810	0.70	-2050	0.70	-351	0.70	-740	0.75	-4701	0.71	-1860	0.79	-1651	0.70	-924
N-1: SNOK TAP-SNOKING 500 KV	0.70	-810	0.70	-2053	0.70	-351	0.70	-740	0.72	-4899	0.71	-1859	0.79	-1650	0.70	-925
N-1: TABLE MTN-TESLA 500 KV	0.70	-812	0.70	-2069	0.70	-353	0.70	-740	0.72	-4797	0.71	-1875	0.79	-1666	0.70	-927
N-1: TABLE MTN-VACA DIXON 500 KV	0.70	-813	0.70	-2077	0.70	-353	0.70	-740	0.72	-4681	0.71	-1884	0.79	-1675	0.70	-928
N-1: VANTAGE 500/230 KV XFMR #1	0.70	-810	0.70	-2056	0.70	-351	0.70	-741	0.72	-4932	0.71	-1862	0.79	-1652	0.70	-925
N-1: VANTAGE 500/230 KV XFMR #2	0.70	-810	0.70	-2056	0.70	-351	0.70	-741	0.72	-4949	0.71	-1862	0.79	-1652	0.70	-925
N-1: WALLA WALLA-TALBOT 230 KV	0.70	-810	0.70	-2055	0.70	-351	0.70	-740	0.72	-4931	0.71	-1861	0.79	-1651	0.70	-925
N-1: WALLA WALLA-WALLULA 230 KV	0.70	-810	0.70	-2045	0.70	-351	0.70	-740	0.72	-4942	0.71	-1856	0.79	-1650	0.70	-925
N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.70	-808	0.70	-2021	0.70	-348	0.70	-739	0.75	-4599	0.71	-1845	0.79	-1641	0.70	-923
N-2: ASHE-MARION & BUCKLEY-MARION 500 KV	0.70	-806	0.70	-2023	0.70	-345	0.70	-738	0.78	-4268	0.71	-1845	0.79	-1642	0.70	-921
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.70	-805	0.70	-2034	0.70	-345	0.70	-737	0.74	-4530	0.71	-1855	0.79	-1651	0.70	-919
N-2: ASHE-MARION & SLATT-COYOTE TAP-LONGHORN 500 KV	0.70	-807	0.70	-2033	0.70	-348	0.70	-738	0.76	-4469	0.71	-1850	0.79	-1645	0.70	-922
N-2: ASHE-MARION & SLATT-JOHN DAY 500 KV	0.70	-806	0.70	-2033	0.70	-346	0.70	-738	0.75	-4637	0.71	-1857	0.79	-1653	0.70	-921
N-2: ASHE-SLATT & MCNARY-JOHN DAY 500 KV	0.70	-808	0.70	-2027	0.70	-349	0.70	-739	0.75	-4667	0.71	-1850	0.79	-1646	0.70	-923
N-2: ASHE-SLATT & SLATT-COYOTE TAP-LONGHORN 500 KV	0.70	-809	0.70	-2034	0.70	-350	0.70	-740	0.74	-4759	0.71	-1853	0.79	-1648	0.70	-924
N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.70	-790	0.72	-1653	0.70	-336	0.70	-722	0.79	-4284	0.76	-1515	0.80	-1335	0.70	-903
N-2: BETHEL-CEDAR SPRING 500 KV & BETHEL-ROUND BUTTE 230 KV	0.70	-807	0.70	-2041	0.70	-347	0.70	-739	0.78	-4359	0.71	-1860	0.79	-1657	0.70	-921
N-2: BETHEL-CEDAR SPRING 500 KV & BETHEL-SANTIAM 230 KV	0.70	-806	0.70	-2042	0.70	-347	0.70	-739	0.78	-4385	0.71	-1861	0.79	-1657	0.70	-921
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-CHEMAWA 230 KV	0.70	-810	0.70	-2044	0.70	-350	0.70	-740	0.74	-4790	0.71	-1855	0.79	-1648	0.70	-924
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-TROUTDALE 230 KV	0.70	-810	0.70	-2045	0.70	-350	0.70	-740	0.74	-4789	0.71	-1856	0.79	-1648	0.70	-924
N-2: BOISE BENCH-BROWNLEE #1 & #2 230 KV	0.70	-810	0.70	-1964	0.70	-351	0.70	-736	0.72	-4918	0.72	-1759	0.80	-1604	0.70	-925
N-2: BOISE BENCH-BROWNLEE #3 & BOISE BENCH-HORSEFLAT#4 230 KV	0.70	-810	0.70	-1963	0.70	-351	0.70	-736	0.72	-4937	0.72	-1756	0.80	-1604	0.70	-925
N-2: BRIDGER-POPULUS #1 & #2 345 KV	0.70	-811	0.73	-1714	0.70	-352	0.70	-733	0.72	-4916	0.77	-1483	0.83	-1062	0.70	-926
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV	0.70	-810	0.73	-1645	0.70	-351	0.70	-728	0.75	-4714	0.78	-1435	0.83	-1012	0.70	-925
N-2: BROADVIEW-GARRISON #1 & #2 500 KV + RAS	0.70	-793	0.86	-1283	0.70	-338	0.70	-726	0.78	-4561	0.85	-1265	0.86	-1173	0.70	-906
N-2: BROWNLEE-HELLS CANYON & OXBOW-LOLO 230 KV	0.70	-802	0.70	-1870	0.70	-346	0.70	-732	0.72	-4882	0.72	-1766	0.79	-1609	0.70	-917

Appendix H - 16la1sa_3400idnw_Path76 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hill top		Humboldt		Malin		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: BROWNLEE-OXBOW & BROWNLEE-HELLS CANYON 230 KV	0.70	-808	0.70	-1967	0.70	-350	0.70	-739	0.72	-4971	0.72	-1810	0.79	-1626	0.70	-923
N-2: BUCKLEY-MARION & JOHN DAY-MARION 500 KV	0.70	-807	0.70	-2023	0.70	-346	0.70	-739	0.78	-4289	0.71	-1845	0.79	-1643	0.70	-922
N-2: CHIEF JO-MONROE & CHIEF JO-SICKLER 500 KV	0.70	-810	0.70	-2043	0.70	-351	0.70	-740	0.74	-4792	0.71	-1853	0.79	-1646	0.70	-925
N-2: CHIEF JO-MONROE 500 KV & CHIEF JO-SNOHOMS4 345 KV	0.70	-810	0.70	-2045	0.70	-351	0.70	-740	0.74	-4798	0.71	-1855	0.79	-1647	0.70	-925
N-2: CHIEF JO-MONROE 500 KV & MONROE-SAMMAMSH 230 KV	0.70	-810	0.70	-2048	0.70	-351	0.70	-740	0.76	-4644	0.71	-1856	0.79	-1648	0.70	-925
N-2: CHIEF JO-SICKLER 500 KV & CHIEF J3-SNOHOMS3 345 KV	0.70	-810	0.70	-2050	0.70	-351	0.70	-740	0.73	-4867	0.71	-1858	0.79	-1650	0.70	-925
N-2: COULEE-CHIEF JO 500 KV & CHIEF J4-SNOHOMS4 345 KV	0.70	-810	0.70	-2047	0.70	-351	0.70	-740	0.73	-4851	0.71	-1855	0.79	-1647	0.70	-925
N-2: COULEE-HANFORD & HANFORD-VANTAGE 500 KV	0.70	-810	0.70	-2042	0.70	-351	0.70	-741	0.75	-4656	0.71	-1855	0.79	-1650	0.70	-925
N-2: COULEE-SCHULTZ #1 & #2 500 KV	0.70	-809	0.70	-2029	0.70	-350	0.70	-739	0.75	-4718	0.71	-1843	0.79	-1638	0.70	-924
N-2: CUSTERW-ING500 & CUSTERW-MONROE 500 KV	0.70	-810	0.70	-2053	0.70	-351	0.70	-740	0.73	-4877	0.71	-1860	0.79	-1651	0.70	-925
N-2: CUSTERW-MONROE #1 & #2 500 KV	0.70	-810	0.70	-2049	0.70	-351	0.70	-740	0.74	-4822	0.71	-1858	0.79	-1649	0.70	-925
N-2: DC-BIPOLE	0.70	-828	0.70	-2294	0.70	-367	0.70	-735	0.70	-5048	0.70	-2049	0.77	-1842	0.70	-943
N-2: DOUBLE PALO VERDE	0.70	-835	0.70	-2270	0.70	-367	0.70	-734	0.73	-4615	0.70	-2039	0.78	-1787	0.70	-950
N-2: ECHOLAKE-MAPLE VLY 500 KV & COVINGTON-MAPLE VLY 230 KV	0.70	-810	0.70	-2051	0.70	-351	0.70	-740	0.73	-4882	0.71	-1858	0.79	-1650	0.70	-925
N-2: ECHOLAKE-MAPLE VLY 500 KV & ROCKY RH-MAPLE VLY 345 KV	0.70	-810	0.70	-2049	0.70	-351	0.70	-740	0.73	-4839	0.71	-1857	0.79	-1649	0.70	-925
N-2: GARRISON-TAFT #1 & #2 500 KV + RAS	0.70	-791	0.73	-1649	0.70	-337	0.70	-721	0.77	-4491	0.76	-1506	0.81	-1318	0.70	-904
N-2: GRASSLAND-CEDAR SPRING & SLATT - BUCKLEY 500 KV	0.70	-803	0.70	-2044	0.70	-345	0.70	-736	0.75	-4524	0.71	-1869	0.79	-1666	0.70	-918
N-2: GRASSLAND-COYOTE & SLATT - LONGHORN 500 KV	0.70	-809	0.70	-1971	0.70	-350	0.70	-738	0.73	-4804	0.71	-1825	0.79	-1628	0.70	-924
N-2: GRIZZLY-MALIN & GRIZZLY-CAPTAIN JACK 500 KV	0.70	-800	0.70	-2015	0.70	-336	0.70	-735	0.70	-4241	0.71	-1845	0.79	-1647	0.70	-915
N-2: GRIZZLY-MALIN & GRIZZLY-SUMMER LAKE 500 KV	0.70	-806	0.70	-2000	0.70	-343	0.70	-739	0.70	-4415	0.71	-1836	0.79	-1642	0.70	-921
N-2: GRIZZLY-MALIN & MALIN-SUMMER LAKE 500 KV	0.70	-794	0.70	-2010	0.70	-337	0.70	-732	0.70	-4232	0.70	-1879	0.79	-1702	0.70	-908
N-2: HANFORD-ASHE & HANFORD-LOW MON 500 KV	0.70	-806	0.70	-2000	0.70	-347	0.70	-737	0.80	-4121	0.71	-1835	0.79	-1635	0.70	-921
N-2: HANFORD-WAUTOMA #1 & #2 500 KV	0.70	-809	0.70	-2045	0.70	-351	0.70	-739	0.73	-4862	0.71	-1855	0.79	-1648	0.70	-924
N-2: HELLS CANYON-BROWNLEE & OXBOW-LOLO 230 KV	0.70	-804	0.70	-1890	0.70	-347	0.70	-733	0.73	-4861	0.72	-1783	0.79	-1628	0.70	-918
N-2: JOHN DAY-BIG EDDY #1 & #2 500 KV	0.70	-810	0.70	-2041	0.70	-350	0.70	-741	0.78	-4363	0.71	-1853	0.79	-1648	0.70	-925
N-2: JOHN DAY-BIG EDDY & JOHN DAY-MARION 500 KV	0.70	-809	0.70	-2036	0.70	-349	0.70	-739	0.77	-4490	0.71	-1851	0.79	-1646	0.70	-924
N-2: JOHN DAY-GRIZZLY #1 & #2 500 KV	0.70	-805	0.70	-2015	0.70	-342	0.70	-737	0.70	-4331	0.71	-1838	0.79	-1638	0.70	-920
N-2: JOHN DAY-GRIZZLY #2 & BUCKLEY-GRIZZLY 500 KV	0.70	-806	0.70	-2031	0.70	-343	0.70	-738	0.70	-4505	0.71	-1847	0.79	-1643	0.70	-921
N-2: JOHN DAY-MARION & BUCKLEY-MARION 500 KV	0.70	-807	0.70	-2023	0.70	-346	0.70	-739	0.78	-4289	0.71	-1845	0.79	-1643	0.70	-922
N-2: JOHN DAY-MARION & MARION-PEARL 500 KV	0.70	-810	0.70	-2033	0.70	-350	0.70	-740	0.75	-4616	0.71	-1848	0.79	-1644	0.70	-925
N-2: JOHN DAY-ROCK CREEK 500 KV & MCNARY-ROSS 345 KV	0.70	-809	0.70	-2041	0.70	-349	0.70	-739	0.74	-4731	0.71	-1855	0.79	-1648	0.70	-924
N-2: KEELER-PEARL 500 & SHERWOOD-CARLTON 230 KV	0.70	-811	0.70	-2059	0.70	-352	0.70	-741	0.73	-4835	0.71	-1865	0.79	-1656	0.70	-926
N-2: KNIGHT-OSTRANDER & OSTRANDER-BIG EDDY 500 KV	0.70	-808	0.70	-2031	0.70	-348	0.70	-739	0.77	-4409	0.71	-1847	0.79	-1643	0.70	-923
N-2: KNIGHT-OSTRANDER 500 KV & MCNARY-ROSS 345 KV	0.70	-808	0.70	-2034	0.70	-349	0.70	-739	0.77	-4431	0.71	-1850	0.79	-1645	0.70	-923
N-2: KNIGHT-OSTRANDER 500 KV & MIDWAY-BONNEVILLE 230 KV	0.70	-809	0.70	-2045	0.70	-350	0.70	-740	0.74	-4769	0.71	-1856	0.79	-1649	0.70	-924
N-2: LOWER GRANITE-CENTRAL FERRY #1 & #2 500 KV	0.70	-806	0.70	-1990	0.70	-348	0.70	-735	0.74	-4789	0.72	-1813	0.79	-1607	0.70	-921
N-2: MALIN-ROUND MTN #1 & #2 500 KV	0.70	-815	0.70	-2096	0.70	-350	0.70	-734	0.71	-3165	0.70	-1929	0.79	-1735	0.70	-929
N-2: MCNARY-JOHN DAY & ROCK CREEK-JOHN DAY 500 KV	0.70	-808	0.70	-2036	0.70	-349	0.70	-738	0.74	-4690	0.71	-1854	0.79	-1648	0.70	-923
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-HORSE HEAVEN 230 KV	0.70	-808	0.70	-2040	0.70	-349	0.70	-738	0.74	-4779	0.71	-1856	0.79	-1649	0.70	-923
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-ROSS 345 KV	0.70	-807	0.70	-2032	0.70	-348	0.70	-738	0.75	-4659	0.71	-1852	0.79	-1647	0.70	-922
N-2: MCNARY-ROSS 345 KV & MCNARY-HORSE HEAVEN 230 KV	0.70	-809	0.70	-2044	0.70	-350	0.70	-739	0.74	-4799	0.71	-1857	0.79	-1649	0.70	-924
N-2: MIDPOINT-SUMMER LAKE 500 KV & MIDPOINT-KING 230 KV	0.70	-779	0.70	-1553	0.70	-333	0.70	-704	0.76	-4620	0.70	-1362	0.78	-1427	0.70	-891
N-2: MONROE-CUSTERW & CHIEF JO-MONROE 500 KV	0.70	-810	0.70	-2046	0.70	-351	0.70	-740	0.74	-4768	0.71	-1855	0.79	-1647	0.70	-925
N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV	0.70	-808	0.70	-2030	0.70	-349	0.70	-738	0.81	-4228	0.71	-1845	0.79	-1639	0.70	-923
N-2: PAUL-NAPAVINE & PAUL-ALLSTON #2 500 KV	0.70	-809	0.70	-2047	0.70	-350	0.70	-740	0.74	-4802	0.71	-1857	0.79	-1648	0.70	-924
N-2: PAUL-RAVER & RAVER-COVINGT4 500 KV	0.70	-811	0.70	-2055	0.70	-352	0.70	-741	0.73	-4864	0.71	-1861	0.79	-1652	0.70	-926
N-2: PEARL-KEELER 500 KV & PEARL-SHERWOOD 230 KV	0.70	-811	0.70	-2059	0.70	-352	0.70	-741	0.73	-4855	0.71	-1864	0.79	-1654	0.70	-926
N-2: PEARL-OSTRANDER 500 KV & BIG EDDY-MCLOUGLN 230 KV	0.70	-810	0.70	-2055	0.70	-351	0.70	-740	0.75	-4696	0.71	-1861	0.79	-1652	0.70	-925
N-2: PEARL-OSTRANDER 500 KV & OSTRANDER-MCLOUGLN 230 KV	0.70	-810	0.70	-2058	0.70	-351	0.70	-741	0.75	-4701	0.71	-1862	0.79	-1652	0.70	-925
N-2: RAVER-COVINGTON #1 & #2 500 KV	0.70	-810	0.70	-2055	0.70	-351	0.70	-741	0.73	-4887	0.71	-1861	0.79	-1651	0.70	-925
N-2: RAVER-ECHO LAKE & RAVER-SCHULTZ 500 KV	0.70	-810	0.70	-2052	0.70	-351	0.70	-740	0.73	-4869	0.71	-1859	0.79	-1651	0.70	-925
N-2: RAVER-PAUL & NAPAVINE-PAUL 500 KV	0.70	-811	0.70	-2055	0.70	-352	0.70	-741	0.73	-4878	0.71	-1861	0.79	-1652	0.70	-926

Appendix H - 16la1sa_3400idnw_Path76 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hill top		Humboldt		Malin		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: RAVER-PAUL 500 KV & COULEE-OLYMPIA 300 KV	0.70	-810	0.70	-2053	0.70	-351	0.70	-741	0.76	-4659	0.71	-1859	0.79	-1651	0.70	-925
N-2: RAVER-PAUL 500 KV & TACOMA A-CHEHALIS 230 KV	0.70	-811	0.70	-2059	0.70	-352	0.70	-741	0.73	-4894	0.71	-1864	0.79	-1655	0.70	-926
N-2: RAVER-SCHULTZ #1 & #2 500 KV	0.70	-809	0.70	-2038	0.70	-350	0.70	-740	0.75	-4683	0.71	-1851	0.79	-1644	0.70	-924
N-2: RAVER-TACOMA & RAVER-COVINGT4 500 KV	0.70	-810	0.70	-2053	0.70	-351	0.70	-740	0.73	-4870	0.71	-1859	0.79	-1650	0.70	-925
N-2: RAVER-TACOMA 500 KV & TACOMA-CHRISTOP-COVINGTON 230 KV	0.70	-810	0.70	-2054	0.70	-351	0.70	-740	0.73	-4887	0.71	-1860	0.79	-1651	0.70	-925
N-2: ROUND MTN-TABLE MTN #1 & #2 500 KV	0.70	-820	0.70	-2142	0.70	-361	0.70	-736	0.71	-3798	0.70	-1953	0.78	-1750	0.70	-933
N-2: SCHULTZ-WAUTOMA & VANTAGE-SCHULTZ 500 KV	0.70	-810	0.70	-2048	0.70	-351	0.70	-741	0.75	-4662	0.71	-1859	0.79	-1651	0.70	-925
N-2: SICKLER-SCHULTZ & SCHULTZ-VANTAGE 500 KV	0.70	-810	0.70	-2052	0.70	-351	0.70	-740	0.73	-4865	0.71	-1860	0.79	-1651	0.70	-925
N-2: TABLE MTN-TESLA & TABLE MTN-VACA DIXON 500 KV	0.70	-822	0.70	-2154	0.70	-361	0.70	-738	0.71	-4251	0.70	-1956	0.78	-1749	0.70	-937
N-2: TAFT-BELL 500KV & BELL-BOUNDARY #3 230KV	0.70	-802	0.70	-1873	0.70	-345	0.70	-729	0.80	-4217	0.73	-1720	0.79	-1525	0.70	-916
N-2: TAFT-BELL 500KV & BELL-LANCASTER 230KV + RAS	0.70	-799	0.70	-1804	0.70	-342	0.70	-726	0.81	-4070	0.74	-1664	0.80	-1472	0.70	-913
N-2: TAFT-BELL 500KV & BELL-TRENTWOOD #2 115KV	0.70	-802	0.70	-1874	0.70	-345	0.70	-729	0.80	-4222	0.73	-1721	0.79	-1525	0.70	-916
N-2: TAFT-BELL 500KV & LANCASTER-NOXON 230KV + RAS	0.70	-801	0.70	-1839	0.70	-344	0.70	-728	0.80	-4147	0.73	-1695	0.79	-1502	0.70	-915
N-2: TAFT-DWORSHAK & GARRISON-TAFT #1 500KV	0.70	-805	0.70	-1903	0.70	-347	0.70	-731	0.75	-4718	0.73	-1730	0.79	-1527	0.70	-919
N-2: WAUTOMA-ROCK CK 500 KV & MIDWAY-BIG EDDY 230 KV	0.70	-810	0.70	-2049	0.70	-351	0.70	-740	0.73	-4807	0.71	-1858	0.79	-1651	0.70	-925
N-2: WAUTOMA-ROCK CK 500 KV & SPRINGCREEK-BIG EDDY 230 KV	0.70	-810	0.70	-2049	0.70	-351	0.70	-740	0.73	-4810	0.71	-1858	0.79	-1651	0.70	-925
N-3: SCHULTZ-RAVER #1 & #2 & #3 500 KV	0.70	-809	0.70	-2037	0.70	-350	0.70	-740	0.77	-4444	0.71	-1850	0.79	-1643	0.70	-924

Appendix H - 16la1sa_3400idnw_Path76 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Shunt HANFORD_500.0 (40499) #s
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Bus MALIN R3_500.0 (40688)
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Shunt HOT SPR_500.0 (40553) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN Shunt DWORSHAK_500.0 (40369) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN Shunt HOT SPR_500.0 (40553) #s
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Bus HOT SPR_500.0 (40553)
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt DWORSHAK_500.0 (40369) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 81 MVR
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP S1_ 18.0 (47641)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G2_ 18.0 (47640)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G1_ 18.0 (47639)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 2
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1

Appendix H - 16la1sa_3400idnw_Path76 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Bus SANTIAM_500.0 (40941)
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN Bus SNOK TAP_500.0 (41001)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN Bus SNOKING_500.0 (41007)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR G2_ 20.0 (47744)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2AX_ 4.2 (47746)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2FG_ 13.8 (47747)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR G1_ 20.0 (47740)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1AX_ 4.2 (47742)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1FG_ 13.8 (47743)
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Transformer TONO_115.0 (42806) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Shunt OLY E_230.0 (40794) #s
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 109.8 MVR
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN Shunt MONROE_500.0 (40749) #s
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Transformer ALLSTON_500.0 (40045) TO ALLSTN E_230.0 (40043) CKT 2
BF 4708 Hatwai 500 kV Bus	OPEN Bus HATWAI_500.0 (40521)

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Contingency	Actions Taken in the Contingency
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Transformer CHIEF JO_500.0 (40233) TO CHIEF J2_230.0 (40232) CKT 3
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Transformer BIG EDDY_500.0 (40111) TO BIGEDDY1_230.0 (41341) CKT 2
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Bus CGS_ 25.0 (40063)
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN Bus BURNS_500.0 (45029)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R3_500.0 (40688)
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN Bus ROUND BU_500.0 (43485)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Bus MAPLE VL_500.0 (40693)
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M1_500.0 (43115)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 81 MVR
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G1_ 18.0 (47639) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G2_ 18.0 (47640) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP S1_ 18.0 (47641) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
BF 5266 Slatt-Buckly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1

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Contingency	Actions Taken in the Contingency
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Bus BURNS_500.0 (45029)
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 400 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BYPASS SeriesCap MIDPOINT_500.0 (60240) TO MIDHEM11_500.0 (61988) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 400 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS AMPS_ 69.0 (65026) TO 30 MVR
BF Lolo 230kV	OPEN Bus LOLO_230.0 (48197)
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Gen BOARD CT_ 18.5 (43044) #1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Transformer BOARD ST_ 16.0 (43045) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Transformer BOARD CT_ 18.5 (43044) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Gen BOARD ST_ 16.0 (43045) #1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Line COYOTE_500.0 (43123) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Transformer BOARD F_ 24.0 (43047) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Gen BOARD F_ 24.0 (43047) #1
Bus: Alvey 500 kV	OPEN Bus ALVEY_500.0 (40051)
Bus: Bell BPA 500 kV	OPEN Bus BELL BPA_500.0 (40091)
Bus: Bell BPA 500 kV	OPEN Bus COULE R1_500.0 (40288)
Bus: Bell BPA 500 kV	OPEN Bus BELL SC_500.0 (40096)
Bus: Buckley 500 kV	OPEN Bus BUCKLEY_500.0 (40155)
Bus: Dixonville 500 kV	OPEN Bus DIXONVLE_500.0 (45095)
Bus: Hot Springs 500 kV	OPEN Bus HOT SPR_500.0 (40553)
Bus: Keeler 500 kV	OPEN Bus KEELER_500.0 (40601)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_500.0 (41401)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_230.0 (41402)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_230.0 (47386)
Bus: Rock Creek 500 kV	OPEN Bus ENRGZR T_230.0 (47823)
Bus: Rock Creek 500 kV	OPEN Bus WHITE CK_230.0 (47827)
Bus: Rock Creek 500 kV	OPEN Bus IMRIE_230.0 (47822)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_ 34.5 (47387)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC C1_ 34.5 (47388)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC W1_ 0.7 (47389)
Bus: Rock Creek 500 kV	OPEN Bus DOOLEY T_230.0 (47465)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 3_ 34.5 (47496)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 2_ 34.5 (47493)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C2_ 34.5 (47494)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W2_ 0.7 (47495)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C3_ 34.5 (47497)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W3_ 0.7 (47498)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE 1_ 34.5 (47829)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 1_ 34.5 (47825)
Bus: Rock Creek 500 kV	OPEN Bus WILLIS T_230.0 (47824)
Bus: Rock Creek 500 kV	OPEN Bus TULMN 1_ 34.5 (47826)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C1_ 34.5 (47936)
Bus: Rock Creek 500 kV	OPEN Bus TULMN C1_ 34.5 (47938)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 2_ 34.5 (47903)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 1_ 34.5 (47902)
Bus: Rock Creek 500 kV	OPEN Bus MILLRA S_230.0 (47857)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE C1_ 34.5 (47865)
Bus: Rock Creek 500 kV	OPEN Bus MILLR 1_ 34.5 (47966)

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Contingency	Actions Taken in the Contingency
Bus: Rock Creek 500 kV	OPEN Bus HARVST W_230.0 (47858)
Bus: Rock Creek 500 kV	OPEN Bus HRVST 1_ 34.5 (47979)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE W1_ 0.6 (47866)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C1_ 34.5 (47904)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C2_ 34.5 (47905)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W1_ 0.7 (47906)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W2_ 0.7 (47907)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W1_ 0.7 (47937)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W2_ 0.6 (47940)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W1_ 0.7 (47939)
Bus: Rock Creek 500 kV	OPEN Bus MILLR C1_ 34.5 (47967)
Bus: Rock Creek 500 kV	OPEN Bus MILLR W1_ 0.6 (47968)
Bus: Rock Creek 500 kV	OPEN Bus HRVST C1_ 34.5 (47980)
Bus: Rock Creek 500 kV	OPEN Bus HRVST W1_ 0.7 (47981)
Bus: Sickler 500 kV	OPEN Bus SICKLER_500.0 (40973)
Bus: Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
Bus: Summer Lake 500 kV	OPEN Bus SUMMER L_500.0 (41043)
Bus: Summer Lake 500 kV	OPEN Bus BURNS_500.0 (45029)
Bus: Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-1: Allston-Keeler 500 kV	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
N-1: Allston-Napavine 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-1: Allston-Paul #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-1: Alvery-Dixonville 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO DIXONVLE_500.0 (45095) CKT 1
N-1: Alvey-Marion 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
N-1: Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-1: Ashe-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
N-1: Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-1: Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-1: Bell-Coulee 500 kV	OPEN Bus COULE R1_500.0 (40288)
N-1: Bell-Taft 500 kV	OPEN Bus BELL SC_500.0 (40096)
N-1: Big Eddy-Celilo 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO CELILO1_500.0 (41311) CKT 1
N-1: Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-1: Big Eddy-Knight 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO KNIGHT_500.0 (41450) CKT 1
N-1: Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-1: Boise Bench-Brownlee #3 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-1: Brady-Antelope 230 kV + RAS	OPEN Line BRADY_230.0 (60073) TO ANTLOPE_230.0 (65075) CKT 1
N-1: Brady-Antelope 230 kV + RAS	OPEN Bus MLCK PHA_230.0 (62355)
N-1: Brady-Antelope 230 kV + RAS	OPEN Shunt AMPS_ 69.0 (65026) #1
N-1: Broadview-Garrison #1 500 kV	OPEN Bus GAR1EAST_500.0 (40451)
N-1: Broadview-Garrison #1 500 kV	OPEN Bus TOWN1_500.0 (62013)
N-1: Broadview-Garrison #1 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Brownlee-Ontario 230 kV	OPEN MultiSectionLine BROWNLEE_230.0 (60095) TO ONTARIO_230.0 (60265) CKT 1
N-1: Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-1: Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-1: Buckley-Slatt 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-1: Cal Sub 120 kV Phase Shifter	OPEN Transformer CAL SUB_120.0 (64025) TO CAL S PS_120.0 (64023) CKT 1
N-1: Captain Jack-Olinda 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO OLINDA_500.0 (30020) CKT 1
N-1: CaptJack-Kfalls 500 kV	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
N-1: Cascade Crossing 500 kV	OPEN Bus CDR SPRG_500.0 (43950)
N-1: Cascade Crossing 500 kV	OPEN Bus CDRSBET1_500.0 (43951)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHCRS1_500.0 (43491)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHEL5_500.0 (43041)
N-1: Chief Jo-Coulee 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-1: Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-1: Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-1: Coulee-Hanford 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-1: Coulee-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Covington4-Raver 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-1: Covington5-Raver 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
N-1: Coyote-Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
N-1: CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-1: Dixonville-Meridian 500 kV	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
N-1: Drycreek-Lolo 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO LOLO_230.0 (48197) CKT 1
N-1: Drycreek-N Lewiston 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO N LEWIST_230.0 (48255) CKT 1
N-1: Drycreek-Wala Ava 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO WALA AVA_230.0 (48451) CKT 1
N-1: Dworshak-Hatwai 500 kV	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Taft 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-1: Echo Lake-Maple Valley 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO MAPLE VL_500.0 (40693) CKT 1
N-1: Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-1: Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Echo Lake-Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
N-1: Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-1: Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSHE1_115.0 (32229)

Appendix H - 16la1sa_3400idnw_Path76 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSESHE_115.0 (32230)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTL1_115.0 (32233)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_115.0 (32234)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_ 13.2 (32460)
N-1: Goldhill-Placer 115 kV	OPEN Bus FLINT1_115.0 (32236)
N-1: Grassland-Coyote 500 kV	OPEN Line COYOTE_500.0 (43123) TO GRASSLND_500.0 (43049) CKT 1
N-1: Grassland-Slatt 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
N-1: Grizzly-John Day #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-1: Grizzly-Malin 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN MultiSectionLine PONDROSA_500.0 (40837) TO SUMMER L_500.0 (41043) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZ R3_500.0 (40488) TO PONDROSA_500.0 (40837) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO GRIZZ R3_500.0 (40488) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Grizzly-Round Bu 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO ROUND BU_500.0 (43485) CKT 1
N-1: Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-1: Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-1: Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Harry Allen 345 kV Phase Shifter	OPEN Transformer HA PS_345.0 (18002) TO H ALLEN_345.0 (18001) CKT 1
N-1: Harry Allen 345 kV Phase Shifter	OPEN Transformer HA PS_345.0 (18002) TO H ALLEN_345.0 (18001) CKT 2
N-1: Harry Allen 345 kV Phase Shifter	OPEN Shunt REDBUTTE_345.0 (66280) #1
N-1: Hatwai 500/230 kV Xfmr	OPEN Transformer HATWAI_500.0 (40521) TO HATWAI_230.0 (40519) CKT 1
N-1: Hatwai-Lolo 230 kV	OPEN Line HATWAI_230.0 (40519) TO LOLO_230.0 (48197) CKT 1
N-1: Hatwai-Low Gran 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Hatwai-N Lewiston 230 kV	OPEN Line HATWAI_230.0 (40519) TO N LEWIST_230.0 (48255) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO HURICANE_230.0 (45103) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN MultiSectionLine HURICANE_230.0 (45103) TO WALAWALA_230.0 (45327) CKT 1
N-1: Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
N-1: Hemingway-Summer Lake 500 kV	OPEN Line HEMINWAY_500.0 (60155) TO BURNS_500.0 (45029) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN MultiSectionLine BURNS_500.0 (45029) TO SUMMER L_500.0 (41043) CKT 1
N-1: Hemingway-Summer Lake 500 kV	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
N-1: Hemingway-Summer Lake 500 kV	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
N-1: Hemingway-Summer Lake 500 kV	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
N-1: Hill Top 345/230 Xfmr	OPEN Transformer HIL TOP_230.0 (40537) TO HIL TOP_345.0 (64058) CKT 1
N-1: Horse Hv-McNary 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-1: Hot Springs-Taft 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line COYOTECR_345.0 (64032) TO HUMBOLDT_345.0 (64059) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line MAGGIECR_120.0 (64070) TO CARLIN_120.0 (64169) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt EIGHTMFK_120.0 (64457) #b
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO &1_345.0 (67582)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO_345.0 (66225)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #2_ 99.0 (65014)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #3_ 99.0 (65017)
N-1: Ing500-CusterW 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-1: John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-1: John Day-Rock Ck 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-1: John Day-Slatt 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-1: Kfalls-Meridian 500 kV	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
N-1: Knight-Wautoma 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
N-1: LaGrande-North Powder 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO N POWDER_230.0 (60312) CKT 1
N-1: Lanes-Marion 500 kV	OPEN Line LANE_500.0 (40629) TO MARION_500.0 (40699) CKT 1
N-1: Lit Goose-Central Ferry 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
N-1: Lit Goose-Low Mon 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
N-1: Low Gran-Central Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Low Mon-Sac Tap 500 kV	OPEN Line LOW MON_500.0 (40683) TO SACJWA T_500.0 (40917) CKT 1
N-1: Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
N-1: Malin-Hilltop 230 kV	OPEN Line CANBYTAP_230.0 (40171) TO HIL TOP_230.0 (40537) CKT 1
N-1: Malin-Hilltop 230 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 0 MVR
N-1: Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-1: Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-1: Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-1: Maple Vly-Rocky RH 345 kV	OPEN MultiSectionLine MAPLE VL_345.0 (40691) TO ROCKY RH_345.0 (40891) CKT 1
N-1: Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Line MARION_500.0 (40699) TO SANTIAM_500.0 (40941) CKT 1
N-1: McLouglin-Ostrander 230 kV	OPEN Bus OSTRNDER_230.0 (40810)

Appendix H - 16la1sa_3400idnw_Path76 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
N-1: McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 81 MVR
N-1: McNary-Board T1 230 kV	OPEN Line BOARD T1_230.0 (40121) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-1: McNary-Longhorn 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
N-1: McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-1: McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-1: McNary-Roundup 230 kV	OPEN Line MCNRY S1_230.0 (41351) TO ROUNDUP_230.0 (40905) CKT 1
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJWA T_500.0 (40917)
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
N-1: McNary-Sac Tap-Low Mon 500 kV	CLOSE Gen ICE H1-2_ 13.8 (40559) #1
N-1: Midpoint-Hemingway 500 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Humboldt 345 kV	OPEN Bus IDAHO-NV_345.0 (64061)
N-1: Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
N-1: Ontario-Caldwell 230 kV	OPEN MultiSectionLine CALDWELL_230.0 (60110) TO LANGLEY_230.0 (60266) CKT 1
N-1: Ostrander-Knight 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-1: Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-1: Ostrander-Troutdale 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO TROUTDAL_500.0 (41095) CKT 1
N-1: Oxbow-Brownlee #2 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 2
N-1: Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-1: Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-1: Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO SATSOP_500.0 (40949) CKT 1
N-1: Pearl-Keeler 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pinto-Four Corner 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Pinto-Four Corner 345 kV	OPEN Shunt PINTO_138.0 (66230) #1
N-1: Pinto-Four Corner 345 kV	CLOSE Shunt PINTO 2_ 13.8 (66228) #1
N-1: Pinto-Four Corner 345 kV	CLOSE Shunt PINTO 3_ 13.8 (66229) #1
N-1: Ponderosa A 500/230 kV Xfmr	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Ponderosa B 500/230 kV Xfmr	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Populus-Cedar Hill-Hemingway 500 kV	OPEN MultiSectionLine POPULUS_500.0 (67794) TO CEDARHIL_500.0 (60159) CKT 2
N-1: Populus-Cedar Hill-Hemingway 500 kV	OPEN MultiSectionLine CEDARHIL_500.0 (60159) TO HEMINWAY_500.0 (60155) CKT 2
N-1: Populus-Cedar Hill-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 400 MVR
N-1: Populus-Cedar Hill-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Raver-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-1: Raver-Tacoma 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus H ALLEN_345.0 (18001)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus HA PS_345.0 (18002)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus UTAH-NEV_345.0 (67657)
N-1: Red Butte-Harry Allen 345 kV	OPEN Shunt REDBUTTE_345.0 (66280) #1
N-1: Red Butte-Harry Allen 345 kV	OPEN Shunt GONDER1_230.0 (64205) #v
N-1: Robinson-Harry Allen 500 kV	OPEN Line ROBINSON_500.0 (64895) TO H ALLEN_500.0 (18450) CKT 1
N-1: Rock Ck-Wautoma 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Round Mtn-Table Mtn 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-1: Roundup-Lagrande 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO ROUNDUP_230.0 (40905) CKT 1
N-1: Schultz-Sickler 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-1: Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-1: Schultz-Wautoma 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Sigurd-Glen Canyon 230 kV	OPEN Bus SIGURDPS_230.0 (66355)
N-1: Slatt 500/230 kV Xfmr	OPEN Transformer SLATT_500.0 (40989) TO SLATT_230.0 (40986) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-1: Snok Tap-Snoking 500 kV	OPEN Line SNOK TAP_500.0 (41001) TO SNOKING_500.0 (41007) CKT 1
N-1: Table Mtn-Tesla 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-1: Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-1: Vantage 500/230 kV Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
N-1: Vantage 500/230 kV Xfmr #2	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 2
N-1: Walla Walla-Talbot 230 kV	OPEN Line TALBOT_230.0 (44912) TO WALAWALA_230.0 (45327) CKT 1
N-1: Walla Walla-Wallula 230 kV	OPEN Line WALAWALA_230.0 (45327) TO WALLULA_230.0 (45331) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2

Appendix H - 16la1sa_3400idnw_Path76 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	CLOSE Shunt GARRISON_500.0 (40459) #r
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Line BETHEL_230.0 (43039) TO ROUNDB N_230.0 (43483) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN MultiSectionLine BETHEL_230.0 (43039) TO SANTIAM_230.0 (40939) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN MultiSectionLine BIGEDDY2_230.0 (41342) TO CHEMAWA_230.0 (40213) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Bus PARKDALE_230.0 (40813)
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 2
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIHOR41_230.0 (61995) CKT 4 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO HORSEFLT_230.0 (60102) CKT 4
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO11_230.0 (61998) CKT 1 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO21_230.0 (61997) CKT 2 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 1
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine BRIDGER_345.0 (60085) TO 3MIKNOLL_345.0 (60084) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	CLOSE Shunt KINPORT_345.0 (60190) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 2_ 22.0 (62049) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus GAR1EAST_500.0 (40451)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus TOWN1_500.0 (62013)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus GAR2EAST_500.0 (40453)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus TOWN2_500.0 (62012)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS AMPS_ 69.0 (65026) TO 30 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt MILLCKT2_ 13.8 (62333) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt MILLCKT1_ 13.8 (62332) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS TAFT_500.0 (41057) TO -186 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS BZ EGALL_ 50.0 (62348) TO 20.4 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS JACKRABB_ 50.0 (62349) TO 19.7 MVR
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Transformer HELLSCYN_230.0 (60150) TO HELSCYN1_ 14.4 (60151) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine MONROE_230.0 (40747) TO NOVELTY_230.0 (42304) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus CHIEF J3_345.0 (40223)
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus SNOHOMS3_345.0 (40993)

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Contingency	Actions Taken in the Contingency
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
N-2: DC-BIPOLE	OPEN Bus SYLMAR1_230.0 (26097)
N-2: DC-BIPOLE	OPEN Bus SYLMAR2_230.0 (26099)
N-2: DC-BIPOLE	OPEN Bus CELILO4_230.0 (41314)
N-2: DC-BIPOLE	OPEN Bus CELILO3_230.0 (41313)
N-2: DC-BIPOLE	OPEN Bus CELILO2_500.0 (41312)
N-2: DC-BIPOLE	OPEN Bus CELILO1_500.0 (41311)
N-2: Double Palo Verde	OPEN Gen PALOVRD2_ 24.0 (14932) #1
N-2: Double Palo Verde	OPEN Gen PALOVRD1_ 24.0 (14931) #1
N-2: Double Palo Verde	CHANGE LOAD AT BUS AGUAFAPS_ 69.0 (14400) BY -120 MW (cnst pf)
N-2: Double Palo Verde	CLOSE Shunt ROBINSON_345.0 (64885) #b1
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS PINTO_138.0 (66230) TO 64 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS YORKCANY_115.0 (12091) TO 15 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS DURANGO_115.0 (79023) TO 40 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS PEIGAN 4_240.0 (54165) TO 0 MVR
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Line COVINGTN_230.0 (40303) TO MAPLEV12_230.0 (40692) CKT 2
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_345.0 (40691)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus ROCKY RH_345.0 (40891)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	OPEN Bus PONDROSB_500.0 (40834)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	OPEN Bus IMNAHA_230.0 (60278)
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus CASCADTP_230.0 (40185)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus WINDSHAR_230.0 (41155)
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)

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Contingency	Actions Taken in the Contingency
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus ALFALFA_230.0 (40039)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus OUTLOOK_230.0 (45229)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine MCNARY_345.0 (40721) TO ROSS_345.0 (40901) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN Line KING_230.0 (60177) TO MIDPOINT_230.0 (60232) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV	OPEN Line PEARL #_230.0 (43773) TO SHERWOOD_230.0 (43527) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN MultiSectionLine BIGEDDY3_230.0 (41343) TO MCLOUGLN_230.0 (43313) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT5_500.0 (40306)
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus COULEE_300.0 (40285)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus OLYMPIA_300.0 (40795)
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Bus CENTR SS_230.0 (47748)
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN Bus CHRISTOP_230.0 (42505)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 2
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus ADDY N_230.0 (40021)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Line BELL BPA_115.0 (40087) TO BIGELOW_115.0 (40113) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN MultiSectionLine LANCASTR_230.0 (40624) TO NOXONBPA_230.0 (40787) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1

Appendix H - 16la1sa_3400idnw_Path76 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN Shunt GARRISON_500.0 (40459) #s
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4

Appendix I

16la1sa_3400idnw_nv Base Case (Idaho-Sierra, Path 16)

Appendix I - 16la1sa_3400idnw_nv Base Case Post-Transient Contingency Results

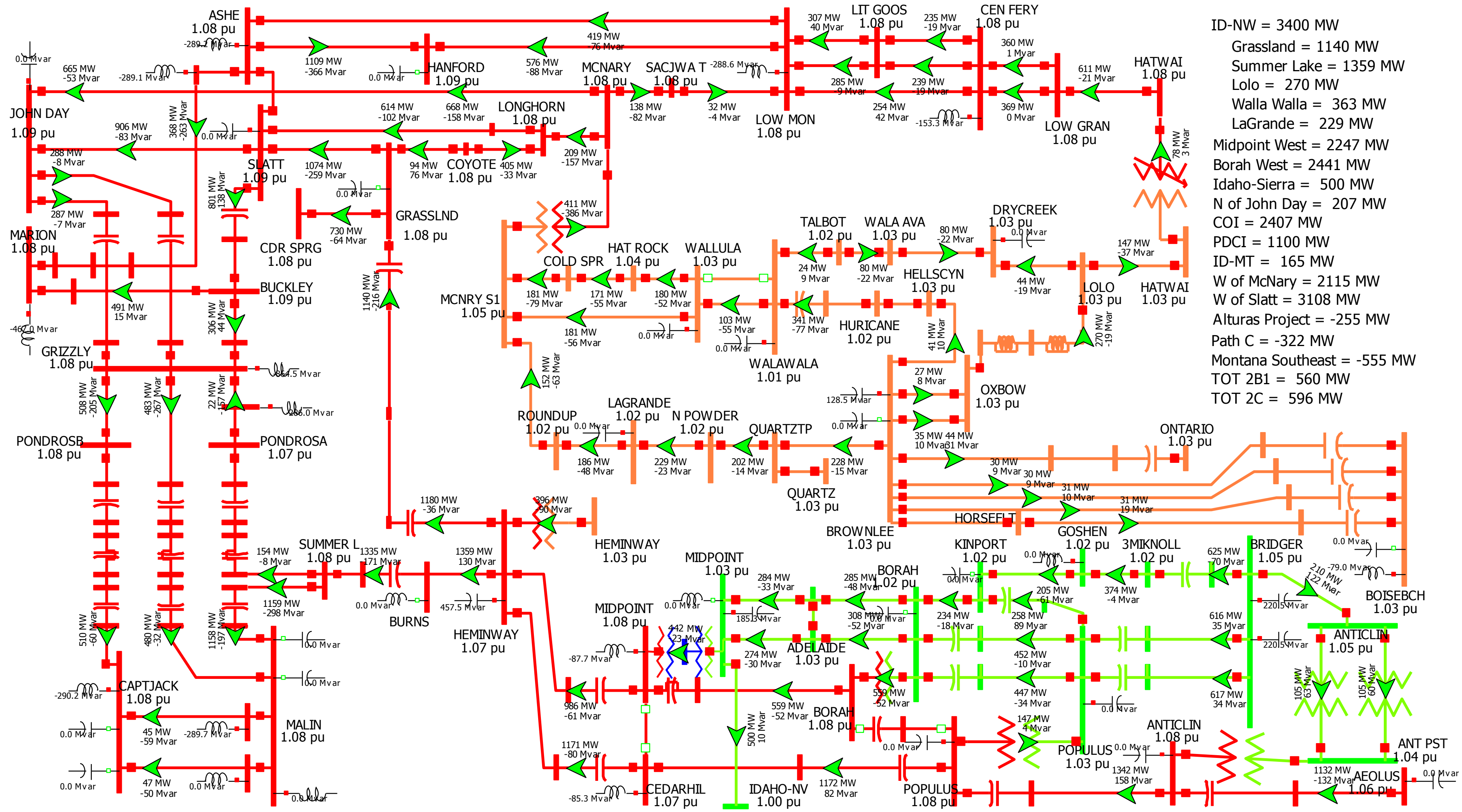
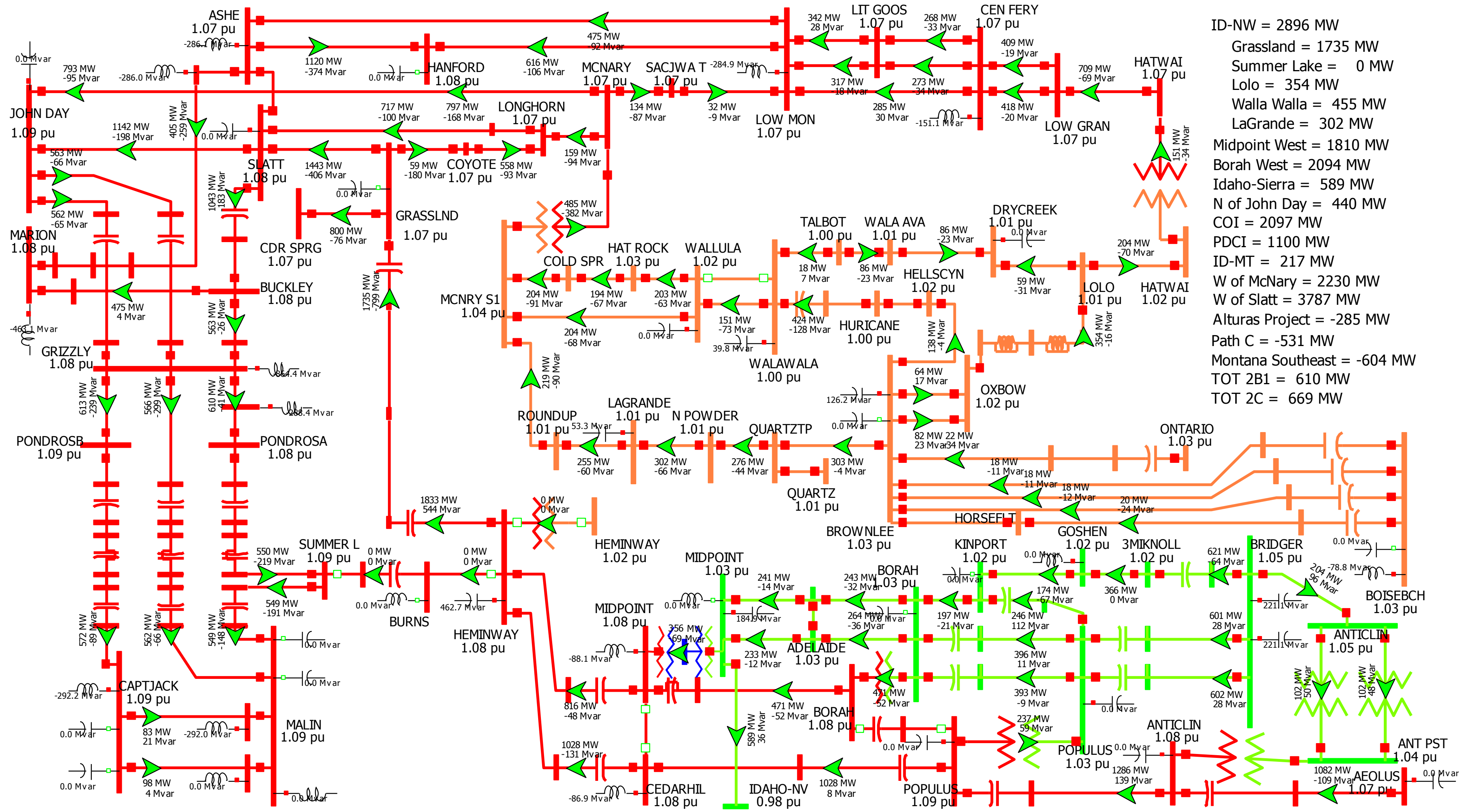


Figure I1: 16la1sa_3400idnw_nv Base Case **Pre Contingency**

Appendix I - 16la1sa_3400idnw_nv Base Case Post-Transient Contingency Results



ID-NW = 2896 MW
Grassland = 1735 MW
Summer Lake = 0 MW
Lolo = 354 MW
Walla Walla = 455 MW
LaGrande = 302 MW
Midpoint West = 1810 MW
Borah West = 2094 MW
Idaho-Sierra = 589 MW
N of John Day = 440 MW
COI = 2097 MW
PDCI = 1100 MW
ID-MT = 217 MW
W of McNary = 2230 MW
W of Slatt = 3787 MW
Alturas Project = -285 MW
Path C = -531 MW
Montana Southeast = -604 MW
TOT 2B1 = 610 MW
TOT 2C = 669 MW

Figure I2: 16la1sa_3400idnw_nv Base Case after the contingency **BF IPC Hemingway-Summer Lake 500 kV & Hemingway 500/230 Xfmr**

Appendix I - 16la1sa_3400idnw_nv Base Case Post-Transient Contingency Results

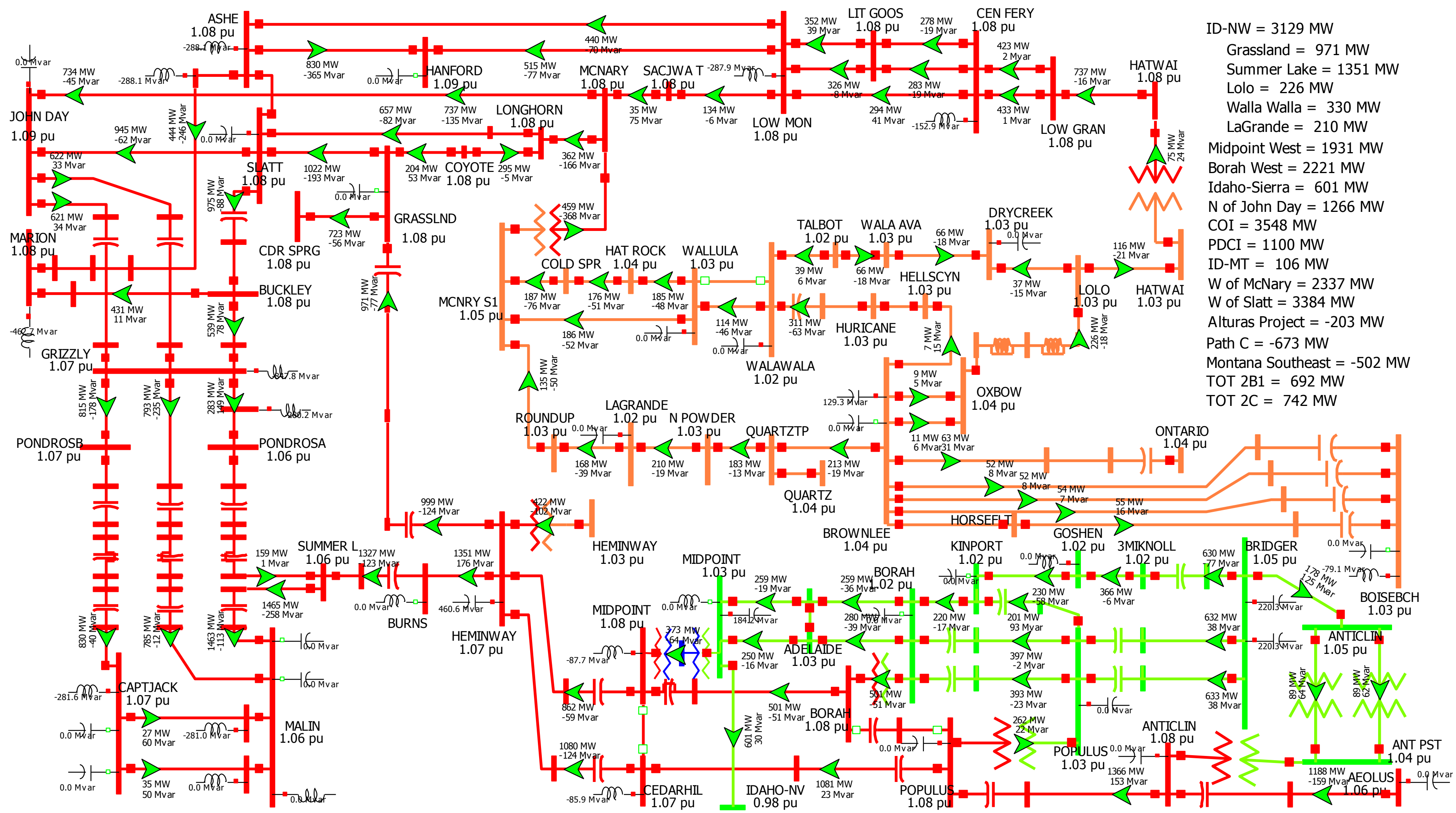


Figure I3: 16la1sa_3400idnw_nv Base Case after the contingency **N-2: Double Palo Verde**

Appendix I - 16la1sa_3400idnw_nv Base Case Post-Transient Contingency Results

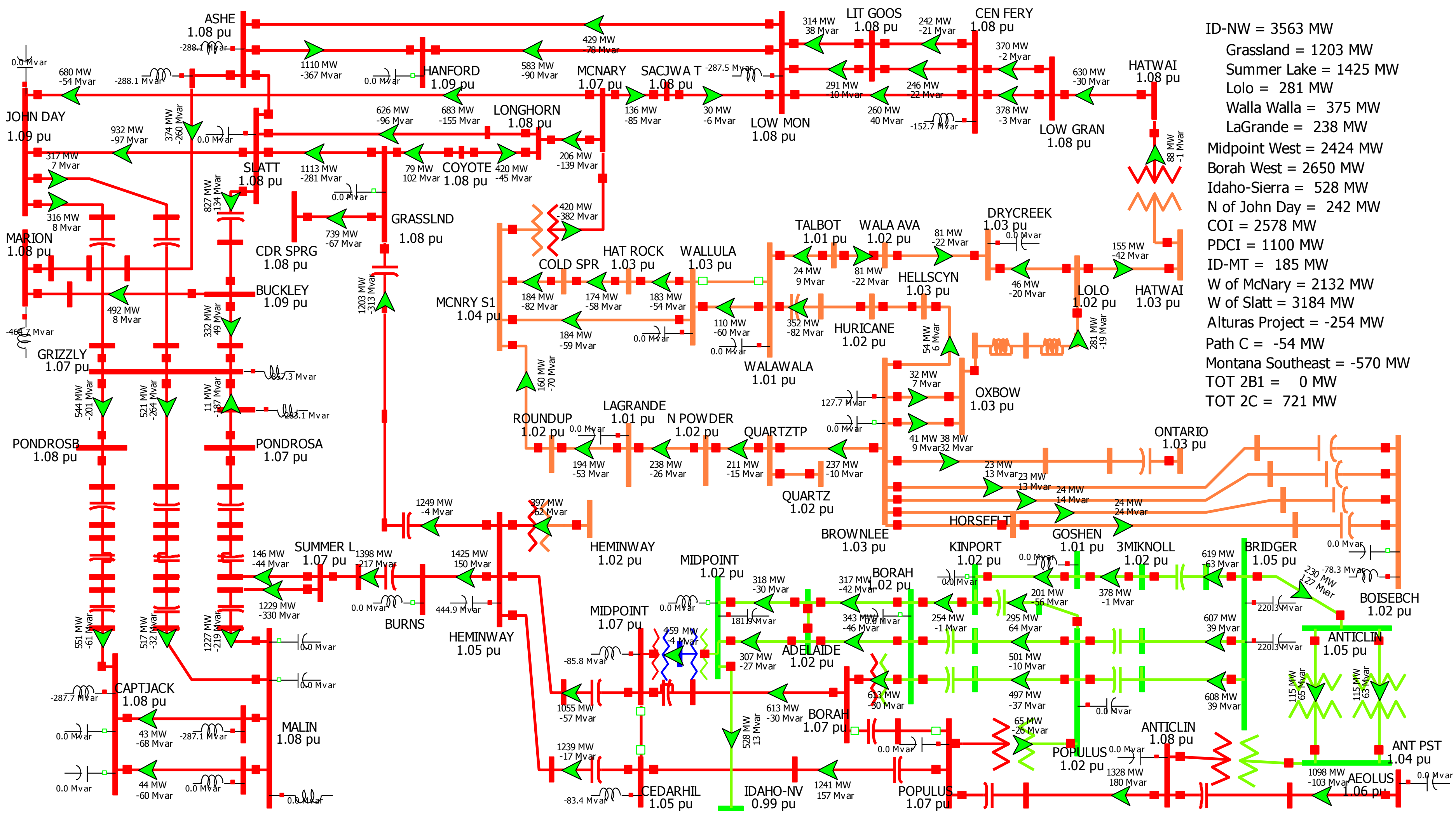


Figure I4: 16la1sa_3400idnw_nv Base Case after the contingency **N-1: Huntington-Pinto-Four Corners 345 kV**

Appendix I - 16la1sa_3400idnw_nv Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	No Violations							
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	No Violations							
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4028 Taft-Dworshak & Taft Reactor 500kV	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	No Violations							
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	No Violations							
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	301.9	300.0	100.6%	370.0	81.6%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	301.9	300.0	100.6%	370.0	81.6%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	No Violations							
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	No Violations							
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	300.8	300.0	100.3%	370.0	81.3%
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	300.8	300.0	100.3%	370.0	81.3%
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations							
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	No Violations							
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	FRANKLIN (40443) -> FRANKL E (40440) CKT 1 at FRANKLIN	Branch MVA	186.5	254.1	254.0	100.0%	307.0	82.8%
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	No Violations							
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	No Violations							
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV	No Violations							
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations							
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	No Violations							
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations							
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations							
BF 4502 Paul-Allston & Allston-Keeler 500 kV	No Violations							
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							

Appendix I - 16la1sa_3400idnw_nv Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV	No Violations							
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations							
BF 4542 Paul-Allston 500 kV & Center G2	No Violations							
BF 4542 Paul-Napavine 500 kV & Center G1	No Violations							
BF 4550 Olympia-Paul & Paul-Allston 500 kV	No Violations							
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	No Violations							
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	FRANKLIN (40443) -> FRANKL E (40440) CKT 1 at FRANKLIN	Branch MVA	186.5	268.1	254.0	105.5%	307.0	87.3%
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	No Violations							
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations							
BF 4708 Hatwai 500 kV Bus	No Violations							
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	No Violations							
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	No Violations							
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	SLVR PK (64094) -> SLVR PKX (64095) CKT 1 at SLVR PKX	Branch MVA	16.6	17.0	17.0	100.2%	23.9	71.3%
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	334.6	300.0	111.5%	370.0	90.4%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	334.6	300.0	111.5%	370.0	90.4%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.3	321.9	315.0	102.2%	394.0	81.7%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.3	321.3	315.0	102.0%	394.0	81.5%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1077.3	999.1	107.8%	1250.1	86.2%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	866.3	1057.0	1000.1	105.7%	1250.1	84.6%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1267.2	2050.7	2000.1	102.5%	3000.0	68.4%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1300.8	2031.4	2000.1	101.6%	3000.0	67.7%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	333.3	300.0	111.1%	370.0	90.1%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	333.3	300.0	111.1%	370.0	90.1%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.3	321.0	315.0	101.9%	394.0	81.5%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.3	320.4	315.0	101.7%	394.0	81.3%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1070.8	999.1	107.2%	1250.1	85.7%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	866.3	1050.6	1000.1	105.1%	1250.1	84.0%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1267.2	2046.3	2000.1	102.3%	3000.0	68.2%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1300.8	2022.1	2000.1	101.1%	3000.0	67.4%
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	No Violations							
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	301.3	300.0	100.4%	370.0	81.4%
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	301.3	300.0	100.4%	370.0	81.4%
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations							
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	No Violations							

Appendix I - 16la1sa_3400idnw_nv Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	No Violations							
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations							
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations							
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations							
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	No Violations							
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	FRANKLIN (40443) -> FRANKL E (40440) CKT 1 at FRANKLIN	Branch MVA	186.5	267.8	254.0	105.4%	307.0	87.2%
BF 5214 Low Mon-McNary & Calpine PH 500 kV	No Violations							
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.1	52.0	50.0	104.0%	55.0	94.5%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	323.6	300.0	107.9%	370.0	87.5%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	323.6	300.0	107.9%	370.0	87.5%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	90.3	113.7	112.0	101.5%	146.7	77.5%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1173.1	999.1	117.4%	1250.1	93.8%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	866.3	1151.2	1000.1	115.1%	1250.1	92.1%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1494.5	2112.0	1732.1	121.9%	2338.3	90.3%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	IMNAHA (60278) -> LOLO (48197) CKT 1 at IMNAHA	Branch Amp	667.5	936.7	920.0	101.8%	1046.8	89.5%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.1	54.8	50.0	109.6%	55.0	99.7%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	330.0	300.0	110.0%	370.0	89.2%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	330.0	300.0	110.0%	370.0	89.2%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.3	318.5	315.0	101.1%	394.0	80.8%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.3	317.9	315.0	100.9%	394.0	80.7%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1135.5	999.1	113.7%	1250.1	90.8%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	866.3	1113.0	1000.1	111.3%	1250.1	89.0%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.1	54.4	50.0	108.8%	55.0	98.9%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	319.3	300.0	106.4%	370.0	86.3%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	319.3	300.0	106.4%	370.0	86.3%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1194.0	999.1	119.5%	1250.1	95.5%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	866.3	1170.4	1000.1	117.0%	1250.1	93.6%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	IMNAHA (60278) -> LOLO (48197) CKT 1 at IMNAHA	Branch Amp	667.5	958.3	920.0	104.2%	1046.8	91.6%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> HURICANE (45103) CKT 1 at HELLSCYN	Branch Amp	902.4	1211.4	1199.9	101.0%	1396.0	86.8%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	317.5	300.0	105.8%	370.0	85.8%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	317.5	300.0	105.8%	370.0	85.8%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1093.2	2173.4	1732.1	125.5%	2338.3	93.0%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1028.3	999.1	102.9%	1250.1	82.3%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	866.3	1008.1	1000.1	100.8%	1250.1	80.6%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	331.8	300.0	110.6%	370.0	89.7%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	331.8	300.0	110.6%	370.0	89.7%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.3	319.6	315.0	101.5%	394.0	81.1%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.3	319.0	315.0	101.3%	394.0	81.0%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	90.3	114.6	112.0	102.4%	146.7	78.1%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1110.4	999.1	111.1%	1250.1	88.8%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	866.3	1089.0	1000.1	108.9%	1250.1	87.1%
BF Lolo 230kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1019.8	999.1	102.1%	1250.1	81.6%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.1	50.8	50.0	101.6%	55.0	92.3%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	325.0	300.0	108.3%	370.0	87.8%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	325.0	300.0	108.3%	370.0	87.8%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	90.3	114.3	112.0	102.0%	146.7	77.9%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1494.5	2174.8	1732.1	125.6%	2338.3	93.0%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1116.3	999.1	111.7%	1250.1	89.3%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	866.3	1095.1	1000.1	109.5%	1250.1	87.6%
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	No Violations							
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	No Violations							
Bus: Alvey 500 kV	No Violations							
Bus: Bell BPA 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	300.1	300.0	100.0%	370.0	81.1%
Bus: Bell BPA 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	300.1	300.0	100.0%	370.0	81.1%
Bus: Buckley 500 kV	No Violations							
Bus: Dixonville 500 kV	No Violations							
Bus: Hot Springs 500 kV	No Violations							
Bus: Keeler 500 kV	No Violations							
Bus: Rock Creek 500 kV	No Violations							
Bus: Sickler 500 kV	No Violations							
Bus: Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	334.6	300.0	111.5%	370.0	90.4%
Bus: Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	334.6	300.0	111.5%	370.0	90.4%
Bus: Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.3	321.9	315.0	102.2%	394.0	81.7%
Bus: Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.3	321.3	315.0	102.0%	394.0	81.5%
Bus: Summer Lake 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1076.7	999.1	107.8%	1250.1	86.1%
Bus: Summer Lake 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	866.3	1056.5	1000.1	105.6%	1250.1	84.5%
Bus: Summer Lake 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1267.2	2049.6	2000.1	102.5%	3000.0	68.3%
Bus: Summer Lake 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1300.8	2030.5	2000.1	101.5%	3000.0	67.7%
N-1: Allston-Keeler 500 kV	No Violations							
N-1: Allston-Napavine 500 kV	No Violations							
N-1: Allston-Paul #2 500 kV	No Violations							
N-1: Alvery-Dixonville 500 kV	No Violations							
N-1: Alvey-Marion 500 kV	No Violations							
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Bell-Coulee 500 kV	No Violations							
N-1: Bell-Taft 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	300.0	300.0	100.0%	370.0	81.1%
N-1: Bell-Taft 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	300.0	300.0	100.0%	370.0	81.1%
N-1: Big Eddy-Celilo 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV + RAS	No Violations							
N-1: Broadview-Garrison #1 500 kV	No Violations							
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Cal Sub 120 kV Phase Shifter	No Violations							
N-1: Captain Jack-Olinda 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	302.9	300.0	101.0%	370.0	81.9%
N-1: Captain Jack-Olinda 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	302.9	300.0	101.0%	370.0	81.9%
N-1: CaptJack-Kfalls 500 kV	No Violations							
N-1: Cascade Crossing 500 kV	No Violations							
N-1: Chief Jo-Coulee 500 kV	No Violations							
N-1: Chief Jo-Monroe 500 kV	No Violations							
N-1: Chief Jo-Sickler 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Covington4-Raver 500 kV	No Violations							
N-1: Covington5-Raver 500 kV	No Violations							
N-1: Coyote-Longhorn 500 kV	No Violations							
N-1: CusterW-Monroe 500 kV	No Violations							
N-1: Dixonville-Meridian 500 kV	No Violations							
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV	No Violations							
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Echo Lake-Maple Valley 500 kV	No Violations							
N-1: Echo Lake-Raver 500 kV	No Violations							
N-1: Echo Lake-Schultz 500 kV	No Violations							
N-1: Echo Lake-Snok Tap 500 kV	No Violations							
N-1: Garrison-Taft #2 500 kV	No Violations							
N-1: Goldhill-Placer 115 kV	No Violations							
N-1: Grassland-Coyote 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	No Violations							
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Harry Allen 345 kV Phase Shifter	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.3	348.7	315.0	110.7%	394.0	88.5%
N-1: Harry Allen 345 kV Phase Shifter	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.3	347.5	315.0	110.3%	394.0	88.2%
N-1: Hatwai 500/230 kV Xfmr	No Violations							
N-1: Hatwai-Lolo 230 kV	No Violations							
N-1: Hatwai-Low Gran 500 kV	No Violations							
N-1: Hatwai-N Lewiston 230 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	No Violations							
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	324.6	300.0	108.2%	370.0	87.7%
N-1: Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	324.6	300.0	108.2%	370.0	87.7%
N-1: Hemingway-Grassland 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	90.3	114.7	112.0	102.4%	146.7	78.2%
N-1: Hemingway-Grassland 500 kV	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1494.5	2174.0	1732.1	125.5%	2338.3	93.0%
N-1: Hemingway-Grassland 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1126.8	999.1	112.8%	1250.1	90.1%
N-1: Hemingway-Grassland 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	866.3	1105.4	1000.1	110.5%	1250.1	88.4%
N-1: Hemingway-Summer Lake 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.1	53.2	50.0	106.5%	55.0	96.8%
N-1: Hemingway-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	331.0	300.0	110.3%	370.0	89.5%
N-1: Hemingway-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	331.0	300.0	110.3%	370.0	89.5%
N-1: Hemingway-Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.3	319.2	315.0	101.3%	394.0	81.0%
N-1: Hemingway-Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.3	318.7	315.0	101.2%	394.0	80.9%
N-1: Hemingway-Summer Lake 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1080.5	999.1	108.1%	1250.1	86.4%
N-1: Hemingway-Summer Lake 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	866.3	1058.7	1000.1	105.9%	1250.1	84.7%
N-1: Hemingway-Summer Lake 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1267.2	2062.3	2000.1	103.1%	3000.0	68.7%
N-1: Hemingway-Summer Lake 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1300.8	2043.2	2000.1	102.2%	3000.0	68.1%
N-1: Hill Top 345/230 Xfmr	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	108.5	175.5	150.0	117.0%	180.0	97.5%
N-1: Hill Top 345/230 Xfmr	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	319.9	435.3	415.7	104.7%	483.5	90.0%
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: Hot Springs-Taft 500 kV	HOT SPR (40553)	% Δ Volts	1.079	1.022				5.28%
N-1: Humboldt-Coyote Ck 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	310.2	300.0	103.4%	370.0	83.9%
N-1: Humboldt-Coyote Ck 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	310.2	300.0	103.4%	370.0	83.9%
N-1: Humboldt-Coyote Ck 345 kV	SLVR PK (64094) -> SLVR PKX (64095) CKT 1 at SLVR PKX	Branch MVA	16.6	19.4	17.0	114.0%	23.9	81.1%
N-1: Humboldt-Coyote Ck 345 kV	SLVR PS (64096) -> SLVR PK (64094) CKT 1 at SLVR PK	Branch MVA	15.9	18.4	17.0	108.5%	23.9	77.1%
N-1: Huntington-Pinto-Four Corners 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	357.0	300.0	119.0%	370.0	96.5%
N-1: Huntington-Pinto-Four Corners 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	357.0	300.0	119.0%	370.0	96.5%
N-1: Huntington-Pinto-Four Corners 345 kV	H ALLEN (18001) -> H ALLEN (18019) CKT 1 at H ALLEN	Branch MVA	296.3	364.2	357.0	102.0%	415.9	87.6%
N-1: Huntington-Pinto-Four Corners 345 kV	H ALLEN (18001) -> H ALLEN (18019) CKT 2 at H ALLEN	Branch MVA	296.3	364.2	357.0	102.0%	415.9	87.6%
N-1: Ing500-CusterW 500 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Kfalls-Meridian 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.1	52.0	50.0	103.9%	55.0	94.5%
N-1: Lanes-Marion 500 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-Sac Tap 500 kV	No Violations							
N-1: Malin 500/230 Xfmr	No Violations							
N-1: Malin-Hilltop 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	108.5	150.7	150.0	100.5%	180.0	83.7%
N-1: Malin-Round Mtn #1 500 kV	No Violations							
N-1: Malin-Round Mtn #2 500 kV	No Violations							
N-1: Malin-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	304.2	300.0	101.4%	370.0	82.2%
N-1: Malin-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	304.2	300.0	101.4%	370.0	82.2%
N-1: Maple Vly-Rocky RH 345 kV	No Violations							
N-1: Marion-Pearl 500 kV	No Violations							
N-1: Marion-Santiam 500 kV	No Violations							
N-1: McLouglin-Ostrander 230 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	FRANKLIN (40443) -> FRANKL E (40440) CKT 1 at FRANKLIN	Branch MVA	186.5	254.6	254.0	100.3%	307.0	82.9%
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Longhorn 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	No Violations							
N-1: McNary-Sac Tap-Low Mon 500 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	311.0	300.0	103.7%	370.0	84.1%
N-1: Midpoint-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	311.0	300.0	103.7%	370.0	84.1%
N-1: Midpoint-Humboldt 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	313.1	300.0	104.4%	370.0	84.6%
N-1: Midpoint-Humboldt 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	313.1	300.0	104.4%	370.0	84.6%
N-1: Midpoint-Humboldt 345 kV	SLVR PK (64094) -> SLVR PKX (64095) CKT 1 at SLVR PKX	Branch MVA	16.6	19.8	17.0	116.4%	23.9	82.8%
N-1: Midpoint-Humboldt 345 kV	SLVR PS (64096) -> SLVR PK (64094) CKT 1 at SLVR PK	Branch MVA	15.9	18.8	17.0	110.7%	23.9	78.7%
N-1: Napavine-Paul 500 kV	No Violations							
N-1: Olympia-Paul 500 kV	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	884.5	1020.1	999.1	102.1%	1250.1	81.6%
N-1: Paul-Satsop 500 kV	No Violations							
N-1: Pearl-Keeler 500 kV	No Violations							
N-1: Pinto-Four Corner 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	354.4	300.0	118.1%	370.0	95.8%
N-1: Pinto-Four Corner 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	354.4	300.0	118.1%	370.0	95.8%
N-1: Pinto-Four Corner 345 kV	H ALLEN (18001) -> H ALLEN (18019) CKT 1 at H ALLEN	Branch MVA	296.3	361.2	357.0	101.2%	415.9	86.9%
N-1: Pinto-Four Corner 345 kV	H ALLEN (18001) -> H ALLEN (18019) CKT 2 at H ALLEN	Branch MVA	296.3	361.2	357.0	101.2%	415.9	86.9%
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Populus-Cedar Hill-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	314.6	300.0	104.9%	370.0	85.0%
N-1: Populus-Cedar Hill-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	314.6	300.0	104.9%	370.0	85.0%
N-1: Populus-Cedar Hill-Hemingway 500 kV	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1093.2	1776.5	1732.1	102.6%	2338.3	76.0%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Raver-Paul 500 kV	No Violations							
N-1: Raver-Tacoma 500 kV	No Violations							
N-1: Red Butte-Harry Allen 345 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.3	348.7	315.0	110.7%	394.0	88.5%
N-1: Red Butte-Harry Allen 345 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.3	347.5	315.0	110.3%	394.0	88.2%
N-1: Robinson-Harry Allen 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	301.5	300.0	100.5%	370.0	81.5%
N-1: Robinson-Harry Allen 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	301.5	300.0	100.5%	370.0	81.5%
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Round Mtn-Table Mtn 500 kV	No Violations							
N-1: Roundup-Lagrande 230 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	41.1	50.0	50.0	100.1%	55.0	91.0%
N-1: Schultz-Sickler 500 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Sigurd-Glen Canyon 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	316.7	300.0	105.6%	370.0	85.6%
N-1: Sigurd-Glen Canyon 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	316.7	300.0	105.6%	370.0	85.6%
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Slatt-Longhorn 500 kV	No Violations							
N-1: Snok Tap-Snoking 500 kV	No Violations							
N-1: Table Mtn-Tesla 500 kV	No Violations							
N-1: Table Mtn-Vaca Dixon 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	300.1	300.0	100.0%	370.0	81.1%
N-1: Table Mtn-Vaca Dixon 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	300.1	300.0	100.0%	370.0	81.1%
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations							
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	SLVR PK (64094) -> SLVR PKX (64095) CKT 1 at SLVR PKX	Branch MVA	16.6	17.0	17.0	100.3%	23.9	71.3%
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	No Violations							
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Bridger-Populus #1 & #2 345 kV	BRIDGER (60085) -> BRI3MI11 (61999) CKT 1 at BRIDGER	Branch Amp	1043.6	1703.4	1600.0	106.5%	1840.0	92.6%
N-2: Bridger-Populus #1 & #2 345 kV	BRI3MI11 (61999) -> 3MIKNOLL (60084) CKT 1 at 3MIKNOLL	Branch Amp	1043.6	1678.0	1650.1	101.7%	2227.4	75.3%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	BRIDGER (60085) -> POPBRI11 (61968) CKT 1 at BRIDGER	Branch Amp	984.0	1737.5	1492.7	116.4%	1849.2	94.0%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	POPBRI11 (61968) -> POPULUS (67790) CKT 1 at POPULUS	Branch Amp	973.2	1719.3	1650.1	104.2%	2227.6	77.2%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	90.3	126.2	112.0	112.7%	146.7	86.0%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SLVR PK (64094) -> SLVR PKX (64095) CKT 1 at SLVR PKX	Branch MVA	16.6	17.3	17.0	101.8%	23.9	72.4%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	ABSAROKE (62201)	% Δ Volts	0.963	0.911				5.40%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLBUSAT (62224)	% Δ Volts	0.983	0.933				5.09%
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	No Violations							
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	No Violations							
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations							
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations							
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations							
N-2: CusterW-Monroe #1 & #2 500 kV	No Violations							
N-2: DC-BIPOLE	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	326.0	300.0	108.7%	370.0	88.1%
N-2: DC-BIPOLE	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	326.0	300.0	108.7%	370.0	88.1%
N-2: Double Palo Verde	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	368.6	300.0	122.9%	370.0	99.6%
N-2: Double Palo Verde	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	368.6	300.0	122.9%	370.0	99.6%
N-2: Double Palo Verde	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO	Branch MVA	290.3	365.7	315.0	116.1%	394.0	92.8%
N-2: Double Palo Verde	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO	Branch MVA	290.3	364.2	315.0	115.6%	394.0	92.4%
N-2: Double Palo Verde	H ALLEN (18001) -> H ALLEN (18019) CKT 1 at H ALLEN	Branch MVA	296.3	377.3	357.0	105.7%	415.9	90.7%
N-2: Double Palo Verde	H ALLEN (18001) -> H ALLEN (18019) CKT 2 at H ALLEN	Branch MVA	296.3	377.3	357.0	105.7%	415.9	90.7%
N-2: Double Palo Verde	CR_NEST1 (54458) -> CBK 500 (50791) CKT 1 at CR_NEST1	Branch Amp	410.4	1151.8	1085.4	106.1%	1199.7	96.0%
N-2: Double Palo Verde	CHOLLA (14000) -> CHOSAG11 (14014) CKT 1 at CHOSAG11	Branch Amp	972.6	1069.6	1026.0	104.3%	1538.1	69.5%
N-2: Double Palo Verde	MONTROSE (79049)	% Δ Volts	1.024	0.971				5.18%
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations							
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations							
N-2: Garrison-Taft #1 & #2 500 kV + RAS	SLVR PK (64094) -> SLVR PKX (64095) CKT 1 at SLVR PKX	Branch MVA	16.6	17.0	17.0	100.1%	23.9	71.2%
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	No Violations							
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	No Violations							
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	304.3	300.0	101.4%	370.0	82.3%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	304.3	300.0	101.4%	370.0	82.3%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	No Violations							
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	314.8	300.0	104.9%	370.0	85.1%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	314.8	300.0	104.9%	370.0	85.1%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	BENTNAVA (48039) -> TAUNTON (48425) CKT 1 at BENTNAVA	Branch Amp	217.0	253.9	252.0	100.7%	271.1	93.7%
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	No Violations							
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV	No Violations							
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	No Violations							
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	No Violations							
N-2: Malin-Round Mtn #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	327.3	300.0	109.1%	370.0	88.5%
N-2: Malin-Round Mtn #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	327.3	300.0	109.1%	370.0	88.5%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	108.5	156.0	150.0	104.0%	180.0	86.7%
N-2: Malin-Round Mtn #1 & #2 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.3	316.3	315.0	100.4%	394.0	80.3%
N-2: Malin-Round Mtn #1 & #2 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.3	315.8	315.0	100.2%	394.0	80.1%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	310.6	300.0	103.5%	370.0	83.9%
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	310.6	300.0	103.5%	370.0	83.9%
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations							
N-2: Napavine-Allston & Paul-Allston #2 500 kV	No Violations							
N-2: Paul-Napavine & Paul-Allston #2 500 kV	No Violations							
N-2: Paul-Raver & Raver-Covingt4 500 kV	No Violations							
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	No Violations							
N-2: Raver-Covington #1 & #2 500 kV	No Violations							
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations							
N-2: Raver-Paul & Napavine-Paul 500 kV	No Violations							
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations							
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations							
N-2: Raver-Schultz #1 & #2 500 kV	No Violations							
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations							
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations							
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	323.9	300.0	108.0%	370.0	87.5%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	323.9	300.0	108.0%	370.0	87.5%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	108.5	153.1	150.0	102.1%	180.0	85.1%
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	No Violations							
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	No Violations							
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	321.1	300.0	107.0%	370.0	86.8%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	321.1	300.0	107.0%	370.0	86.8%
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	No Violations							
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	293.5	300.0	300.0	100.0%	370.0	81.1%
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	293.5	300.0	300.0	100.0%	370.0	81.1%
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	No Violations							
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							

Appendix I - 16la1sa_3400idnw_nv Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations							

Appendix I - 16la1sa_3400idnw_nv Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hilltop		Humboldt		Malin		Midpoint		Robinson		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 11L12 MERIDIAN-KLAM FALLS 500 KV+KFGEN2+ST	0.70	-802	0.70	-2330	0.70	-349	0.70	-505	0.71	-4430	0.70	-2101	0.70	-817	0.70	-879
BF 11L22 CAPT JACK-KLAM FALLS 500 KV+KFGEN2+ST	0.70	-802	0.70	-2335	0.70	-350	0.70	-503	0.70	-4514	0.70	-2102	0.70	-816	0.70	-878
BF 11R1 MERIDIAN-KLAM FALLS 500 KV & MERIDIAN 500/230 KV XFMR	0.70	-807	0.70	-2376	0.70	-352	0.70	-509	0.71	-4572	0.70	-2131	0.70	-822	0.70	-884
BF 11R6 MERIDIAN-DIXONVILLE 500 KV & MERIDIAN 500/230 KV XFMR	0.70	-805	0.70	-2379	0.70	-351	0.70	-506	0.71	-4500	0.70	-2131	0.70	-819	0.70	-882
BF 4003 HANFORD-VANTAGE & HANFORD CAPS	0.70	-808	0.70	-2386	0.70	-355	0.70	-508	0.72	-4610	0.70	-2136	0.70	-820	0.70	-885
BF 4019 CAPTJACK-MALIN #2 & MALIN 500/230 XFMR	0.70	-791	0.70	-2385	0.70	-253	0.70	-512	0.70	-4656	0.70	-2135	0.70	-824	0.70	-869
BF 4028 TAFT-DWORSHAK & TAFT REACTOR 500KV	0.70	-806	0.70	-2352	0.70	-354	0.70	-505	0.72	-4619	0.70	-2113	0.70	-817	0.70	-882
BF 4046 JOHN DAY-GRIZZLY #2 & GRIZZLY-MALIN #2 500 KV	0.70	-797	0.70	-2343	0.70	-343	0.70	-498	0.70	-4265	0.70	-2112	0.70	-812	0.70	-873
BF 4064 CAPTJACK-MALIN & MALIN-ROUND MTN #1 500 KV	0.70	-810	0.70	-2405	0.70	-359	0.70	-505	0.72	-4328	0.70	-2146	0.70	-817	0.70	-886
BF 4072 GRIZZLY-MALIN #2 & MALIN-ROUND MTN #2 500 KV	0.70	-798	0.70	-2361	0.70	-343	0.70	-495	0.70	-3955	0.70	-2124	0.70	-809	0.70	-874
BF 4095 LOW MON-HANFORD & HANFORD-WAUTOMA 500 KV	0.70	-807	0.70	-2373	0.70	-355	0.70	-506	0.72	-4617	0.70	-2128	0.70	-819	0.70	-883
BF 4104 ASHE-HANFORD & HANFORD-WAUTOMA 500 KV	0.70	-807	0.70	-2372	0.70	-354	0.70	-507	0.73	-4526	0.70	-2131	0.70	-819	0.70	-884
BF 4111 HOT SPRINGS-TAFT & TAFT-DWORSHAK 500 KV	0.70	-806	0.70	-2354	0.70	-355	0.70	-505	0.72	-4628	0.70	-2115	0.70	-817	0.70	-883
BF 4114 GARRISON-TAFT #1 +TAFT REACTOR 500KV	0.70	-803	0.70	-2320	0.70	-354	0.70	-501	0.73	-4624	0.70	-2091	0.70	-814	0.70	-880
BF 4119 GARRISON-TAFT #1 & TAFT-BELL 500KV + RAS	0.70	-796	0.70	-2211	0.70	-350	0.70	-491	0.75	-4484	0.70	-2024	0.70	-805	0.70	-871
BF 4131 SLATT-JOHN DAY & JOHN DAY-GRIZZLY #2 500 KV	0.70	-802	0.70	-2358	0.70	-350	0.70	-502	0.70	-4464	0.70	-2124	0.70	-815	0.70	-879
BF 4143 (OR 4134) JOHN DAY-GRIZZLY #1 & JOHN DAY CAPS 500 KV	0.70	-805	0.70	-2370	0.70	-352	0.70	-505	0.72	-4527	0.70	-2126	0.70	-818	0.70	-881
BF 4148 HOT SPRINGS-TAFT & GARRISON-TAFT #2 500 KV	0.70	-804	0.70	-2340	0.70	-354	0.70	-503	0.71	-4731	0.70	-2101	0.70	-815	0.70	-881
BF 4170 JOHN DAY-MARION & JOHN DAY CAPS 500 KV	0.70	-806	0.70	-2372	0.70	-353	0.70	-506	0.73	-4554	0.70	-2129	0.70	-819	0.70	-883
BF 4186 (OR 4582) MALIN-ROUND MTN 500 KV & MALIN 500/230 XFMR	0.70	-790	0.70	-2385	0.70	-253	0.70	-506	0.70	-4239	0.70	-2137	0.70	-819	0.70	-867
BF 4194 ROCK CK-JOHN DAY & BIG EDDY-JOHN DAY 500 KV	0.70	-807	0.70	-2380	0.70	-354	0.70	-507	0.72	-4574	0.70	-2132	0.70	-820	0.70	-884
BF 4197 JOHN DAY-BIG EDDY #1 & JOHN DAY CAPS 500 KV	0.70	-808	0.70	-2388	0.70	-355	0.70	-508	0.72	-4681	0.70	-2136	0.70	-820	0.70	-885
BF 4202 JOHN DAY-BIG EDDY#2 & BIG EDDY-OSTRANDER 500 KV	0.70	-808	0.70	-2381	0.70	-355	0.70	-508	0.73	-4583	0.70	-2133	0.70	-820	0.70	-884
BF 4231 MCNARY-LONGHORN 500 KV & MCNARY 500/230 KV XFMR	0.70	-806	0.70	-2335	0.70	-356	0.70	-505	0.79	-4488	0.70	-2113	0.70	-818	0.70	-883
BF 4234 MCNARY-LONGHORN & MCNARY-HERMCALP 500 KV	0.70	-805	0.70	-2302	0.70	-353	0.70	-508	0.76	-4523	0.70	-2087	0.70	-820	0.70	-882
BF 4247 LIT GOOS-LOW MON #2 & LOW MON-MCNARY 500 KV	0.70	-807	0.70	-2377	0.70	-355	0.70	-507	0.73	-4579	0.70	-2131	0.70	-820	0.70	-884
BF 4259 LIT GOOS-LOW MON #2 & LOW MON-HANFORD 500 KV	0.70	-807	0.70	-2372	0.70	-355	0.70	-506	0.72	-4614	0.70	-2127	0.70	-819	0.70	-883
BF 4268 MONROE-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.70	-808	0.70	-2386	0.70	-355	0.70	-508	0.72	-4674	0.70	-2134	0.70	-820	0.70	-885
BF 4276 ING500-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.70	-808	0.70	-2388	0.70	-355	0.70	-508	0.71	-4693	0.70	-2135	0.70	-820	0.70	-885
BF 4280 KEELER-PEARL & PEARL-MARION 500 KV	0.70	-809	0.70	-2387	0.70	-357	0.70	-509	0.73	-4512	0.70	-2137	0.70	-821	0.70	-886
BF 4280 KEELER-PEARL & PEARL-OSTRANDER 500 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-507	0.73	-4560	0.70	-2134	0.70	-820	0.70	-884
BF 4287 PEARL-OSTRANDER 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.70	-808	0.70	-2388	0.70	-355	0.70	-508	0.72	-4682	0.70	-2135	0.70	-820	0.70	-885
BF 4293 SCHULTZ-RAVER & RAVER COVINGTON5 500 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-508	0.72	-4655	0.70	-2134	0.70	-820	0.70	-885
BF 4336 CHIEF JO-SICKLER 500 KV & SICKLER 500/230 XFMR	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.72	-4689	0.70	-2135	0.70	-820	0.70	-885
BF 4336 SICKLER-SCHULTZ 500 KV & SICKLER 500/230 XFMR	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.72	-4687	0.70	-2135	0.70	-820	0.70	-885
BF 4377 ASHE-MARION & MARION-ALVEY 500 KV	0.70	-802	0.70	-2359	0.70	-350	0.70	-502	0.73	-4311	0.70	-2121	0.70	-816	0.70	-879
BF 4386 BUCKLEY-MARION & MARION-SANTIAM 500 KV	0.70	-806	0.70	-2371	0.70	-353	0.70	-506	0.73	-4535	0.70	-2129	0.70	-819	0.70	-883
BF 4439 BIG EDDY-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.70	-807	0.70	-2379	0.70	-354	0.70	-507	0.73	-4586	0.70	-2132	0.70	-820	0.70	-884
BF 4442 BIG EDDY-OSTRANDER 500 KV & OSTRANDER-MCLOUGHLIN 230 KV	0.70	-807	0.70	-2381	0.70	-355	0.70	-507	0.73	-4609	0.70	-2133	0.70	-820	0.70	-884
BF 4448 KNIGHT-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.70	-807	0.70	-2374	0.70	-354	0.70	-507	0.73	-4544	0.70	-2130	0.70	-819	0.70	-884
BF 4450 KNIGHT-OSTRANDER & OSTRANDER-PEARL 500 KV	0.70	-807	0.70	-2376	0.70	-354	0.70	-507	0.73	-4569	0.70	-2130	0.70	-819	0.70	-884
BF 4502 PAUL-ALLSTON & ALLSTON-KEELER 500 KV	0.70	-807	0.70	-2377	0.70	-355	0.70	-506	0.74	-4470	0.70	-2130	0.70	-819	0.70	-884
BF 4510 PEARL-MARION 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.70	-810	0.70	-2390	0.70	-357	0.70	-510	0.72	-4583	0.70	-2138	0.70	-822	0.70	-887
BF 4526 CUSTERW-MONROE & MONROE-ECHO LAKE 500 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-508	0.72	-4644	0.70	-2134	0.70	-820	0.70	-885
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV	0.70	-808	0.70	-2389	0.70	-355	0.70	-509	0.73	-4619	0.70	-2137	0.70	-821	0.70	-885
BF 4540 PAUL-NAPAVINE & PAUL-SATSOP 500 KV	0.70	-808	0.70	-2386	0.70	-355	0.70	-508	0.72	-4660	0.70	-2135	0.70	-820	0.70	-885
BF 4542 PAUL-ALLSTON 500 KV & CENTER G2	0.70	-802	0.70	-2298	0.70	-351	0.70	-506	0.74	-4602	0.70	-2077	0.70	-818	0.70	-879
BF 4542 PAUL-NAPAVINE 500 KV & CENTER G1	0.70	-803	0.70	-2307	0.70	-352	0.70	-507	0.73	-4666	0.70	-2082	0.70	-819	0.70	-880
BF 4550 OLYMPIA-PAUL & PAUL-ALLSTON 500 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-508	0.72	-4673	0.70	-2134	0.70	-820	0.70	-884
BF 4554 OLYMPIA-PAUL 500 KV & TONO 500/115 XFMR	0.70	-808	0.70	-2391	0.70	-356	0.70	-508	0.71	-4729	0.70	-2136	0.70	-820	0.70	-885
BF 4572 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.70	-806	0.70	-2349	0.70	-356	0.70	-505	0.78	-4516	0.70	-2116	0.70	-818	0.70	-883
BF 4630 CEN FERRY-LIT GOOS #1 & LIT GOOS-LOW MON #1 500 KV	0.70	-808	0.70	-2383	0.70	-355	0.70	-507	0.72	-4681	0.70	-2133	0.70	-820	0.70	-884

Appendix I - 16la1sa_3400idnw_nv Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hilltop		Humboldt		Malin		Midpoint		Robinson		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 4652 TAFT-DWORSHAK & TAFT-HATWAI 500 KV + RAS	0.70	-806	0.70	-2347	0.70	-354	0.70	-508	0.71	-4755	0.70	-2105	0.70	-819	0.70	-883
BF 4672 MONROE-CHIEF JO 500 KV & MONROE CAPS	0.70	-808	0.70	-2382	0.70	-355	0.70	-507	0.72	-4632	0.70	-2132	0.70	-820	0.70	-884
BF 4676 LIT GOOS-LOW MON & LOW MON-ASHE 500 KV	0.70	-808	0.70	-2388	0.70	-355	0.70	-507	0.71	-4735	0.70	-2134	0.70	-819	0.70	-884
BF 4690 PAUL-ALLSTON 500 KV & ALLSTON 500/230 XFMR	0.70	-808	0.70	-2385	0.70	-355	0.70	-507	0.72	-4653	0.70	-2134	0.70	-820	0.70	-884
BF 4708 HATWAI 500 KV BUS	0.70	-803	0.70	-2320	0.70	-354	0.70	-500	0.72	-4634	0.70	-2093	0.70	-814	0.70	-879
BF 4728 COULEE-CHIEF JO 500 KV & CHEIF JO 500/230 XFMR	0.70	-808	0.70	-2382	0.70	-355	0.70	-507	0.72	-4665	0.70	-2133	0.70	-820	0.70	-884
BF 4775 CEN FERRY-LOW GRAN #1 & #2 500 KV	0.70	-802	0.70	-2307	0.70	-353	0.70	-498	0.73	-4573	0.70	-2086	0.70	-812	0.70	-878
BF 4776 HATWAI-LOW GRAN & LOW GRAN-CEN FERRY 500 KV	0.70	-803	0.70	-2319	0.70	-353	0.70	-500	0.72	-4619	0.70	-2093	0.70	-814	0.70	-879
BF 4870 JOHN DAY-BIG EDDY 500 KV & BIG EDDY 500/230 KV	0.70	-808	0.70	-2388	0.70	-355	0.70	-508	0.72	-4677	0.70	-2136	0.70	-820	0.70	-885
BF 4888 ASHE-SLATT & CGS 500 KV	0.70	-801	0.70	-2257	0.70	-351	0.70	-507	0.73	-4667	0.70	-2052	0.70	-818	0.70	-878
BF 4891 LOW MON-ASHE & ASHE-SLATT 500 KV	0.70	-807	0.70	-2362	0.70	-354	0.70	-506	0.73	-4557	0.70	-2125	0.70	-819	0.70	-883
BF 4901 LOW MON-ASHE & ASHE-HANFORD 500 KV	0.70	-807	0.70	-2361	0.70	-353	0.70	-507	0.75	-4319	0.70	-2129	0.70	-820	0.70	-884
BF 4940 LOW MON-ASHE & ASHE-MARION 500 KV	0.70	-804	0.70	-2358	0.70	-352	0.70	-504	0.74	-4460	0.70	-2120	0.70	-817	0.70	-881
BF 4957 SUMMER L-MALIN & SUMMER L-HEMINGWAY 500 KV	0.70	-741	0.70	-1931	0.70	-337	0.70	-420	0.75	-4172	0.70	-1971	0.70	-741	0.70	-811
BF 4959 GRIZZLY-SUMMER L & SUMMER L-MALIN 500 KV	0.70	-745	0.70	-2004	0.70	-337	0.70	-427	0.74	-4228	0.70	-2031	0.70	-746	0.70	-814
BF 4996 CAPTJACK-MALIN #1 & #2 500 KV	0.70	-811	0.70	-2400	0.70	-359	0.70	-510	0.70	-4102	0.70	-2143	0.70	-822	0.70	-888
BF 5003 SLATT-BUCKLEY & SLATT-BOARDMAN 500 KV	0.70	-800	0.70	-2340	0.70	-351	0.70	-498	0.72	-4484	0.70	-2123	0.70	-811	0.70	-876
BF 5006 SLATT-LONGHORN & SLATT-GRASSLAND 500 KV	0.70	-796	0.70	-2327	0.70	-351	0.70	-492	0.74	-4484	0.70	-2122	0.70	-806	0.70	-871
BF 5015 ASHE-SLATT & SLATT-BUCKLEY 500 KV	0.70	-803	0.70	-2356	0.70	-352	0.70	-501	0.73	-4443	0.70	-2124	0.70	-815	0.70	-879
BF 5018 ASHE-SLATT & SLATT-JOHN DAY 500 KV	0.70	-804	0.70	-2358	0.70	-353	0.70	-503	0.73	-4527	0.70	-2129	0.70	-816	0.70	-880
BF 5021 SLATT-JOHN DAY & SLATT-LONGHORN 500 KV	0.70	-804	0.70	-2369	0.70	-353	0.70	-503	0.73	-4595	0.70	-2130	0.70	-816	0.70	-881
BF 5028 BUCKLEY-GRIZZLY & GRIZZLY-SUMMER LAKE 500 KV	0.70	-805	0.70	-2346	0.70	-352	0.70	-505	0.70	-4558	0.70	-2121	0.70	-818	0.70	-882
BF 5040 GRIZZLY-JOHN DAY & GRIZZLY-ROUND BU 500 KV	0.70	-804	0.70	-2364	0.70	-351	0.70	-504	0.71	-4520	0.70	-2123	0.70	-817	0.70	-881
BF 5114 ECHO LAKE-RAVER & ECHO LAKE- SNOK TAP 500 KV	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.72	-4691	0.70	-2136	0.70	-820	0.70	-885
BF 5117 ECHO LAKE-MAPLE VALLEY & ECHO LAKE-RAVER 500 KV	0.70	-808	0.70	-2384	0.70	-355	0.70	-508	0.72	-4656	0.70	-2133	0.70	-820	0.70	-885
BF 5148 COULEE-SCHULTZ & ECHO LAKE-SCHULTZ 500 KV	0.70	-807	0.70	-2371	0.70	-354	0.70	-507	0.73	-4542	0.70	-2128	0.70	-819	0.70	-884
BF 5170 WAUTOMA-SCHULTZ & SCHULTZ-RAVER 500 KV	0.70	-808	0.70	-2382	0.70	-355	0.70	-508	0.73	-4559	0.70	-2134	0.70	-820	0.70	-885
BF 5179 VANTAGE-SCHULTZ & SCHULTZ-RAVER #4	0.70	-808	0.70	-2383	0.70	-355	0.70	-508	0.73	-4614	0.70	-2134	0.70	-820	0.70	-884
BF 5187 MCNARY-LONGHORN & LONGHORN-SLATT 500 KV	0.70	-807	0.70	-2361	0.70	-355	0.70	-507	0.72	-4640	0.70	-2129	0.70	-819	0.70	-884
BF 5193 GRASSLAND-COYOTE & COYOTE-LONGHORN 500 KV	0.70	-805	0.70	-2278	0.70	-353	0.70	-507	0.73	-4625	0.70	-2081	0.70	-819	0.70	-881
BF 5211 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.70	-806	0.70	-2351	0.70	-356	0.70	-505	0.80	-4434	0.70	-2117	0.70	-818	0.70	-883
BF 5214 LOW MON-MCNARY & CALPINE PH 500 KV	0.70	-804	0.70	-2290	0.70	-353	0.70	-507	0.77	-4377	0.70	-2081	0.70	-819	0.70	-881
BF 5250 HANFORD-WAUTOMA#1 & WAUTOMA-KNIGHT 500 KV	0.70	-807	0.70	-2372	0.70	-354	0.70	-506	0.73	-4579	0.70	-2128	0.70	-819	0.70	-883
BF 5259 HANFORD-WAUTOMA#2 & WAUTOMA-ROCK CK 500 KV	0.70	-807	0.70	-2376	0.70	-355	0.70	-507	0.73	-4571	0.70	-2131	0.70	-819	0.70	-884
BF 5266 SLATT-BUCKLY 500 KV	0.70	-803	0.70	-2374	0.70	-353	0.70	-502	0.72	-4538	0.70	-2129	0.70	-815	0.70	-880
BF 5339 VANTAGE-SCHULTZ 500 KV & VANTAGE 500/230 XFMR #1	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.72	-4656	0.70	-2136	0.70	-820	0.70	-885
BF 5345 VANTAGE-HANFORD 500 KV & VANTAGE 500/230 XFMR #1	0.70	-808	0.70	-2386	0.70	-355	0.70	-508	0.72	-4611	0.70	-2136	0.70	-820	0.70	-885
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR	0.70	-753	0.70	-1313	0.70	-335	0.70	-428	0.75	-4444	0.70	-1686	0.70	-756	0.70	-823
BF IPC HEMINGWAY-SUMMER L 500 KV & HEMINGWAY 500/230 XFMR	0.70	-748	0.70	-1567	0.70	-339	0.70	-427	0.77	-4259	0.70	-1862	0.70	-749	0.70	-817
BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.70	-745	0.70	-1365	0.70	-341	0.70	-408	0.74	-4603	0.70	-1478	0.70	-751	0.70	-814
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR	0.70	-795	0.70	-1787	0.70	-354	0.70	-499	0.74	-4808	0.70	-1887	0.70	-796	0.70	-870
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR + RAS	0.70	-768	0.70	-1627	0.70	-349	0.70	-455	0.72	-4855	0.70	-1650	0.70	-761	0.70	-840
BF LOLO 230KV	0.70	-800	0.70	-2278	0.70	-352	0.70	-495	0.72	-4641	0.70	-2076	0.70	-811	0.70	-876
BF PGE GRASSLAND-CEDAR SPRING & HEMINGWAY-GRASSLAND 500 KV	0.70	-751	0.70	-1676	0.70	-333	0.70	-430	0.76	-4308	0.70	-1810	0.70	-756	0.70	-822
BF PGE GRASSLAND-COYOTE 500 KV & CARTY GAS PROJECT	0.70	-808	0.70	-2345	0.70	-355	0.70	-507	0.71	-4687	0.70	-2123	0.70	-820	0.70	-884
BF PGE SLATT-GRASSLAND 500 KV & BOARDMAN COAL GEN	0.70	-802	0.70	-2255	0.70	-353	0.70	-504	0.73	-4650	0.70	-2067	0.70	-816	0.70	-879
BUS: ALVEY 500 KV	0.70	-803	0.70	-2372	0.70	-349	0.70	-504	0.72	-4374	0.70	-2128	0.70	-817	0.70	-880
BUS: BELL BPA 500 KV	0.70	-798	0.70	-2242	0.70	-351	0.70	-493	0.75	-4450	0.70	-2047	0.70	-808	0.70	-873
BUS: BUCKLEY 500 KV	0.70	-801	0.70	-2350	0.70	-349	0.70	-501	0.73	-4343	0.70	-2119	0.70	-814	0.70	-877
BUS: DIXONVILLE 500 KV	0.70	-805	0.70	-2382	0.70	-351	0.70	-506	0.71	-4493	0.70	-2132	0.70	-818	0.70	-882
BUS: HOT SPRINGS 500 KV	0.70	-808	0.70	-2391	0.70	-356	0.70	-508	0.71	-4710	0.70	-2137	0.70	-820	0.70	-885
BUS: KEELER 500 KV	0.70	-807	0.70	-2377	0.70	-355	0.70	-507	0.75	-4428	0.70	-2130	0.70	-819	0.70	-884

Appendix I - 16la1sa_3400idnw_nv Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hilltop		Humboldt		Malin		Midpoint		Robinson		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BUS: ROCK CREEK 500 KV	0.70	-806	0.70	-2363	0.70	-354	0.70	-506	0.73	-4543	0.70	-2123	0.70	-819	0.70	-883
BUS: SICKLER 500 KV	0.70	-808	0.70	-2384	0.70	-355	0.70	-508	0.72	-4666	0.70	-2134	0.70	-820	0.70	-885
BUS: SUMMER LAKE 500 KV	0.70	-741	0.70	-1934	0.70	-337	0.70	-420	0.75	-4191	0.70	-1972	0.70	-741	0.70	-810
N-1: ALLSTON-KEELER 500 KV	0.70	-807	0.70	-2377	0.70	-355	0.70	-506	0.74	-4471	0.70	-2130	0.70	-819	0.70	-883
N-1: ALLSTON-NAPAVINE 500 KV	0.70	-808	0.70	-2384	0.70	-355	0.70	-507	0.72	-4641	0.70	-2133	0.70	-820	0.70	-884
N-1: ALLSTON-PAUL #2 500 KV	0.70	-808	0.70	-2384	0.70	-355	0.70	-507	0.72	-4656	0.70	-2133	0.70	-820	0.70	-884
N-1: ALVERY-DIXONVILLE 500 KV	0.70	-805	0.70	-2383	0.70	-351	0.70	-505	0.71	-4491	0.70	-2132	0.70	-818	0.70	-881
N-1: ALVEY-MARION 500 KV	0.70	-805	0.70	-2380	0.70	-352	0.70	-505	0.73	-4494	0.70	-2131	0.70	-818	0.70	-881
N-1: ASHE-HANFORD 500 KV	0.70	-807	0.70	-2375	0.70	-354	0.70	-507	0.73	-4551	0.70	-2132	0.70	-820	0.70	-884
N-1: ASHE-LOW MON 500 KV	0.70	-807	0.70	-2378	0.70	-355	0.70	-507	0.72	-4658	0.70	-2130	0.70	-819	0.70	-884
N-1: ASHE-MARION 500 KV	0.70	-805	0.70	-2368	0.70	-353	0.70	-505	0.73	-4517	0.70	-2125	0.70	-818	0.70	-882
N-1: ASHE-SLATT 500 KV	0.70	-807	0.70	-2371	0.70	-355	0.70	-507	0.72	-4603	0.70	-2130	0.70	-820	0.70	-884
N-1: BELL-COULEE 500 KV	0.70	-804	0.70	-2339	0.70	-354	0.70	-502	0.72	-4666	0.70	-2105	0.70	-815	0.70	-880
N-1: BELL-TAFT 500 KV	0.70	-798	0.70	-2241	0.70	-351	0.70	-493	0.77	-4318	0.70	-2047	0.70	-808	0.70	-873
N-1: BIG EDDY-CELILO 500 KV	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.71	-4705	0.70	-2136	0.70	-820	0.70	-885
N-1: BIG EDDY-JOHN DAY 500 KV	0.70	-808	0.70	-2388	0.70	-355	0.70	-508	0.72	-4681	0.70	-2136	0.70	-820	0.70	-885
N-1: BIG EDDY-KNIGHT 500 KV	0.70	-808	0.70	-2384	0.70	-355	0.70	-508	0.70	-4677	0.70	-2134	0.70	-820	0.70	-885
N-1: BIG EDDY-OSTRANDER 500 KV	0.70	-807	0.70	-2381	0.70	-355	0.70	-507	0.72	-4617	0.70	-2133	0.70	-820	0.70	-884
N-1: BOISE BENCH-BROWNLEE #3 230 KV	0.70	-808	0.70	-2368	0.70	-355	0.70	-507	0.71	-4703	0.70	-2116	0.70	-820	0.70	-885
N-1: BRADY-ANTELOPE 230 KV + RAS	0.70	-805	0.70	-2339	0.70	-354	0.70	-503	0.71	-4693	0.70	-2097	0.70	-816	0.70	-881
N-1: BROADVIEW-GARRISON #1 500 KV	0.70	-804	0.70	-2328	0.70	-354	0.70	-503	0.72	-4688	0.70	-2091	0.70	-816	0.70	-881
N-1: BROWNLEE-ONTARIO 230 KV	0.70	-808	0.70	-2374	0.70	-355	0.70	-507	0.71	-4703	0.70	-2129	0.70	-820	0.70	-885
N-1: BUCKLEY-GRIZZLY 500 KV	0.70	-805	0.70	-2379	0.70	-352	0.70	-505	0.70	-4589	0.70	-2130	0.70	-818	0.70	-882
N-1: BUCKLEY-MARION 500 KV	0.70	-806	0.70	-2373	0.70	-353	0.70	-506	0.73	-4553	0.70	-2130	0.70	-819	0.70	-883
N-1: BUCKLEY-SLATT 500 KV	0.70	-803	0.70	-2374	0.70	-353	0.70	-502	0.72	-4540	0.70	-2129	0.70	-815	0.70	-880
N-1: CAL SUB 120 KV PHASE SHIFTER	0.70	-782	0.70	-2378	0.70	-338	0.70	-528	0.71	-4645	0.70	-2139	0.70	-837	0.72	-846
N-1: CAPTAIN JACK-OLINDA 500 KV	0.70	-807	0.70	-2397	0.70	-353	0.70	-499	0.73	-3983	0.70	-2144	0.70	-812	0.70	-882
N-1: CAPTJACK-KFALLS 500 KV	0.70	-806	0.70	-2380	0.70	-352	0.70	-505	0.70	-4584	0.70	-2131	0.70	-818	0.70	-882
N-1: CASCADE CROSSING 500 KV	0.70	-803	0.70	-2367	0.70	-351	0.70	-503	0.75	-4404	0.70	-2129	0.70	-816	0.70	-879
N-1: CHIEF JO-COULEE 500 KV	0.70	-808	0.70	-2382	0.70	-355	0.70	-507	0.72	-4663	0.70	-2132	0.70	-820	0.70	-884
N-1: CHIEF JO-MONROE 500 KV	0.70	-808	0.70	-2382	0.70	-355	0.70	-507	0.72	-4632	0.70	-2132	0.70	-820	0.70	-884
N-1: CHIEF JO-SICKLER 500 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-508	0.72	-4683	0.70	-2134	0.70	-820	0.70	-885
N-1: COULEE-HANFORD 500 KV	0.70	-808	0.70	-2381	0.70	-355	0.70	-507	0.73	-4611	0.70	-2133	0.70	-820	0.70	-884
N-1: COULEE-SCHULTZ 500 KV	0.70	-807	0.70	-2378	0.70	-355	0.70	-507	0.72	-4630	0.70	-2131	0.70	-819	0.70	-884
N-1: COVINGTON4-RAVER 500 KV	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.71	-4695	0.70	-2136	0.70	-820	0.70	-885
N-1: COVINGTON5-RAVER 500 KV	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.71	-4694	0.70	-2136	0.70	-820	0.70	-885
N-1: COYOTE-LONGHORN 500 KV	0.70	-807	0.70	-2380	0.70	-355	0.70	-507	0.71	-4696	0.70	-2137	0.70	-819	0.70	-884
N-1: CUSTERW-MONROE 500 KV	0.70	-808	0.70	-2386	0.70	-355	0.70	-508	0.72	-4676	0.70	-2134	0.70	-820	0.70	-885
N-1: DIXONVILLE-MERIDIAN 500 KV	0.70	-806	0.70	-2380	0.70	-351	0.70	-506	0.71	-4510	0.70	-2131	0.70	-819	0.70	-882
N-1: DRYCREEK-LOLO 230 KV	0.70	-808	0.70	-2388	0.70	-355	0.70	-508	0.71	-4705	0.70	-2135	0.70	-820	0.70	-885
N-1: DRYCREEK-N LEWISTON 230 KV	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.71	-4705	0.70	-2135	0.70	-820	0.70	-885
N-1: DRYCREEK-WALA AVA 230 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-507	0.72	-4692	0.70	-2134	0.70	-820	0.70	-885
N-1: DWORSHAK-HATWAI 500 KV	0.70	-806	0.70	-2355	0.70	-355	0.70	-505	0.72	-4689	0.70	-2112	0.70	-817	0.70	-882
N-1: DWORSHAK-TAFT 500 KV	0.70	-806	0.70	-2352	0.70	-354	0.70	-505	0.72	-4619	0.70	-2113	0.70	-817	0.70	-882
N-1: ECHO LAKE-MAPLE VALLEY 500 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-508	0.72	-4665	0.70	-2134	0.70	-820	0.70	-885
N-1: ECHO LAKE-RAVER 500 KV	0.70	-808	0.70	-2388	0.70	-355	0.70	-508	0.71	-4691	0.70	-2135	0.70	-820	0.70	-885
N-1: ECHO LAKE-SCHULTZ 500 KV	0.70	-808	0.70	-2382	0.70	-355	0.70	-507	0.72	-4628	0.70	-2133	0.70	-820	0.70	-884
N-1: ECHO LAKE-SNOK TAP 500 KV	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.71	-4687	0.70	-2136	0.70	-820	0.70	-885
N-1: GARRISON-TAFT #2 500 KV	0.70	-803	0.70	-2320	0.70	-354	0.70	-501	0.73	-4624	0.70	-2091	0.70	-814	0.70	-880
N-1: GOLDHILL-PLACER 115 KV	0.70	-808	0.70	-2390	0.70	-355	0.70	-509	0.71	-4709	0.70	-2137	0.70	-821	0.70	-885
N-1: GRASSLAND-COYOTE 500 KV	0.70	-808	0.70	-2345	0.70	-355	0.70	-507	0.71	-4688	0.70	-2123	0.70	-820	0.70	-884
N-1: GRASSLAND-SLATT 500 KV	0.70	-804	0.70	-2355	0.70	-354	0.70	-502	0.72	-4650	0.70	-2131	0.70	-815	0.70	-880

Appendix I - 16la1sa_3400idnw_nv Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hilltop		Humboldt		Malin		Midpoint		Robinson		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: GRIZZLY-JOHN DAY #2 500 KV	0.70	-805	0.70	-2370	0.70	-352	0.70	-505	0.72	-4529	0.70	-2126	0.70	-818	0.70	-881
N-1: GRIZZLY-MALIN 500 KV	0.70	-801	0.70	-2364	0.70	-347	0.70	-501	0.70	-4418	0.70	-2123	0.70	-814	0.70	-877
N-1: GRIZZLY-PONDEROSA A-SUMMER L 500 KV	0.70	-808	0.70	-2352	0.70	-355	0.70	-508	0.70	-4657	0.70	-2124	0.70	-820	0.70	-885
N-1: GRIZZLY-PONDEROSA B-CAPT JACK 500 KV	0.70	-800	0.70	-2364	0.70	-347	0.70	-500	0.70	-4437	0.70	-2123	0.70	-814	0.70	-877
N-1: GRIZZLY-ROUND BU 500 KV	0.70	-808	0.70	-2384	0.70	-355	0.70	-508	0.71	-4689	0.70	-2134	0.70	-820	0.70	-884
N-1: HANFORD-LOW MON 500 KV	0.70	-807	0.70	-2375	0.70	-355	0.70	-506	0.72	-4637	0.70	-2129	0.70	-819	0.70	-883
N-1: HANFORD-VANTAGE 500 KV	0.70	-808	0.70	-2386	0.70	-355	0.70	-508	0.72	-4612	0.70	-2136	0.70	-820	0.70	-885
N-1: HANFORD-WAUTOMA 500 KV	0.70	-808	0.70	-2386	0.70	-355	0.70	-507	0.72	-4694	0.70	-2134	0.70	-820	0.70	-885
N-1: HARRY ALLEN 345 KV PHASE SHIFTER	0.70	-779	0.70	-2137	0.70	-352	0.70	-449	0.75	-4376	0.70	-1954	0.70	-733	0.70	-850
N-1: HATWAI 500/230 KV XFMR	0.70	-807	0.70	-2382	0.70	-355	0.70	-507	0.71	-4701	0.70	-2132	0.70	-819	0.70	-884
N-1: HATWAI-LOLO 230 KV	0.70	-807	0.70	-2382	0.70	-355	0.70	-507	0.71	-4703	0.70	-2132	0.70	-819	0.70	-884
N-1: HATWAI-LOW GRAN 500 KV	0.70	-803	0.70	-2321	0.70	-354	0.70	-500	0.72	-4639	0.70	-2094	0.70	-814	0.70	-879
N-1: HATWAI-N LEWISTON 230 KV	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.71	-4707	0.70	-2135	0.70	-820	0.70	-885
N-1: HELLS CANYON-BROWNLEE 230 KV	0.70	-806	0.70	-2336	0.70	-355	0.70	-506	0.71	-4756	0.70	-2109	0.70	-819	0.70	-883
N-1: HELLS CANYON-WALLA WALLA 230 KV	0.70	-796	0.70	-2197	0.70	-351	0.70	-488	0.72	-4647	0.70	-2030	0.70	-807	0.70	-872
N-1: HEMINGWAY-GRASSLAND 500 KV	0.70	-753	0.70	-1673	0.70	-334	0.70	-431	0.74	-4458	0.70	-1806	0.70	-756	0.70	-823
N-1: HEMINGWAY-SUMMER LAKE 500 KV	0.70	-748	0.70	-1942	0.70	-339	0.70	-428	0.75	-4318	0.70	-1980	0.70	-749	0.70	-818
N-1: HILL TOP 345/230 XFMR	0.70	-797	0.70	-2353	0.70	-230	0.70	-572	0.72	-4604	0.70	-2137	0.70	-871	0.72	-895
N-1: HORSE HV-MCNARY 230 KV	0.70	-807	0.70	-2385	0.70	-355	0.70	-507	0.71	-4687	0.70	-2134	0.70	-820	0.70	-884
N-1: HOT SPRINGS-TAFT 500 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-508	0.71	-4689	0.70	-2133	0.70	-820	0.70	-885
N-1: HUMBOLDT-COYOTE CK 345 KV	0.70	-856	0.70	-2273	0.70	-383	0.70	-215	0.74	-4476	0.70	-2067	0.70	-738	0.72	-925
N-1: HUNTINGTON-PINTO-FOUR CORNERS 345 KV	0.70	-784	0.70	-2165	0.70	-351	0.70	-463	0.75	-4421	0.70	-1979	0.70	-753	0.70	-857
N-1: ING500-CUSTERW 500 KV	0.70	-808	0.70	-2388	0.70	-355	0.70	-508	0.71	-4696	0.70	-2135	0.70	-820	0.70	-885
N-1: JOHN DAY-MARION 500 KV	0.70	-806	0.70	-2372	0.70	-353	0.70	-506	0.73	-4553	0.70	-2129	0.70	-819	0.70	-883
N-1: JOHN DAY-ROCK CK 500 KV	0.70	-807	0.70	-2380	0.70	-355	0.70	-507	0.72	-4611	0.70	-2131	0.70	-819	0.70	-884
N-1: JOHN DAY-SLATT 500 KV	0.70	-805	0.70	-2379	0.70	-354	0.70	-504	0.72	-4641	0.70	-2134	0.70	-817	0.70	-881
N-1: KFALLS-MERIDIAN 500 KV	0.70	-808	0.70	-2376	0.70	-353	0.70	-510	0.71	-4582	0.70	-2131	0.70	-822	0.70	-885
N-1: KNIGHT-WAUTOMA 500 KV	0.70	-807	0.70	-2375	0.70	-354	0.70	-506	0.73	-4597	0.70	-2129	0.70	-819	0.70	-883
N-1: LAGRANDE-NORTH POWDER 230 KV	0.70	-801	0.70	-2299	0.70	-353	0.70	-497	0.72	-4678	0.70	-2087	0.70	-812	0.70	-877
N-1: LANES-MARION 500 KV	0.70	-807	0.70	-2380	0.70	-354	0.70	-507	0.72	-4601	0.70	-2132	0.70	-819	0.70	-884
N-1: LIT GOOSE-CENTRAL FERRY 500 KV	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.71	-4696	0.70	-2134	0.70	-820	0.70	-885
N-1: LIT GOOSE-LOW MON 500 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-507	0.72	-4691	0.70	-2134	0.70	-820	0.70	-885
N-1: LOW GRAN-CENTRAL FERRY 500 KV	0.70	-808	0.70	-2384	0.70	-355	0.70	-507	0.72	-4691	0.70	-2133	0.70	-820	0.70	-884
N-1: LOW MON-SAC TAP 500 KV	0.70	-808	0.70	-2386	0.70	-355	0.70	-508	0.72	-4661	0.70	-2135	0.70	-820	0.70	-885
N-1: MALIN 500/230 XFMR	0.70	-791	0.70	-2387	0.70	-253	0.70	-512	0.71	-4704	0.70	-2136	0.70	-824	0.70	-869
N-1: MALIN-HILLTOP 230 KV	0.70	-787	0.70	-2367	0.70	-177	0.70	-550	0.71	-4630	0.70	-2137	0.70	-855	0.72	-879
N-1: MALIN-ROUND MTN #1 500 KV	0.70	-806	0.70	-2387	0.70	-353	0.70	-503	0.71	-4249	0.70	-2137	0.70	-815	0.70	-882
N-1: MALIN-ROUND MTN #2 500 KV	0.70	-806	0.70	-2387	0.70	-352	0.70	-503	0.71	-4229	0.70	-2137	0.70	-815	0.70	-882
N-1: MALIN-SUMMER LAKE 500 KV	0.70	-793	0.70	-2353	0.70	-350	0.70	-489	0.70	-4457	0.70	-2135	0.70	-803	0.70	-868
N-1: MAPLE VLY-ROCKY RH 345 KV	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.72	-4688	0.70	-2135	0.70	-820	0.70	-885
N-1: MARION-PEARL 500 KV	0.70	-810	0.70	-2391	0.70	-357	0.70	-510	0.72	-4596	0.70	-2138	0.70	-821	0.70	-887
N-1: MARION-SANTIAM 500 KV	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.72	-4699	0.70	-2135	0.70	-820	0.70	-885
N-1: MCLOUGLIN-OSTRANDER 230 KV	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.71	-4689	0.70	-2135	0.70	-820	0.70	-885
N-1: MCNARY 500/230 KV XFMR	0.70	-806	0.70	-2358	0.70	-356	0.70	-505	0.79	-4531	0.70	-2119	0.70	-818	0.70	-883
N-1: MCNARY-BOARD T1 230 KV	0.70	-808	0.70	-2396	0.70	-356	0.70	-508	0.71	-4709	0.70	-2140	0.70	-820	0.70	-885
N-1: MCNARY-JOHN DAY 500 KV	0.70	-805	0.70	-2367	0.70	-354	0.70	-504	0.73	-4579	0.70	-2126	0.70	-817	0.70	-882
N-1: MCNARY-LONGHORN 500 KV	0.70	-808	0.70	-2368	0.70	-356	0.70	-508	0.71	-4680	0.70	-2130	0.70	-820	0.70	-885
N-1: MCNARY-ROSS 345 KV	0.70	-807	0.70	-2378	0.70	-355	0.70	-507	0.73	-4617	0.70	-2131	0.70	-819	0.70	-884
N-1: MCNARY-ROUNDUP 230 KV	0.70	-803	0.70	-2325	0.70	-354	0.70	-500	0.71	-4694	0.70	-2101	0.70	-815	0.70	-880
N-1: MCNARY-SAC TAP-LOW MON 500 KV	0.70	-808	0.70	-2381	0.70	-355	0.70	-508	0.73	-4601	0.70	-2133	0.70	-820	0.70	-884
N-1: MIDPOINT-HEMINGWAY 500 KV	0.70	-770	0.70	-1785	0.70	-345	0.70	-449	0.72	-4655	0.70	-1508	0.70	-779	0.70	-842
N-1: MIDPOINT-HUMBOLDT 345 KV	0.70	-858	0.70	-2243	0.70	-387	0.70	-369	0.75	-4438	0.70	-2059	0.70	-712	0.72	-925

Appendix I - 16la1sa_3400idnw_nv Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin

Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hilltop		Humboldt		Malin		Midpoint		Robinson		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: NAPAVINE-PAUL 500 KV	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.71	-4703	0.70	-2136	0.70	-820	0.70	-885
N-1: OLYMPIA-PAUL 500 KV	0.70	-808	0.70	-2391	0.70	-356	0.70	-508	0.71	-4737	0.70	-2136	0.70	-820	0.70	-885
N-1: ONTARIO-CALDWELL 230 KV	0.70	-808	0.70	-2349	0.70	-356	0.70	-508	0.71	-4704	0.70	-2110	0.70	-820	0.70	-885
N-1: OSTRANDER-KNIGHT 500 KV	0.70	-807	0.70	-2377	0.70	-354	0.70	-507	0.73	-4587	0.70	-2131	0.70	-819	0.70	-884
N-1: OSTRANDER-PEARL 500 KV	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.71	-4681	0.70	-2136	0.70	-820	0.70	-885
N-1: OSTRANDER-TROUTDALE 500 KV	0.70	-808	0.70	-2386	0.70	-355	0.70	-508	0.72	-4674	0.70	-2134	0.70	-820	0.70	-885
N-1: OXBOW-BROWNLEE #2 230 KV	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.71	-4706	0.70	-2134	0.70	-820	0.70	-885
N-1: OXBOW-LOLO 230 KV	0.70	-800	0.70	-2275	0.70	-352	0.70	-495	0.72	-4648	0.70	-2075	0.70	-811	0.70	-876
N-1: PAUL-SATSOP 500 KV	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.72	-4671	0.70	-2135	0.70	-820	0.70	-885
N-1: PEARL-KEELER 500 KV	0.70	-808	0.70	-2387	0.70	-356	0.70	-508	0.73	-4596	0.70	-2136	0.70	-820	0.70	-885
N-1: PINTO-FOUR CORNER 345 KV	0.70	-786	0.70	-2181	0.70	-352	0.70	-465	0.75	-4434	0.70	-1991	0.70	-757	0.70	-859
N-1: PONDEROSA A 500/230 KV XFMR	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.71	-4702	0.70	-2136	0.70	-820	0.70	-885
N-1: PONDEROSA B 500/230 KV XFMR	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.71	-4708	0.70	-2135	0.70	-820	0.70	-885
N-1: POPULUS-CEDAR HILL-HEMINGWAY 500 KV	0.70	-801	0.70	-2191	0.70	-355	0.70	-514	0.70	-4877	0.70	-2075	0.70	-804	0.70	-878
N-1: RAVER-PAUL 500 KV	0.70	-809	0.70	-2391	0.70	-356	0.70	-509	0.72	-4680	0.70	-2137	0.70	-821	0.70	-885
N-1: RAVER-TACOMA 500 KV	0.70	-808	0.70	-2388	0.70	-355	0.70	-508	0.72	-4686	0.70	-2135	0.70	-820	0.70	-885
N-1: RED BUTTE-HARRY ALLEN 345 KV	0.70	-779	0.70	-2136	0.70	-352	0.70	-449	0.75	-4376	0.70	-1953	0.70	-733	0.70	-850
N-1: ROBINSON-HARRY ALLEN 500 KV	0.70	-775	0.70	-2380	0.70	-345	0.70	-448	0.73	-4627	0.70	-2132	0.70	-421	0.71	-837
N-1: ROCK CK-WAUTOMA 500 KV	0.70	-807	0.70	-2379	0.70	-355	0.70	-507	0.73	-4584	0.70	-2132	0.70	-820	0.70	-884
N-1: ROUND MTN-TABLE MTN 500 KV	0.70	-807	0.70	-2393	0.70	-355	0.70	-504	0.71	-4479	0.70	-2139	0.70	-817	0.70	-884
N-1: ROUNDUP-LAGRANDE 230 KV	0.70	-802	0.70	-2313	0.70	-353	0.70	-499	0.71	-4685	0.70	-2095	0.70	-814	0.70	-879
N-1: SCHULTZ-SICKLER 500 KV	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.72	-4692	0.70	-2135	0.70	-820	0.70	-885
N-1: SCHULTZ-VANTAGE 500 KV	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.72	-4662	0.70	-2135	0.70	-820	0.70	-885
N-1: SCHULTZ-WAUTOMA 500 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-508	0.73	-4594	0.70	-2135	0.70	-820	0.70	-885
N-1: SIGURD-GLEN CANYON 230 KV	0.70	-802	0.70	-2343	0.70	-354	0.70	-497	0.72	-4643	0.70	-2105	0.70	-803	0.70	-878
N-1: SLATT 500/230 KV XFMR	0.70	-808	0.70	-2384	0.70	-355	0.70	-508	0.72	-4687	0.70	-2134	0.70	-820	0.70	-885
N-1: SLATT-LONGHORN 500 KV	0.70	-807	0.70	-2380	0.70	-355	0.70	-506	0.72	-4662	0.70	-2132	0.70	-819	0.70	-884
N-1: SNOK TAP-SNOKING 500 KV	0.70	-808	0.70	-2386	0.70	-355	0.70	-508	0.72	-4690	0.70	-2134	0.70	-820	0.70	-885
N-1: TABLE MTN-TESLA 500 KV	0.70	-809	0.70	-2401	0.70	-357	0.70	-506	0.71	-4553	0.70	-2143	0.70	-818	0.70	-886
N-1: TABLE MTN-VACA DIXON 500 KV	0.70	-810	0.70	-2407	0.70	-357	0.70	-504	0.71	-4431	0.70	-2147	0.70	-816	0.70	-886
N-1: VANTAGE 500/230 KV XFMR #1	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.71	-4705	0.70	-2136	0.70	-820	0.70	-885
N-1: VANTAGE 500/230 KV XFMR #2	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.71	-4706	0.70	-2136	0.70	-820	0.70	-885
N-1: WALLA WALLA-TALBOT 230 KV	0.70	-808	0.70	-2388	0.70	-355	0.70	-508	0.71	-4702	0.70	-2135	0.70	-820	0.70	-885
N-1: WALLA WALLA-WALLULA 230 KV	0.70	-807	0.70	-2369	0.70	-355	0.70	-506	0.71	-4722	0.70	-2125	0.70	-819	0.70	-884
N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.70	-804	0.70	-2345	0.70	-352	0.70	-504	0.74	-4373	0.70	-2117	0.70	-817	0.70	-881
N-2: ASHE-MARION & BUCKLEY-MARION 500 KV	0.70	-803	0.70	-2352	0.70	-350	0.70	-503	0.75	-4295	0.70	-2119	0.70	-816	0.70	-879
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.70	-799	0.70	-2351	0.70	-349	0.70	-498	0.74	-4302	0.70	-2118	0.70	-812	0.70	-876
N-2: ASHE-MARION & SLATT-COYOTE TAP-LONGHORN 500 KV	0.70	-804	0.70	-2358	0.70	-352	0.70	-503	0.74	-4451	0.70	-2121	0.70	-817	0.70	-881
N-2: ASHE-MARION & SLATT-JOHN DAY 500 KV	0.70	-802	0.70	-2357	0.70	-351	0.70	-501	0.74	-4426	0.70	-2123	0.70	-814	0.70	-878
N-2: ASHE-SLATT & MCNARY-JOHN DAY 500 KV	0.70	-804	0.70	-2348	0.70	-353	0.70	-503	0.74	-4462	0.70	-2119	0.70	-816	0.70	-881
N-2: ASHE-SLATT & SLATT-COYOTE TAP-LONGHORN 500 KV	0.70	-806	0.70	-2360	0.70	-354	0.70	-506	0.73	-4545	0.70	-2125	0.70	-818	0.70	-883
N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.70	-795	0.70	-2149	0.70	-347	0.70	-500	0.76	-4465	0.70	-1978	0.70	-811	0.70	-871
N-2: BETHEL-CEDAR SPRING 500 KV & BETHEL-ROUND BUTTE 230 KV	0.70	-803	0.70	-2370	0.70	-351	0.70	-503	0.75	-4389	0.70	-2130	0.70	-816	0.70	-880
N-2: BETHEL-CEDAR SPRING 500 KV & BETHEL-SANTIAM 230 KV	0.70	-803	0.70	-2371	0.70	-351	0.70	-503	0.76	-4357	0.70	-2131	0.70	-816	0.70	-880
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-CHEMAWA 230 KV	0.70	-807	0.70	-2379	0.70	-354	0.70	-507	0.73	-4591	0.70	-2132	0.70	-820	0.70	-884
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-TROUTDALE 230 KV	0.70	-807	0.70	-2381	0.70	-354	0.70	-508	0.73	-4596	0.70	-2133	0.70	-820	0.70	-884
N-2: BOISE BENCH-BROWNLEE #1 & #2 230 KV	0.70	-808	0.70	-2311	0.70	-356	0.70	-506	0.71	-4696	0.70	-2064	0.70	-820	0.70	-885
N-2: BOISE BENCH-BROWNLEE #3 & BOISE BENCH-HORSEFLAT#4 230 KV	0.70	-808	0.70	-2309	0.70	-356	0.70	-506	0.71	-4697	0.70	-2062	0.70	-820	0.70	-885
N-2: BRIDGER-POPULUS #1 & #2 345 KV	0.70	-810	0.70	-2220	0.70	-356	0.70	-508	0.71	-4700	0.70	-1919	0.70	-821	0.70	-887
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV	0.70	-810	0.70	-2239	0.70	-356	0.70	-509	0.71	-4701	0.70	-1947	0.70	-822	0.70	-887
N-2: BROADVIEW-GARRISON #1 & #2 500 KV + RAS	0.70	-801	0.70	-2193	0.70	-350	0.70	-511	0.71	-4909	0.70	-1961	0.70	-820	0.70	-878
N-2: BROWNLEE-HELLS CANYON & OXBOW-LOLO 230 KV	0.70	-796	0.70	-2169	0.70	-351	0.70	-488	0.71	-4686	0.70	-2017	0.70	-807	0.70	-871

Appendix I - 16la1sa_3400idnw_nv Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

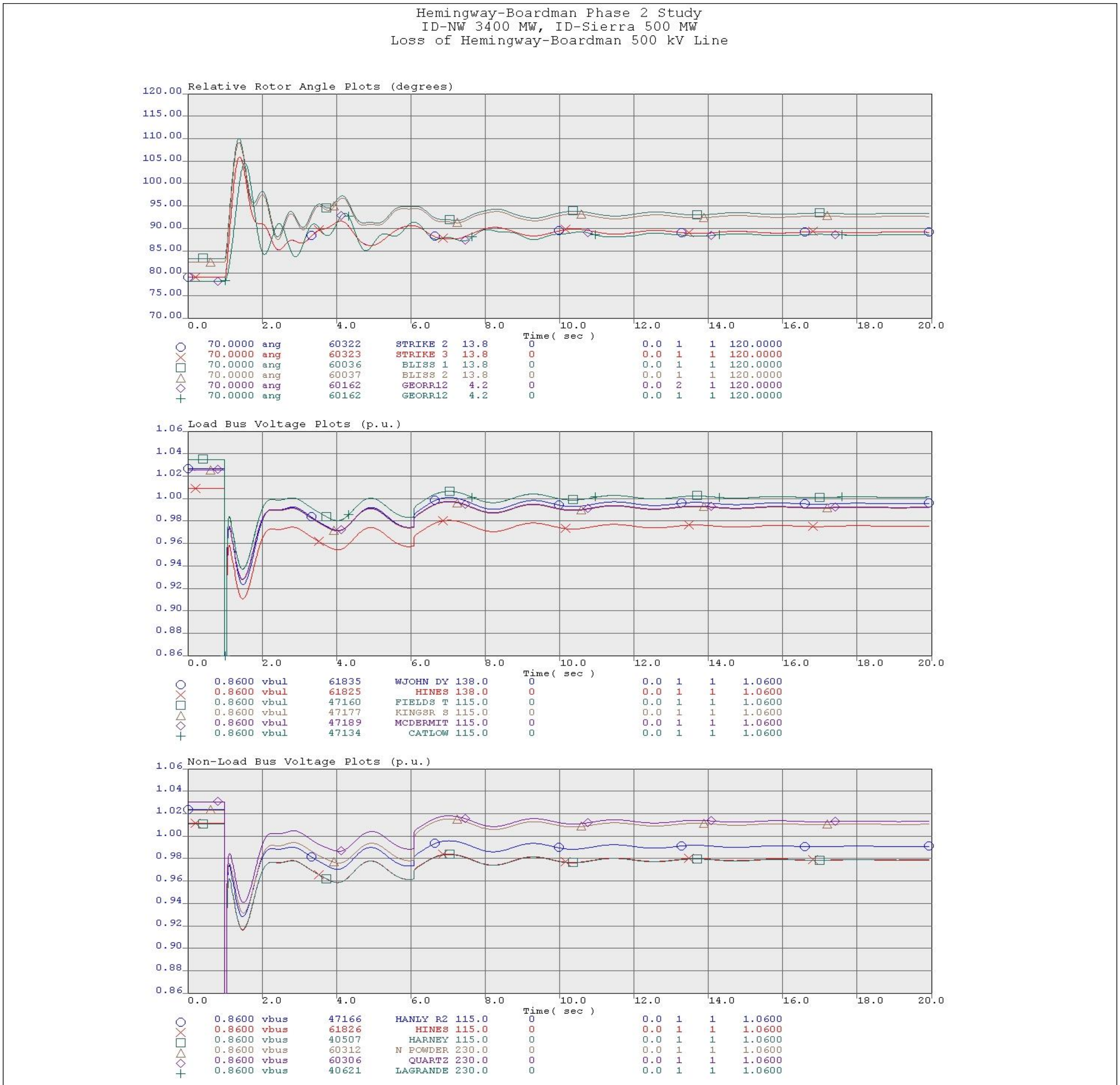
Contingency Name	Bordertown		Hemingway		Hilltop		Humboldt		Malin		Midpoint		Robinson		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: BROWNLEE-OXBOW & BROWNLEE-HELLS CANYON 230 KV	0.70	-806	0.70	-2335	0.70	-355	0.70	-506	0.71	-4755	0.70	-2108	0.70	-819	0.70	-883
N-2: BUCKLEY-MARION & JOHN DAY-MARION 500 KV	0.70	-804	0.70	-2356	0.70	-350	0.70	-505	0.75	-4342	0.70	-2123	0.70	-818	0.70	-881
N-2: CHIEF JO-MONROE & CHIEF JO-SICKLER 500 KV	0.70	-807	0.70	-2376	0.70	-355	0.70	-507	0.73	-4597	0.70	-2130	0.70	-819	0.70	-884
N-2: CHIEF JO-MONROE 500 KV & CHIEF JO-SNOHOMS4 345 KV	0.70	-807	0.70	-2378	0.70	-355	0.70	-507	0.73	-4603	0.70	-2131	0.70	-819	0.70	-884
N-2: CHIEF JO-MONROE 500 KV & MONROE-SAMMAMSH 230 KV	0.70	-807	0.70	-2381	0.70	-355	0.70	-507	0.72	-4624	0.70	-2132	0.70	-820	0.70	-884
N-2: CHIEF JO-SICKLER 500 KV & CHIEF J3-SNOHOMS3 345 KV	0.70	-808	0.70	-2383	0.70	-355	0.70	-507	0.72	-4655	0.70	-2133	0.70	-820	0.70	-884
N-2: COULEE-CHIEF JO 500 KV & CHIEF J4-SNOHOMS4 345 KV	0.70	-807	0.70	-2380	0.70	-355	0.70	-507	0.72	-4632	0.70	-2131	0.70	-820	0.70	-884
N-2: COULEE-HANFORD & HANFORD-VANTAGE 500 KV	0.70	-808	0.70	-2378	0.70	-354	0.70	-508	0.74	-4462	0.70	-2134	0.70	-820	0.70	-885
N-2: COULEE-SCHULTZ #1 & #2 500 KV	0.70	-806	0.70	-2360	0.70	-354	0.70	-505	0.74	-4523	0.70	-2121	0.70	-818	0.70	-883
N-2: CUSTERW-ING500 & CUSTERW-MONROE 500 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-508	0.72	-4665	0.70	-2134	0.70	-820	0.70	-885
N-2: CUSTERW-MONROE #1 & #2 500 KV	0.70	-808	0.70	-2382	0.70	-355	0.70	-507	0.73	-4624	0.70	-2132	0.70	-820	0.70	-884
N-2: DC-BIPOLE	0.70	-814	0.70	-2519	0.70	-365	0.70	-484	0.71	-4665	0.70	-2205	0.70	-796	0.70	-890
N-2: DOUBLE PALO VERDE	0.70	-829	0.70	-2419	0.70	-366	0.70	-461	0.74	-4063	0.70	-2125	0.70	-806	0.70	-904
N-2: ECHOLAKE-MAPLE VLY 500 KV & COVINGTON-MAPLE VLY 230 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-508	0.72	-4666	0.70	-2134	0.70	-820	0.70	-885
N-2: ECHOLAKE-MAPLE VLY 500 KV & ROCKY RH-MAPLE VLY 345 KV	0.70	-808	0.70	-2383	0.70	-355	0.70	-507	0.72	-4637	0.70	-2133	0.70	-820	0.70	-884
N-2: GARRISON-TAFT #1 & #2 500 KV + RAS	0.70	-795	0.70	-2159	0.70	-348	0.70	-499	0.73	-4758	0.70	-1972	0.70	-810	0.70	-871
N-2: GRASSLAND-CEDAR SPRING & SLATT - BUCKLEY 500 KV	0.70	-797	0.70	-2359	0.70	-349	0.70	-495	0.74	-4308	0.70	-2125	0.70	-809	0.70	-873
N-2: GRASSLAND-COYOTE & SLATT - LONGHORN 500 KV	0.70	-807	0.70	-2295	0.70	-354	0.70	-505	0.72	-4591	0.70	-2103	0.70	-819	0.70	-883
N-2: GRIZZLY-MALIN & GRIZZLY-CAPTAIN JACK 500 KV	0.70	-788	0.70	-2341	0.70	-337	0.70	-487	0.70	-4004	0.70	-2111	0.70	-802	0.70	-863
N-2: GRIZZLY-MALIN & GRIZZLY-SUMMER LAKE 500 KV	0.70	-800	0.70	-2321	0.70	-346	0.70	-500	0.70	-4259	0.70	-2107	0.70	-813	0.70	-876
N-2: GRIZZLY-MALIN & MALIN-SUMMER LAKE 500 KV	0.70	-775	0.70	-2343	0.70	-338	0.70	-468	0.70	-3964	0.70	-2134	0.70	-784	0.70	-848
N-2: HANFORD-ASHE & HANFORD-LOW MON 500 KV	0.70	-804	0.70	-2335	0.70	-352	0.70	-503	0.78	-4156	0.70	-2115	0.70	-816	0.70	-880
N-2: HANFORD-WAUTOMA #1 & #2 500 KV	0.70	-806	0.70	-2373	0.70	-355	0.70	-505	0.72	-4635	0.70	-2128	0.70	-818	0.70	-883
N-2: HELLS CANYON-BROWNLEE & OXBOW-LOLO 230 KV	0.70	-796	0.70	-2178	0.70	-351	0.70	-488	0.72	-4652	0.70	-2024	0.70	-807	0.70	-872
N-2: JOHN DAY-BIG EDDY #1 & #2 500 KV	0.70	-809	0.70	-2391	0.70	-355	0.70	-510	0.76	-4393	0.70	-2141	0.70	-822	0.70	-886
N-2: JOHN DAY-BIG EDDY & JOHN DAY-MARION 500 KV	0.70	-806	0.70	-2370	0.70	-353	0.70	-506	0.73	-4506	0.70	-2128	0.70	-819	0.70	-883
N-2: JOHN DAY-GRIZZLY #1 & #2 500 KV	0.70	-797	0.70	-2337	0.70	-344	0.70	-497	0.70	-4156	0.70	-2107	0.70	-811	0.70	-873
N-2: JOHN DAY-GRIZZLY #2 & BUCKLEY-GRIZZLY 500 KV	0.70	-800	0.70	-2356	0.70	-346	0.70	-500	0.70	-4351	0.70	-2117	0.70	-813	0.70	-876
N-2: JOHN DAY-MARION & BUCKLEY-MARION 500 KV	0.70	-804	0.70	-2356	0.70	-350	0.70	-505	0.75	-4342	0.70	-2123	0.70	-818	0.70	-881
N-2: JOHN DAY-MARION & MARION-PEARL 500 KV	0.70	-808	0.70	-2372	0.70	-354	0.70	-508	0.74	-4417	0.70	-2130	0.70	-820	0.70	-885
N-2: JOHN DAY-ROCK CREEK 500 KV & MCNARY-ROSS 345 KV	0.70	-806	0.70	-2368	0.70	-354	0.70	-505	0.73	-4513	0.70	-2126	0.70	-818	0.70	-883
N-2: KEELER-PEARL 500 & SHERWOOD-CARLTON 230 KV	0.70	-808	0.70	-2388	0.70	-356	0.70	-508	0.73	-4588	0.70	-2136	0.70	-820	0.70	-885
N-2: KNIGHT-OSTRANDER & OSTRANDER-BIG EDDY 500 KV	0.70	-806	0.70	-2369	0.70	-353	0.70	-507	0.74	-4421	0.70	-2128	0.70	-819	0.70	-883
N-2: KNIGHT-OSTRANDER 500 KV & MCNARY-ROSS 345 KV	0.70	-806	0.70	-2366	0.70	-353	0.70	-506	0.74	-4465	0.70	-2126	0.70	-818	0.70	-882
N-2: KNIGHT-OSTRANDER 500 KV & MIDWAY-BONNEVILLE 230 KV	0.70	-807	0.70	-2377	0.70	-354	0.70	-507	0.73	-4572	0.70	-2131	0.70	-819	0.70	-884
N-2: LOWER GRANITE-CENTRAL FERRY #1 & #2 500 KV	0.70	-802	0.70	-2307	0.70	-353	0.70	-498	0.73	-4573	0.70	-2086	0.70	-812	0.70	-878
N-2: MALIN-ROUND MTN #1 & #2 500 KV	0.70	-799	0.70	-2440	0.70	-355	0.70	-470	0.72	-2924	0.70	-2174	0.70	-784	0.70	-871
N-2: MCNARY-JOHN DAY & ROCK CREEK-JOHN DAY 500 KV	0.70	-804	0.70	-2356	0.70	-353	0.70	-503	0.72	-4472	0.70	-2120	0.70	-816	0.70	-880
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-HORSE HEAVEN 230 KV	0.70	-804	0.70	-2361	0.70	-353	0.70	-503	0.73	-4563	0.70	-2123	0.70	-816	0.70	-881
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-ROSS 345 KV	0.70	-804	0.70	-2353	0.70	-353	0.70	-502	0.74	-4464	0.70	-2119	0.70	-816	0.70	-880
N-2: MCNARY-ROSS 345 KV & MCNARY-HORSE HEAVEN 230 KV	0.70	-806	0.70	-2372	0.70	-354	0.70	-505	0.73	-4594	0.70	-2128	0.70	-818	0.70	-883
N-2: MIDPOINT-SUMMER LAKE 500 KV & MIDPOINT-KING 230 KV	0.70	-771	0.70	-1780	0.70	-346	0.70	-449	0.72	-4646	0.70	-1473	0.70	-780	0.70	-843
N-2: MONROE-CUSTERW & CHIEF JO-MONROE 500 KV	0.70	-807	0.70	-2379	0.70	-355	0.70	-507	0.73	-4590	0.70	-2131	0.70	-819	0.70	-884
N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV	0.70	-805	0.70	-2359	0.70	-353	0.70	-504	0.76	-4339	0.70	-2120	0.70	-817	0.70	-882
N-2: PAUL-NAPAVINE & PAUL-ALLSTON #2 500 KV	0.70	-807	0.70	-2378	0.70	-355	0.70	-507	0.73	-4605	0.70	-2130	0.70	-819	0.70	-884
N-2: PAUL-RAVER & RAVER-COVINGT4 500 KV	0.70	-809	0.70	-2391	0.70	-356	0.70	-509	0.72	-4669	0.70	-2137	0.70	-821	0.70	-885
N-2: PEARL-KEELER 500 KV & PEARL-SHERWOOD 230 KV	0.70	-808	0.70	-2388	0.70	-356	0.70	-508	0.73	-4592	0.70	-2136	0.70	-820	0.70	-885
N-2: PEARL-OSTRANDER 500 KV & BIG EDDY-MCLOUGLN 230 KV	0.70	-808	0.70	-2387	0.70	-355	0.70	-508	0.72	-4656	0.70	-2135	0.70	-820	0.70	-884
N-2: PEARL-OSTRANDER 500 KV & OSTRANDER-MCLOUGLN 230 KV	0.70	-808	0.70	-2390	0.70	-355	0.70	-508	0.72	-4662	0.70	-2136	0.70	-820	0.70	-885
N-2: RAVER-COVINGTON #1 & #2 500 KV	0.70	-808	0.70	-2389	0.70	-355	0.70	-508	0.72	-4684	0.70	-2136	0.70	-820	0.70	-885
N-2: RAVER-ECHO LAKE & RAVER-SCHULTZ 500 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-508	0.72	-4662	0.70	-2134	0.70	-820	0.70	-885
N-2: RAVER-PAUL & NAPAVINE-PAUL 500 KV	0.70	-809	0.70	-2391	0.70	-356	0.70	-509	0.72	-4671	0.70	-2137	0.70	-821	0.70	-885

Appendix I - 16la1sa_3400idnw_nv Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Hemingway		Hilltop		Humboldt		Malin		Midpoint		Robinson		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: RAVER-PAUL 500 KV & COULEE-OLYMPIA 300 KV	0.70	-808	0.70	-2388	0.70	-355	0.70	-509	0.72	-4640	0.70	-2136	0.70	-821	0.70	-885
N-2: RAVER-PAUL 500 KV & TACOMA A-CHEHALIS 230 KV	0.70	-809	0.70	-2394	0.70	-356	0.70	-509	0.72	-4679	0.70	-2139	0.70	-821	0.70	-886
N-2: RAVER-SCHULTZ #1 & #2 500 KV	0.70	-807	0.70	-2373	0.70	-354	0.70	-507	0.74	-4522	0.70	-2129	0.70	-819	0.70	-884
N-2: RAVER-TACOMA & RAVER-COVINGT4 500 KV	0.70	-808	0.70	-2388	0.70	-355	0.70	-508	0.72	-4668	0.70	-2135	0.70	-820	0.70	-885
N-2: RAVER-TACOMA 500 KV & TACOMA-CHRISTOP-COVINGTON 230 KV	0.70	-808	0.70	-2388	0.70	-355	0.70	-508	0.72	-4686	0.70	-2135	0.70	-820	0.70	-885
N-2: ROUND MTN-TABLE MTN #1 & #2 500 KV	0.70	-805	0.70	-2471	0.70	-365	0.70	-475	0.73	-3547	0.70	-2185	0.70	-789	0.70	-877
N-2: SCHULTZ-WAUTOMA & VANTAGE-SCHULTZ 500 KV	0.70	-808	0.70	-2384	0.70	-355	0.70	-508	0.74	-4485	0.70	-2136	0.70	-821	0.70	-885
N-2: SICKLER-SCHULTZ & SCHULTZ-VANTAGE 500 KV	0.70	-808	0.70	-2385	0.70	-355	0.70	-508	0.72	-4637	0.70	-2135	0.70	-820	0.70	-885
N-2: TABLE MTN-TESLA & TABLE MTN-VACA DIXON 500 KV	0.70	-816	0.70	-2475	0.70	-366	0.70	-490	0.73	-3993	0.70	-2187	0.70	-801	0.70	-891
N-2: TAFT-BELL 500KV & BELL-BOUNDARY #3 230KV	0.70	-798	0.70	-2241	0.70	-351	0.70	-494	0.77	-4311	0.70	-2048	0.70	-808	0.70	-874
N-2: TAFT-BELL 500KV & BELL-LANCASTER 230KV + RAS	0.70	-796	0.70	-2201	0.70	-349	0.70	-493	0.78	-4221	0.70	-2022	0.70	-807	0.70	-871
N-2: TAFT-BELL 500KV & BELL-TRENTWOOD #2 115KV	0.70	-798	0.70	-2241	0.70	-351	0.70	-493	0.77	-4317	0.70	-2047	0.70	-808	0.70	-873
N-2: TAFT-BELL 500KV & LANCASTER-NOXON 230KV + RAS	0.70	-797	0.70	-2225	0.70	-350	0.70	-494	0.78	-4283	0.70	-2038	0.70	-808	0.70	-873
N-2: TAFT-DWORSHAK & GARRISON-TAFT #1 500KV	0.70	-801	0.70	-2282	0.70	-353	0.70	-498	0.74	-4543	0.70	-2066	0.70	-811	0.70	-877
N-2: WAUTOMA-ROCK CK 500 KV & MIDWAY-BIG EDDY 230 KV	0.70	-807	0.70	-2379	0.70	-355	0.70	-507	0.73	-4572	0.70	-2132	0.70	-820	0.70	-884
N-2: WAUTOMA-ROCK CK 500 KV & SPRINGCREEK-BIG EDDY 230 KV	0.70	-807	0.70	-2379	0.70	-355	0.70	-507	0.73	-4572	0.70	-2132	0.70	-820	0.70	-884
N-3: SCHULTZ-RAVER #1 & #2 & #3 500 KV	0.70	-807	0.70	-2373	0.70	-354	0.70	-507	0.74	-4507	0.70	-2129	0.70	-819	0.70	-884

Appendix I – 16la1sa_3400idnw_nv Base Case Transient Stability Plots



Loss of Hemingway-Boardman 500 kV line
3ph fault @ HMWY 500 kV clear in 3 Cycles
RAS: Inserted LGBP 230 kV 52.2 Mvar MSC @ 5 Seconds
Inserted PTSN 230 kV 31.7 Mvar MSC @ 5 Seconds
ALL COMMENTS FROM THE TSS REVIEW ARE INCLUDED

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Figure I5: N-1 Loss of Hemingway-Boardman 500 kV Line (Angle & Voltage Plots)

Appendix I – 16la1sa_3400idnw_nv Base Case Transient Stability Plots

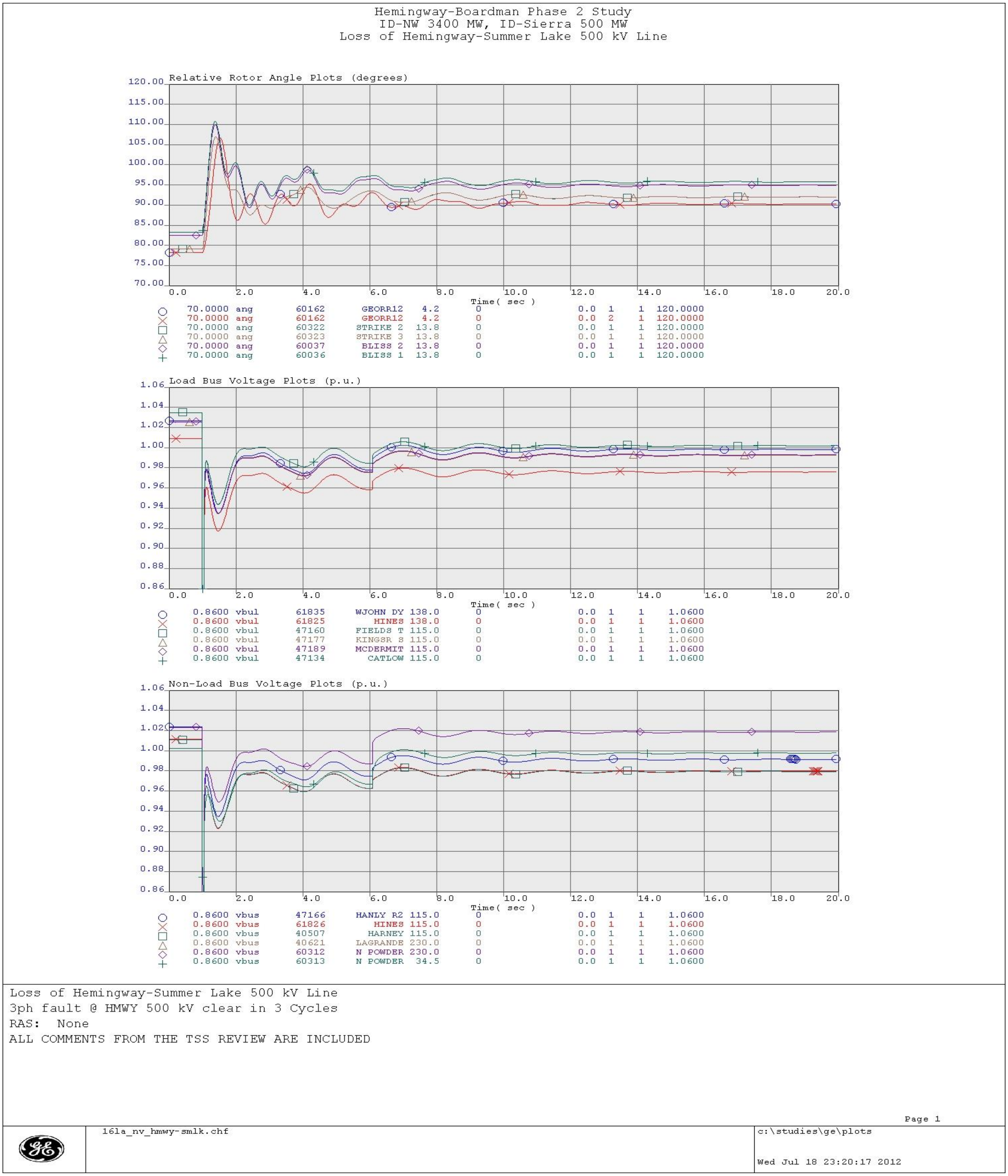


Figure I6: N-1 Loss of Hemingway-Summer Lake 500 kV Line (Angle & Voltage Plots)

Appendix I – 16la1sa_3400idnw_nv Base Case Transient Stability Plots

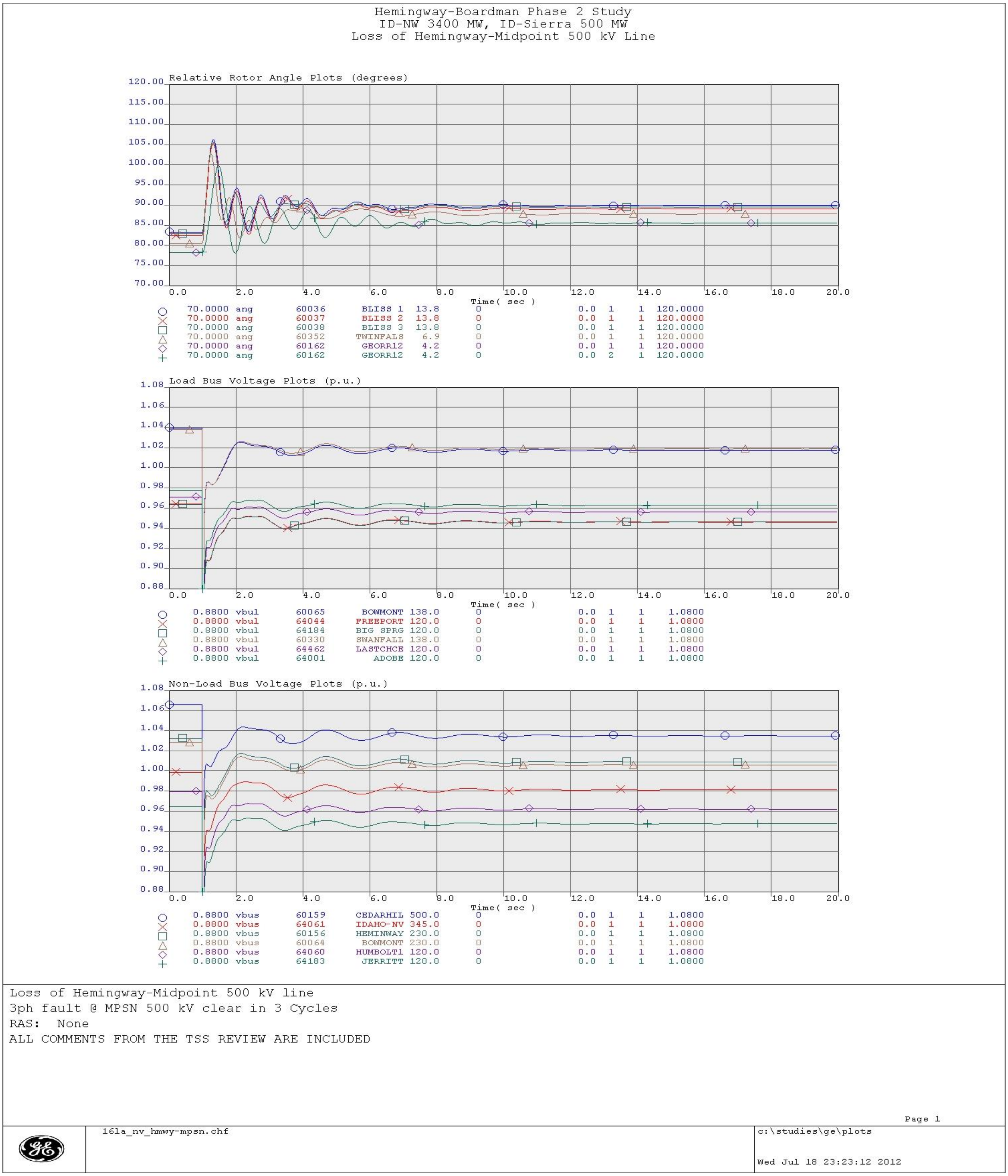


Figure I7: N-1 Loss of Hemingway-Midpoint 500 kV Line (Angle & Voltage Plots)

Appendix I – 16la1sa_3400idnw_nv Base Case Transient Stability Plots

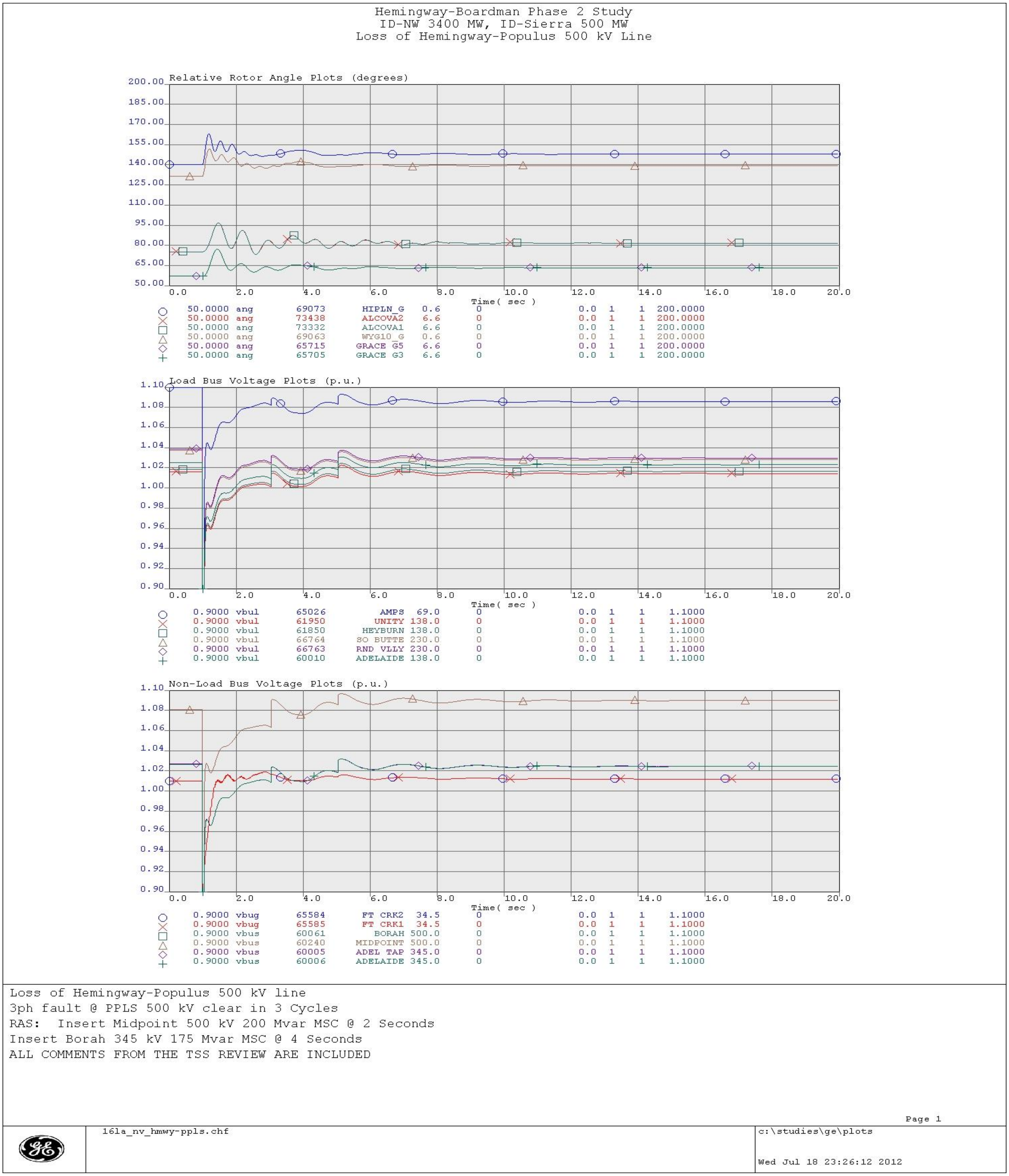


Figure I8: N-1 Loss of Hemingway-Populus 500 kV Line (Angle & Voltage Plots)

Appendix I – 16la1sa_3400idnw_nv Base Case Transient Stability Plots

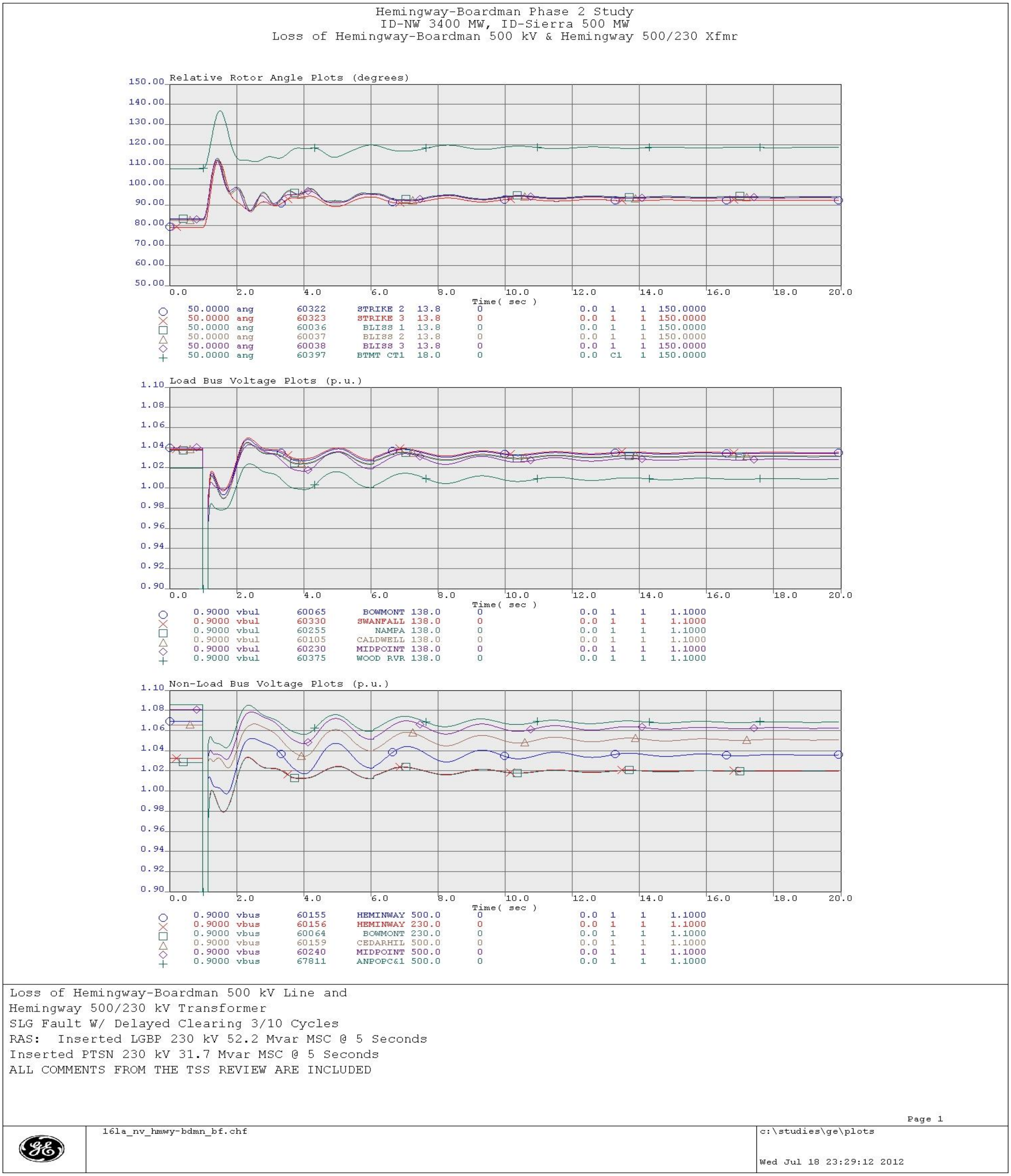


Figure I9: Breaker Failure Loss of Hemingway-Boardman 500 kV & Hemingway 500/230 Xfmr (Angle & Voltage Plots)

Appendix I – 16la1sa_3400idnw_nv Base Case Transient Stability Plots

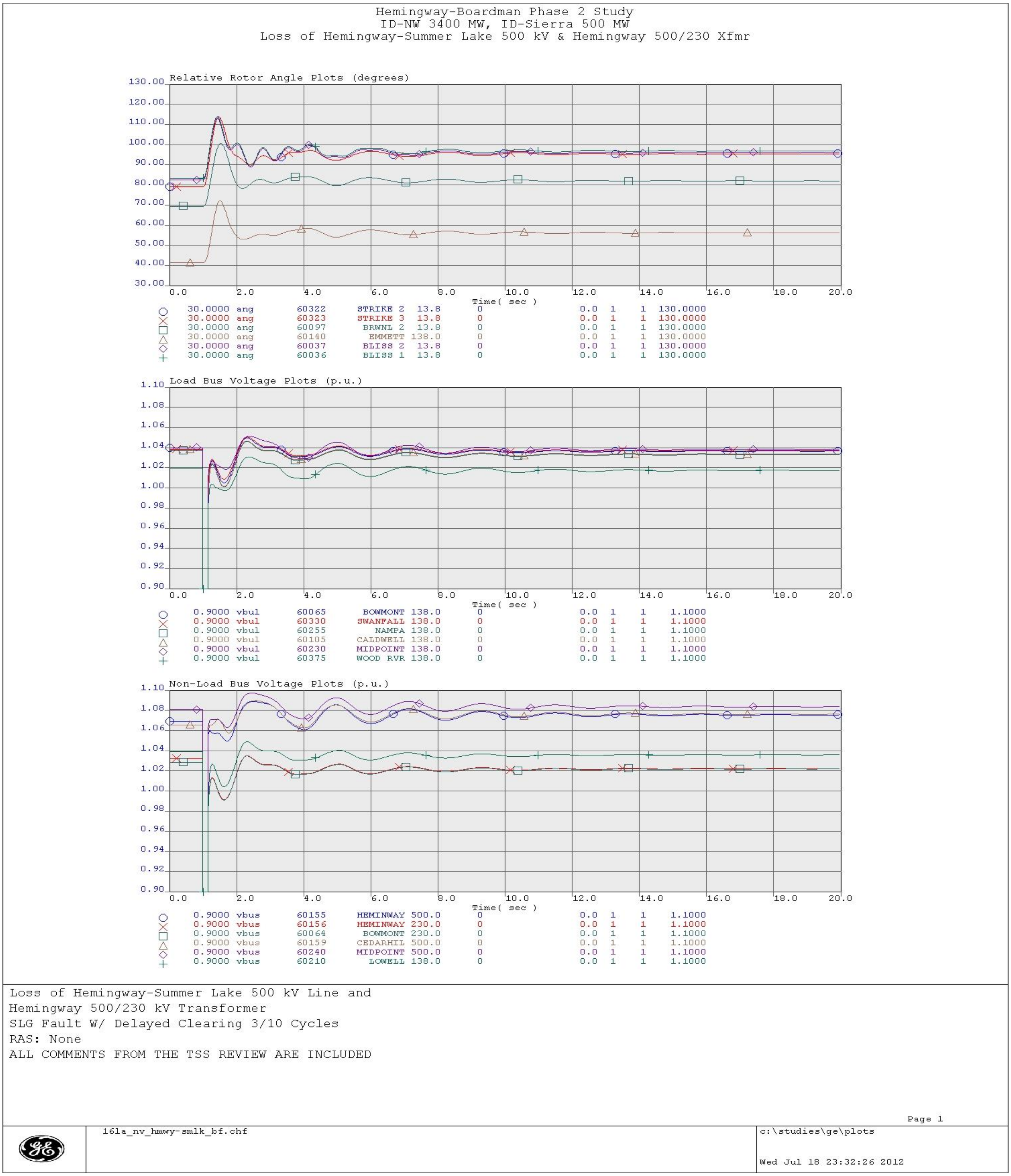
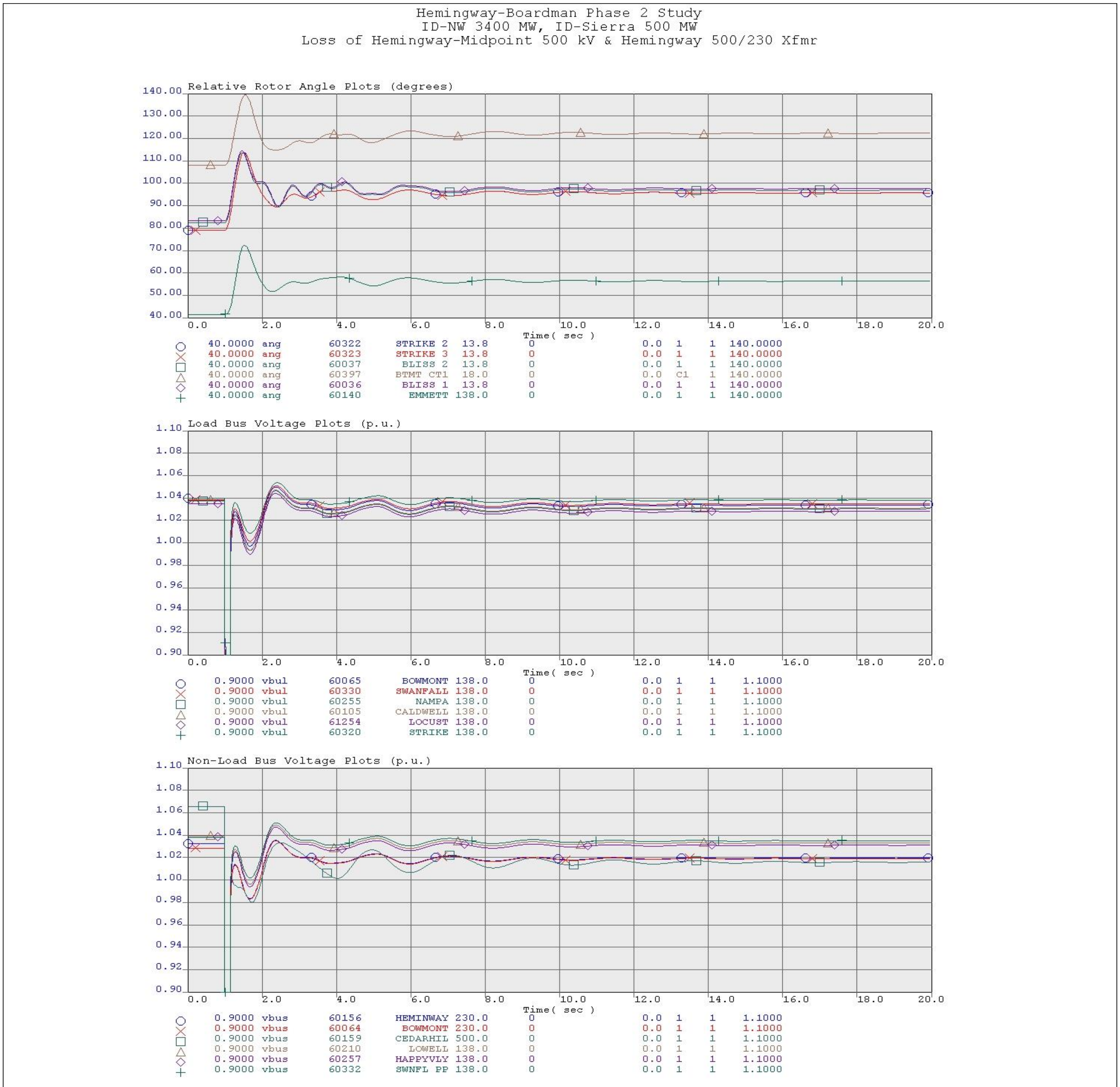


Figure I10: Breaker Failure Loss of Hemingway-Summer Lake 500 kV & Hemingway 500/230 Xfmr (Angle & Voltage Plots)

Appendix I – 16la1sa_3400idnw_nv Base Case Transient Stability Plots



Loss of Hemingway-Midpoint 500 kV Line and
Hemingway 500/230 kV Transformer
SLG Fault W/ Delayed Clearing 3/10 Cycles
RAS: None
ALL COMMENTS FROM THE TSS REVIEW ARE INCLUDED

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Figure I11: Breaker Failure Loss of Hemingway-Midpoint 500 kV & Hemingway 500/230 Xfmr (Angle & Voltage Plots)

Appendix I – 16la1sa_3400idnw_nv Base Case Transient Stability Plots

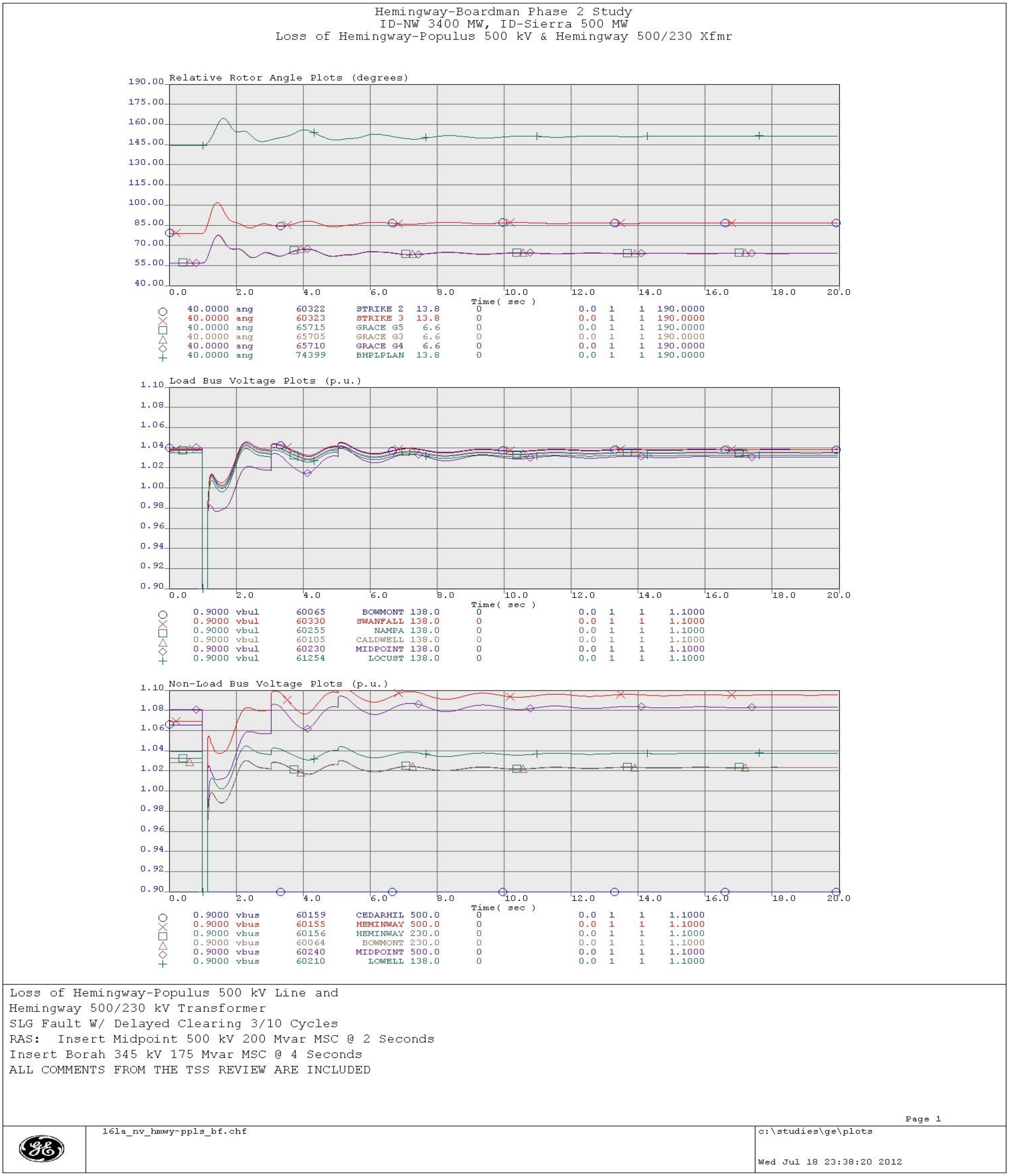
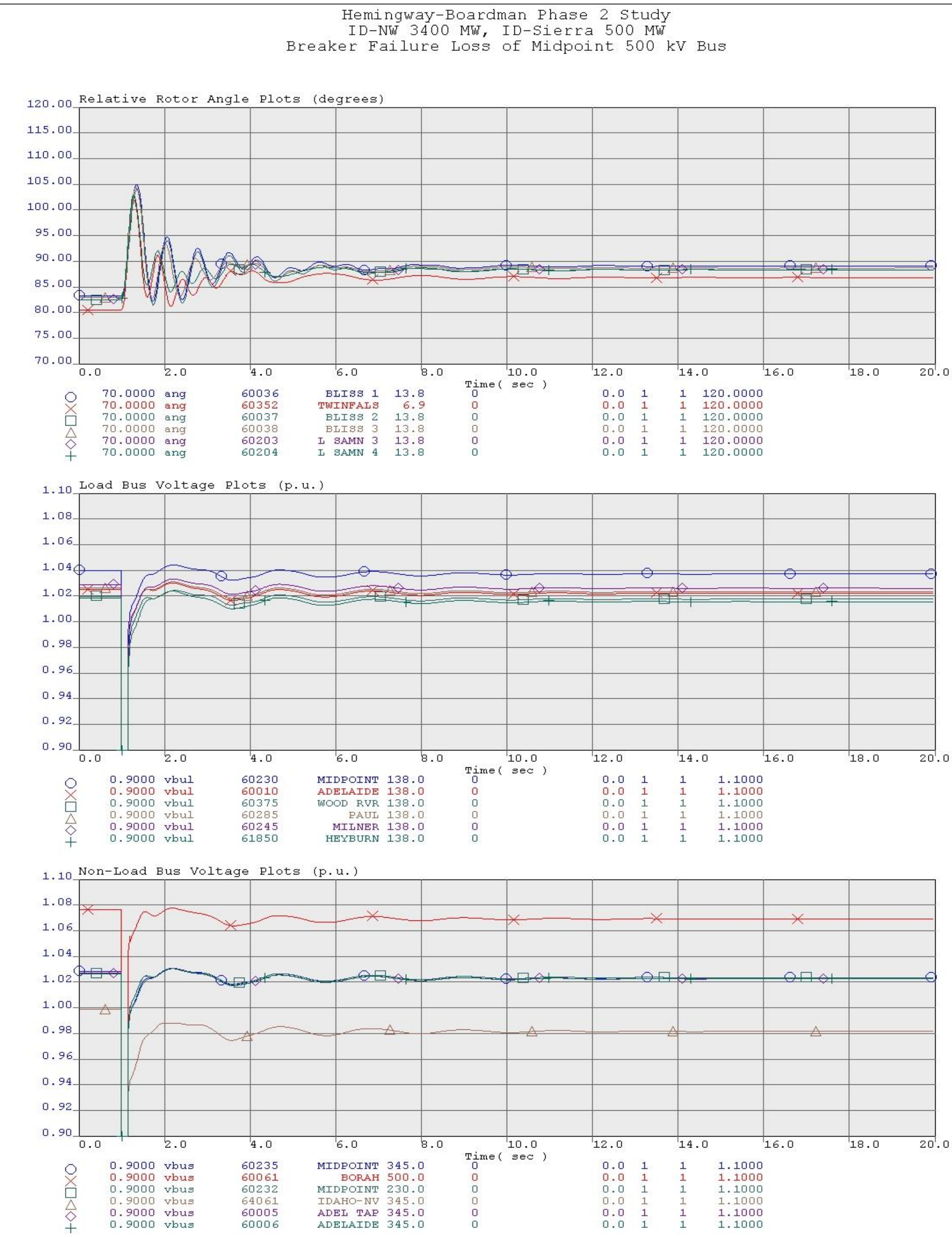


Figure I12: Breaker Failure Loss of Hemingway-Populus 500 kV & Hemingway 500/230 Xfmr (Angle & Voltage Plots)

Appendix I – 16la1sa_3400idnw_nv Base Case Transient Stability Plots



Loss of Midpoint-Hemingway 500 kV Line and
Midpoint 500/345 kV Transformer
Open-ends Midpoint-Borah 500 kV Line (Tripped @ 12 Cycles)
SLG fault @ MPSN 500 kV w/ Delayed Clearing in 3/10 Cycles
RAS: None
ALL COMMENTS FROM THE TSS REVIEW ARE INCLUDED

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Figure I13: Breaker Failure Midpoint 500 kV Bus (Angle & Voltage Plots)

Appendix I - 16la1sa_3400idnw_nv Base Case Transient Stability Results

Fault	Disturbance/Outage	RAS Actions		Largest Swing Voltage Bus (% change)	Lowest Swing Voltage Bus (absolute value)	Largest Swing Voltage Load Bus (% change)	Lowest Load Bus Frequency (Hz)	Comments
		Cycles	Remedial Action					
N-1 3 Cy 3PH Hemingway 500 kV	Hemingway-Grassland 500 kV	305 305	LaGrande 52 Mvar 230 kV MSC Peterson 31.7 Mvar 230 kV MSC	Wjohn Dy 138 -8.5%	Humboldt1 50 0.888	Wjohn Dy 138 -8.5%	Arapasub 115 59.926	Stable & Damped
N-1 3 Cy 3PH Hemingway 500 kV	Hemingway-Summer Lake 500 kV		None	Wjohn Dy 138 -9.0%	Humboldt1 50 0.893	Wjohn Dy 138 -9.0%	Arapasub 115 59.927	Stable & Damped
N-1 3 Cy 3PH Midpoint 500 kV	Hemingway-Midpoint 500 kV		None	Cedarhil 500 -5.8%	Big Sprg 120 0.908	Bowmont 138 -5.5%	Hipln_g 0.6 59.920	Stable & Damped
N-1 3 Cy 3PH Populus 500 kV	Hemingway-Populus 500 kV	123 243	Midpoint 500 kV 200 Mvar MSC Borah 345 kV 175 Mvar MSC	Ft Crk1 34.5 -6.8%	Humboldt1 50 0.901	Amps 69 -5.5%	Hipln_g 0.6 59.845	Stable & Damped
Breaker Failure 3/10 Cy SLG Hemingway 500 kV	Hemingway-Grassland 500 kV Hemingway 500/230 kV Xfmr	305 305	LaGrande 52 Mvar 230 kV MSC Peterson 31.7 Mvar 230 kV MSC	Wjohn Dy 138 -12.2%	Humboldt1 50 0.885	Wjohn Dy 138 -12.2%	Lgpr St1 13.8 59.893	Stable & Damped
Breaker Failure 3/10 Cy SLG Hemingway 500 kV	Hemingway-Summer Lake 500 kV Hemingway 500/230 kV Xfmr		None	Wjohn Dy 138 -11.4%	Humboldt1 50 0.892	Wjohn Dy 138 -11.4%	Helscyn1 14.4 59.897	Stable & Damped
Breaker Failure 3/10 Cy SLG Hemingway 500 kV	Hemingway-Midpoint 500 kV Hemingway 500/230 kV Xfmr		None	Wjohn Dy 138 -12.7%	Humboldt1 50 0.884	Wjohn Dy 138 -12.7%	Lgpr St1 13.8 59.892	Stable & Damped
Breaker Failure 3/10 Cy SLG Hemingway 500 kV	Hemingway-Populus 500 kV Hemingway 500/230 kV Xfmr	123 243	Midpoint 500 kV 200 Mvar MSC Borah 345 kV 175 Mvar MSC	Wjohn Dy 138 -7.3%	Humboldt1 50 0.901	Wjohn Dy 138 -7.3%	Rd_Nixon 20 59.886	Stable & Damped
Breaker Failure 3/10 Cy SLG Midpoint 500 kV	Midpoint-Hemingway 500 kV Midpoint 500/345 kV Xfmr Open Midpoint-Borah 500kV		None	Freeport 120 -5.6%	Humboldt1 50 0.888	Freeport 120 -5.6%	Bliss 3 13.8 59.913	Stable & Damped

Appendix I - 16la1sa_3400idnw_nv Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Shunt HANFORD_500.0 (40499) #s
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Bus MALIN R3_500.0 (40688)
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Shunt HOT SPR_500.0 (40553) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN Shunt DWORSHAK_500.0 (40369) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN Shunt HOT SPR_500.0 (40553) #s
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Bus HOT SPR_500.0 (40553)
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt DWORSHAK_500.0 (40369) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 81 MVR
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP S1_ 18.0 (47641)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G2_ 18.0 (47640)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G1_ 18.0 (47639)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 2
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1

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Contingency	Actions Taken in the Contingency
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Bus SANTIAM_500.0 (40941)
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN Bus SNOK TAP_500.0 (41001)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN Bus SNOKING_500.0 (41007)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR G2_ 20.0 (47744)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2AX_ 4.2 (47746)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2FG_ 13.8 (47747)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR G1_ 20.0 (47740)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1AX_ 4.2 (47742)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1FG_ 13.8 (47743)
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Transformer TONO_115.0 (42806) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Shunt OLY E_230.0 (40794) #s
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 109.8 MVR
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN Shunt MONROE_500.0 (40749) #s
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Transformer ALLSTON_500.0 (40045) TO ALLSTN E_230.0 (40043) CKT 2

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Contingency	Actions Taken in the Contingency
BF 4708 Hatwai 500 kV Bus	OPEN Bus HATWAI_500.0 (40521)
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Transformer CHIEF JO_500.0 (40233) TO CHIEF J2_230.0 (40232) CKT 3
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Transformer BIG EDDY_500.0 (40111) TO BIGEDDY1_230.0 (41341) CKT 2
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Bus CGS_ 25.0 (40063)
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN Bus BURNS_500.0 (45029)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R3_500.0 (40688)
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN Bus ROUND BU_500.0 (43485)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Bus MAPLE VL_500.0 (40693)
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M1_500.0 (43115)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 81 MVR
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G1_ 18.0 (47639) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G2_ 18.0 (47640) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP S1_ 18.0 (47641) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1

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Contingency	Actions Taken in the Contingency
BF 5266 Slatt-Buckly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Bus BURNS_500.0 (45029)
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 400 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BYPASS SeriesCap MIDPOINT_500.0 (60240) TO MIDHEM11_500.0 (61988) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 400 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS AMPS_ 69.0 (65026) TO 30 MVR
BF Lolo 230kV	OPEN Bus LOLO_230.0 (48197)
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Gen BOARD CT_ 18.5 (43044) #1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Transformer BOARD ST_ 16.0 (43045) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Transformer BOARD CT_ 18.5 (43044) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Gen BOARD ST_ 16.0 (43045) #1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Line COYOTE_500.0 (43123) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Transformer BOARD F_ 24.0 (43047) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Gen BOARD F_ 24.0 (43047) #1
Bus: Alvey 500 kV	OPEN Bus ALVEY_500.0 (40051)
Bus: Bell BPA 500 kV	OPEN Bus BELL BPA_500.0 (40091)
Bus: Bell BPA 500 kV	OPEN Bus COULE R1_500.0 (40288)
Bus: Bell BPA 500 kV	OPEN Bus BELL SC_500.0 (40096)
Bus: Buckley 500 kV	OPEN Bus BUCKLEY_500.0 (40155)
Bus: Dixonville 500 kV	OPEN Bus DIXONVLE_500.0 (45095)
Bus: Hot Springs 500 kV	OPEN Bus HOT SPR_500.0 (40553)
Bus: Keeler 500 kV	OPEN Bus KEELER_500.0 (40601)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_500.0 (41401)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_230.0 (41402)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_230.0 (47386)
Bus: Rock Creek 500 kV	OPEN Bus ENRGZR T_230.0 (47823)
Bus: Rock Creek 500 kV	OPEN Bus WHITE CK_230.0 (47827)
Bus: Rock Creek 500 kV	OPEN Bus IMRIE_230.0 (47822)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_ 34.5 (47387)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC C1_ 34.5 (47388)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC W1_ 0.7 (47389)
Bus: Rock Creek 500 kV	OPEN Bus DOOLEY T_230.0 (47465)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 3_ 34.5 (47496)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 2_ 34.5 (47493)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C2_ 34.5 (47494)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W2_ 0.7 (47495)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C3_ 34.5 (47497)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W3_ 0.7 (47498)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE 1_ 34.5 (47829)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 1_ 34.5 (47825)
Bus: Rock Creek 500 kV	OPEN Bus WILLIS T_230.0 (47824)
Bus: Rock Creek 500 kV	OPEN Bus TULMN 1_ 34.5 (47826)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C1_ 34.5 (47936)
Bus: Rock Creek 500 kV	OPEN Bus TULMN C1_ 34.5 (47938)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 2_ 34.5 (47903)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 1_ 34.5 (47902)

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Contingency	Actions Taken in the Contingency
Bus: Rock Creek 500 kV	OPEN Bus MILLRA S_230.0 (47857)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE C1_ 34.5 (47865)
Bus: Rock Creek 500 kV	OPEN Bus MILLR 1_ 34.5 (47966)
Bus: Rock Creek 500 kV	OPEN Bus HARVST W_230.0 (47858)
Bus: Rock Creek 500 kV	OPEN Bus HRVST 1_ 34.5 (47979)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE W1_ 0.6 (47866)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C1_ 34.5 (47904)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C2_ 34.5 (47905)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W1_ 0.7 (47906)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W2_ 0.7 (47907)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W1_ 0.7 (47937)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W2_ 0.6 (47940)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W1_ 0.7 (47939)
Bus: Rock Creek 500 kV	OPEN Bus MILLR C1_ 34.5 (47967)
Bus: Rock Creek 500 kV	OPEN Bus MILLR W1_ 0.6 (47968)
Bus: Rock Creek 500 kV	OPEN Bus HRVST C1_ 34.5 (47980)
Bus: Rock Creek 500 kV	OPEN Bus HRVST W1_ 0.7 (47981)
Bus: Sickler 500 kV	OPEN Bus SICKLER_500.0 (40973)
Bus: Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
Bus: Summer Lake 500 kV	OPEN Bus SUMMER L_500.0 (41043)
Bus: Summer Lake 500 kV	OPEN Bus BURNS_500.0 (45029)
Bus: Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-1: Allston-Keeler 500 kV	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
N-1: Allston-Napavine 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-1: Allston-Paul #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-1: Alvery-Dixonville 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO DIXONVLE_500.0 (45095) CKT 1
N-1: Alvey-Marion 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
N-1: Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-1: Ashe-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
N-1: Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-1: Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-1: Bell-Coulee 500 kV	OPEN Bus COULE R1_500.0 (40288)
N-1: Bell-Taft 500 kV	OPEN Bus BELL SC_500.0 (40096)
N-1: Big Eddy-Celilo 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO CELILO1_500.0 (41311) CKT 1
N-1: Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-1: Big Eddy-Knight 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO KNIGHT_500.0 (41450) CKT 1
N-1: Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-1: Boise Bench-Brownlee #3 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-1: Brady-Antelope 230 kV + RAS	OPEN Line BRADY_230.0 (60073) TO ANTLOPE_230.0 (65075) CKT 1
N-1: Brady-Antelope 230 kV + RAS	OPEN Bus MLCK PHA_230.0 (62355)
N-1: Brady-Antelope 230 kV + RAS	OPEN Shunt AMPS_ 69.0 (65026) #1
N-1: Broadview-Garrison #1 500 kV	OPEN Bus GAR1EAST_500.0 (40451)
N-1: Broadview-Garrison #1 500 kV	OPEN Bus TOWN1_500.0 (62013)
N-1: Broadview-Garrison #1 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Brownlee-Ontario 230 kV	OPEN MultiSectionLine BROWNLEE_230.0 (60095) TO ONTARIO_230.0 (60265) CKT 1
N-1: Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-1: Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-1: Buckley-Slatt 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-1: Cal Sub 120 kV Phase Shifter	OPEN Transformer CAL SUB_120.0 (64025) TO CAL S PS_120.0 (64023) CKT 1
N-1: Captain Jack-Olinda 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO OLINDA_500.0 (30020) CKT 1
N-1: CaptJack-Kfalls 500 kV	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
N-1: Cascade Crossing 500 kV	OPEN Bus CDR SPRG_500.0 (43950)
N-1: Cascade Crossing 500 kV	OPEN Bus CDRSBET1_500.0 (43951)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHCRS1_500.0 (43491)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHEL5_500.0 (43041)
N-1: Chief Jo-Coulee 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-1: Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-1: Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-1: Coulee-Hanford 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-1: Coulee-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Covington4-Raver 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-1: Covington5-Raver 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
N-1: Coyote-Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
N-1: CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-1: Dixonville-Meridian 500 kV	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
N-1: Drycreek-Lolo 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO LOLO_230.0 (48197) CKT 1
N-1: Drycreek-N Lewiston 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO N LEWIST_230.0 (48255) CKT 1
N-1: Drycreek-Wala Ava 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO WALA AVA_230.0 (48451) CKT 1
N-1: Dworshak-Hatwai 500 kV	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Taft 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-1: Echo Lake-Maple Valley 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO MAPLE VL_500.0 (40693) CKT 1
N-1: Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-1: Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1

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Contingency	Actions Taken in the Contingency
N-1: Echo Lake-Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
N-1: Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-1: Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSHE1_115.0 (32229)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSESHE_115.0 (32230)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTL1_115.0 (32233)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_115.0 (32234)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_ 13.2 (32460)
N-1: Goldhill-Placer 115 kV	OPEN Bus FLINT1_115.0 (32236)
N-1: Grassland-Coyote 500 kV	OPEN Line COYOTE_500.0 (43123) TO GRASSLND_500.0 (43049) CKT 1
N-1: Grassland-Slatt 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
N-1: Grizzly-John Day #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-1: Grizzly-Malin 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN MultiSectionLine PONDROSA_500.0 (40837) TO SUMMER L_500.0 (41043) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZ R3_500.0 (40488) TO PONDROSA_500.0 (40837) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO GRIZZ R3_500.0 (40488) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Grizzly-Round Bu 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO ROUND BU_500.0 (43485) CKT 1
N-1: Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-1: Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-1: Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Harry Allen 345 kV Phase Shifter	OPEN Transformer HA PS_345.0 (18002) TO H ALLEN_345.0 (18001) CKT 1
N-1: Harry Allen 345 kV Phase Shifter	OPEN Transformer HA PS_345.0 (18002) TO H ALLEN_345.0 (18001) CKT 2
N-1: Harry Allen 345 kV Phase Shifter	OPEN Shunt REDBUTTE_345.0 (66280) #1
N-1: Hatwai 500/230 kV Xfmr	OPEN Transformer HATWAI_500.0 (40521) TO HATWAI_230.0 (40519) CKT 1
N-1: Hatwai-Lolo 230 kV	OPEN Line HATWAI_230.0 (40519) TO LOLO_230.0 (48197) CKT 1
N-1: Hatwai-Low Gran 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Hatwai-N Lewiston 230 kV	OPEN Line HATWAI_230.0 (40519) TO N LEWIST_230.0 (48255) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO HURICANE_230.0 (45103) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN MultiSectionLine HURICANE_230.0 (45103) TO WALAWALA_230.0 (45327) CKT 1
N-1: Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
N-1: Hemingway-Summer Lake 500 kV	OPEN Line HEMINWAY_500.0 (60155) TO BURNS_500.0 (45029) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN MultiSectionLine BURNS_500.0 (45029) TO SUMMER L_500.0 (41043) CKT 1
N-1: Hemingway-Summer Lake 500 kV	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
N-1: Hemingway-Summer Lake 500 kV	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
N-1: Hemingway-Summer Lake 500 kV	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
N-1: Hill Top 345/230 Xfmr	OPEN Transformer HIL TOP_230.0 (40537) TO HIL TOP_345.0 (64058) CKT 1
N-1: Horse Hv-McNary 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-1: Hot Springs-Taft 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line COYOTECR_345.0 (64032) TO HUMBOLDT_345.0 (64059) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line MAGGIECR_120.0 (64070) TO CARLIN_120.0 (64169) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt EIGHTMFK_120.0 (64457) #b
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO &1_345.0 (67582)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO_345.0 (66225)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #2_ 99.0 (65014)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #3_ 99.0 (65017)
N-1: Ing500-CusterW 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-1: John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-1: John Day-Rock Ck 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-1: John Day-Slatt 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-1: Kfalls-Meridian 500 kV	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
N-1: Knight-Wautoma 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
N-1: LaGrande-North Powder 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO N POWDER_230.0 (60312) CKT 1
N-1: Lanes-Marion 500 kV	OPEN Line LANE_500.0 (40629) TO MARION_500.0 (40699) CKT 1
N-1: Lit Goose-Central Ferry 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
N-1: Lit Goose-Low Mon 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
N-1: Low Gran-Central Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Low Mon-Sac Tap 500 kV	OPEN Line LOW MON_500.0 (40683) TO SACJWA T_500.0 (40917) CKT 1
N-1: Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
N-1: Malin-Hilltop 230 kV	OPEN Line CANBYTAP_230.0 (40171) TO HIL TOP_230.0 (40537) CKT 1
N-1: Malin-Hilltop 230 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 0 MVR
N-1: Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-1: Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-1: Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-1: Maple Vly-Rocky RH 345 kV	OPEN MultiSectionLine MAPLE VL_345.0 (40691) TO ROCKY RH_345.0 (40891) CKT 1
N-1: Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1

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Contingency	Actions Taken in the Contingency
N-1: Marion-Santiam 500 kV	OPEN Line MARION_500.0 (40699) TO SANTIAM_500.0 (40941) CKT 1
N-1: McLouglin-Ostrander 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-1: McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 81 MVR
N-1: McNary-Board T1 230 kV	OPEN Line BOARD T1_230.0 (40121) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-1: McNary-Longhorn 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
N-1: McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-1: McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-1: McNary-Roundup 230 kV	OPEN Line MCNRY S1_230.0 (41351) TO ROUNDUP_230.0 (40905) CKT 1
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJWA T_500.0 (40917)
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
N-1: McNary-Sac Tap-Low Mon 500 kV	CLOSE Gen ICE H1-2_ 13.8 (40559) #1
N-1: Midpoint-Hemingway 500 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Humboldt 345 kV	OPEN Bus IDAHO-NV_345.0 (64061)
N-1: Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
N-1: Ontario-Caldwell 230 kV	OPEN MultiSectionLine CALDWELL_230.0 (60110) TO LANGLEY_230.0 (60266) CKT 1
N-1: Ostrander-Knight 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-1: Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-1: Ostrander-Troutdale 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO TROUTDAL_500.0 (41095) CKT 1
N-1: Oxbow-Brownlee #2 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 2
N-1: Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-1: Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-1: Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO SATSOP_500.0 (40949) CKT 1
N-1: Pearl-Keeler 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pinto-Four Corner 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Pinto-Four Corner 345 kV	OPEN Shunt PINTO_138.0 (66230) #1
N-1: Pinto-Four Corner 345 kV	CLOSE Shunt PINTO 2_ 13.8 (66228) #1
N-1: Pinto-Four Corner 345 kV	CLOSE Shunt PINTO 3_ 13.8 (66229) #1
N-1: Ponderosa A 500/230 kV Xfmr	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Ponderosa B 500/230 kV Xfmr	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Populus-Cedar Hill-Hemingway 500 kV	OPEN MultiSectionLine POPULUS_500.0 (67794) TO CEDARHIL_500.0 (60159) CKT 2
N-1: Populus-Cedar Hill-Hemingway 500 kV	OPEN MultiSectionLine CEDARHIL_500.0 (60159) TO HEMINWAY_500.0 (60155) CKT 2
N-1: Populus-Cedar Hill-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 400 MVR
N-1: Populus-Cedar Hill-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Raver-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-1: Raver-Tacoma 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus H ALLEN_345.0 (18001)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus HA PS_345.0 (18002)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus UTAH-NEV_345.0 (67657)
N-1: Red Butte-Harry Allen 345 kV	OPEN Shunt REDBUTTE_345.0 (66280) #1
N-1: Red Butte-Harry Allen 345 kV	OPEN Shunt GONDER1_230.0 (64205) #v
N-1: Robinson-Harry Allen 500 kV	OPEN Line ROBINSON_500.0 (64895) TO H ALLEN_500.0 (18450) CKT 1
N-1: Rock Ck-Wautoma 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Round Mtn-Table Mtn 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-1: Roundup-Lagrande 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO ROUNDUP_230.0 (40905) CKT 1
N-1: Schultz-Sickler 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-1: Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-1: Schultz-Wautoma 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Sigurd-Glen Canyon 230 kV	OPEN Bus SIGURDPS_230.0 (66355)
N-1: Slatt 500/230 kV Xfmr	OPEN Transformer SLATT_500.0 (40989) TO SLATT_230.0 (40986) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-1: Snok Tap-Snoking 500 kV	OPEN Line SNOK TAP_500.0 (41001) TO SNOKING_500.0 (41007) CKT 1
N-1: Table Mtn-Tesla 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-1: Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-1: Vantage 500/230 kV Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
N-1: Vantage 500/230 kV Xfmr #2	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 2
N-1: Walla Walla-Talbot 230 kV	OPEN Line TALBOT_230.0 (44912) TO WALAWALA_230.0 (45327) CKT 1
N-1: Walla Walla-Wallula 230 kV	OPEN Line WALAWALA_230.0 (45327) TO WALLULA_230.0 (45331) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2

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Contingency	Actions Taken in the Contingency
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	CLOSE Shunt GARRISON_500.0 (40459) #r
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Line BETHEL_230.0 (43039) TO ROUNDB N_230.0 (43483) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN MultiSectionLine BETHEL_230.0 (43039) TO SANTIAM_230.0 (40939) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN MultiSectionLine BIGEDDY2_230.0 (41342) TO CHEMAWA_230.0 (40213) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Bus PARKDALE_230.0 (40813)
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 2
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIHOR41_230.0 (61995) CKT 4 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO HORSEFLT_230.0 (60102) CKT 4
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO11_230.0 (61998) CKT 1 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO21_230.0 (61997) CKT 2 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 1
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine BRIDGER_345.0 (60085) TO 3MIKNOLL_345.0 (60084) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	CLOSE Shunt KINPORT_345.0 (60190) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 2_ 22.0 (62049) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus GAR1EAST_500.0 (40451)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus TOWN1_500.0 (62013)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus GAR2EAST_500.0 (40453)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus TOWN2_500.0 (62012)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS AMPS_ 69.0 (65026) TO 30 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt MILLCKT2_ 13.8 (62333) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt MILLCKT1_ 13.8 (62332) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS TAFT_500.0 (41057) TO -186 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS BZ EGALL_ 50.0 (62348) TO 20.4 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS JACKRABB_ 50.0 (62349) TO 19.7 MVR
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Transformer HELLSCYN_230.0 (60150) TO HELSCYN1_ 14.4 (60151) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1

Appendix I - 16la1sa_3400idnw_nv Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine MONROE_230.0 (40747) TO NOVELTY_230.0 (42304) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus CHIEF J3_345.0 (40223)
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus SNOHOMS3_345.0 (40993)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
N-2: DC-BIPOLE	OPEN Bus SYLMAR1_230.0 (26097)
N-2: DC-BIPOLE	OPEN Bus SYLMAR2_230.0 (26099)
N-2: DC-BIPOLE	OPEN Bus CELILO4_230.0 (41314)
N-2: DC-BIPOLE	OPEN Bus CELILO3_230.0 (41313)
N-2: DC-BIPOLE	OPEN Bus CELILO2_500.0 (41312)
N-2: DC-BIPOLE	OPEN Bus CELILO1_500.0 (41311)
N-2: Double Palo Verde	OPEN Gen PALOVRD2_ 24.0 (14932) #1
N-2: Double Palo Verde	OPEN Gen PALOVRD1_ 24.0 (14931) #1
N-2: Double Palo Verde	CHANGE LOAD AT BUS AGUAFAPS_ 69.0 (14400) BY -120 MW (cnst pf)
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS PINTO_138.0 (66230) TO 64 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS YORKCANY_115.0 (12091) TO 15 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS DURANGO_115.0 (79023) TO 40 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS PEIGAN 4_240.0 (54165) TO 0 MVR
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Line COVINGTN_230.0 (40303) TO MAPLEV12_230.0 (40692) CKT 2
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_345.0 (40691)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus ROCKY RH_345.0 (40891)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	OPEN Bus PONDROSB_500.0 (40834)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	OPEN Bus IMNAHA_230.0 (60278)
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus CASCADTP_230.0 (40185)

Appendix I - 16la1sa_3400idnw_nv Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus WINDSHAR_230.0 (41155)
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus ALFALFA_230.0 (40039)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus OUTLOOK_230.0 (45229)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine MCNARY_345.0 (40721) TO ROSS_345.0 (40901) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN Line KING_230.0 (60177) TO MIDPOINT_230.0 (60232) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV	OPEN Line PEARL #_230.0 (43773) TO SHERWOOD_230.0 (43527) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN MultiSectionLine BIGEDDY3_230.0 (41343) TO MCLOUGLN_230.0 (43313) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT5_500.0 (40306)
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus COULEE_300.0 (40285)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus OLYMPIA_300.0 (40795)
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Bus CENTR SS_230.0 (47748)
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN Bus CHRISTOP_230.0 (42505)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 2
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus ADDY N_230.0 (40021)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Line BELL BPA_115.0 (40087) TO BIGELOW_115.0 (40113) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Bus BELL SC_500.0 (40096)

Appendix I - 16la1sa_3400idnw_nv Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN MultiSectionLine LANCASTR_230.0 (40624) TO NOXONBPA_230.0 (40787) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN Shunt GARRISON_500.0 (40459) #s
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4

Appendix J

16la1sa_3400idnw_N_Path24 Base Case (PG&E-Sierra, Path 24)

Appendix J – 16la1sa_3400idnw_Path24 Base Case Post-Transient Contingency Results

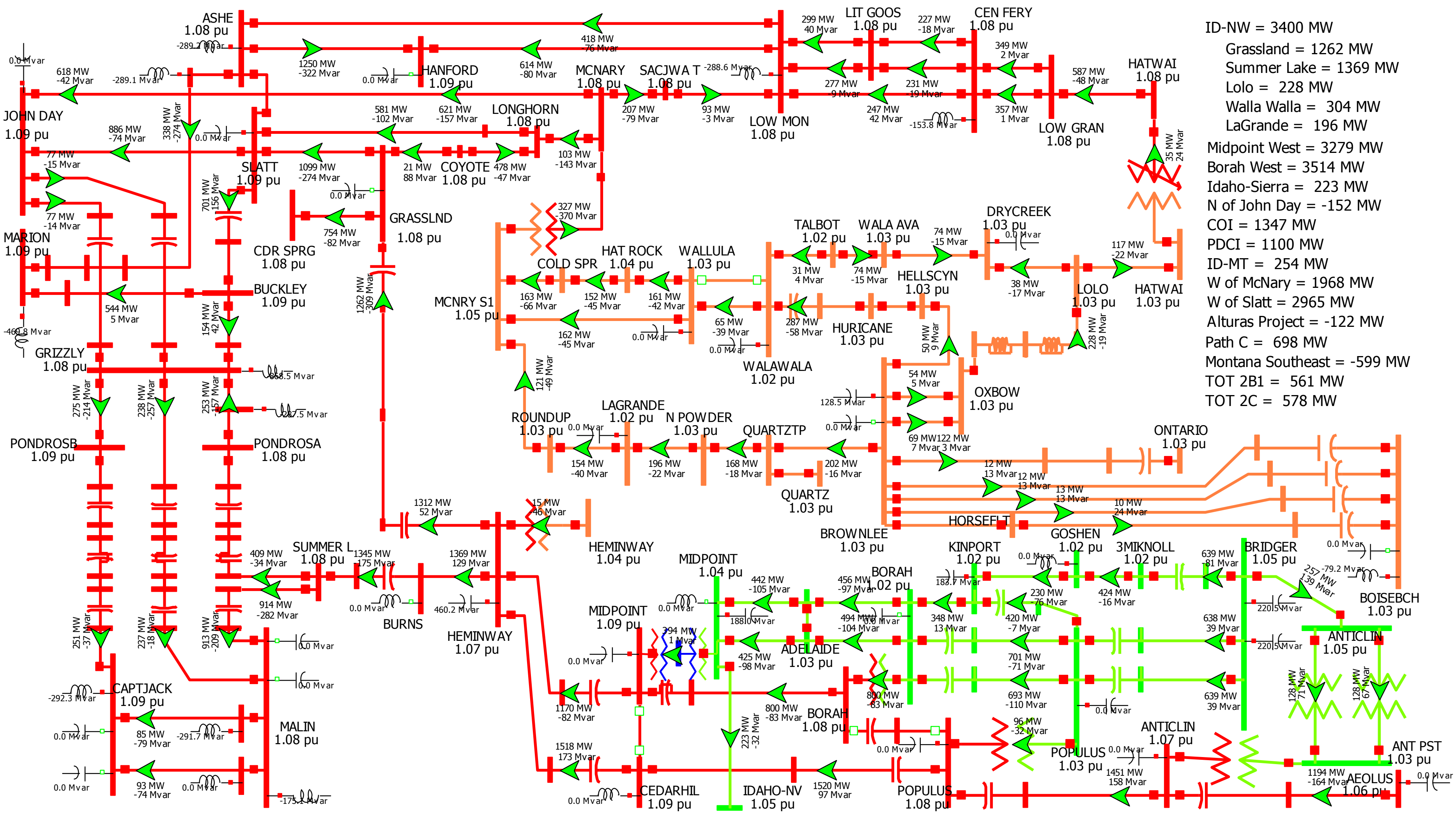

Figure J1: 16la1sa_3400idnw_Path24 Base Case **Pre-Contingency**

Appendix J – 16la1sa_3400idnw_Path24 Base Case Post-Transient Contingency Results

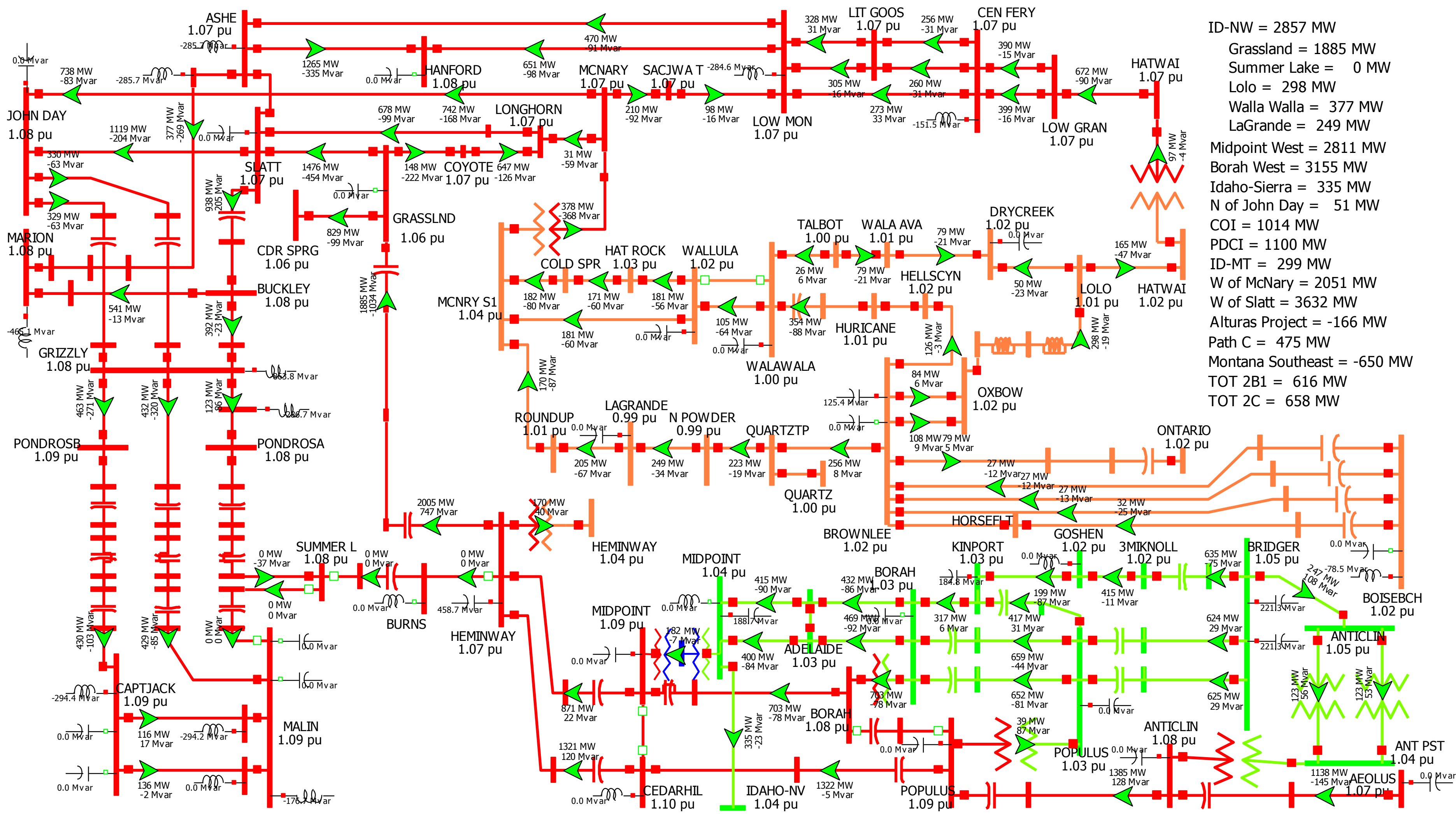

Figure J2: 16la1sa_3400idnw_Path24 Base Case after the contingency **BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV**

Appendix J – 16la1sa_3400idnw_Path24 Base Case Post-Transient Contingency Results

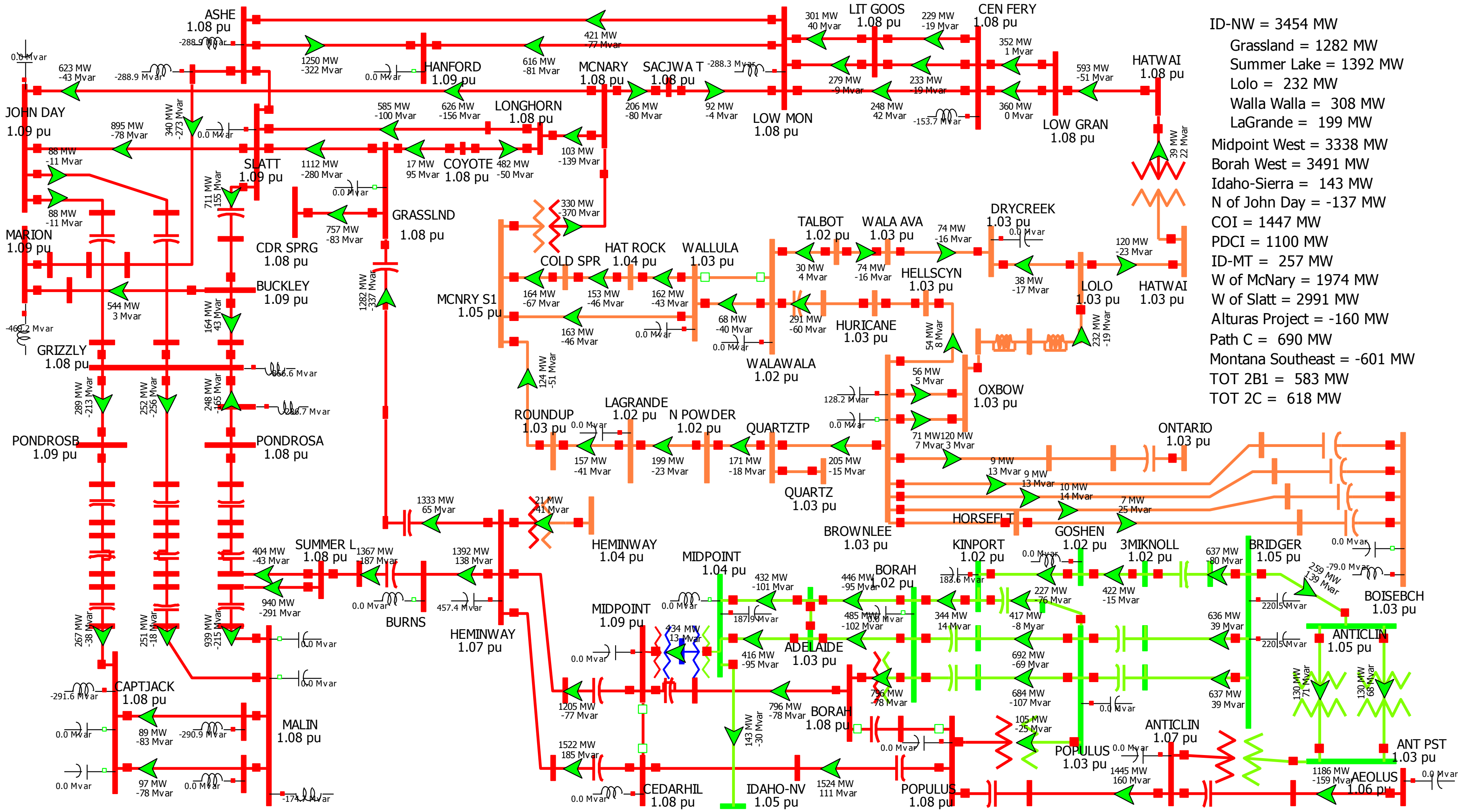

Figure J3: 16la1sa_3400idnw_Path24 Base Case after the contingency **N-1: Robinson-Harry Allen 500 kV**

Appendix J – 16la1sa_3400idnw_Path24 Base Case Post-Transient Contingency Results

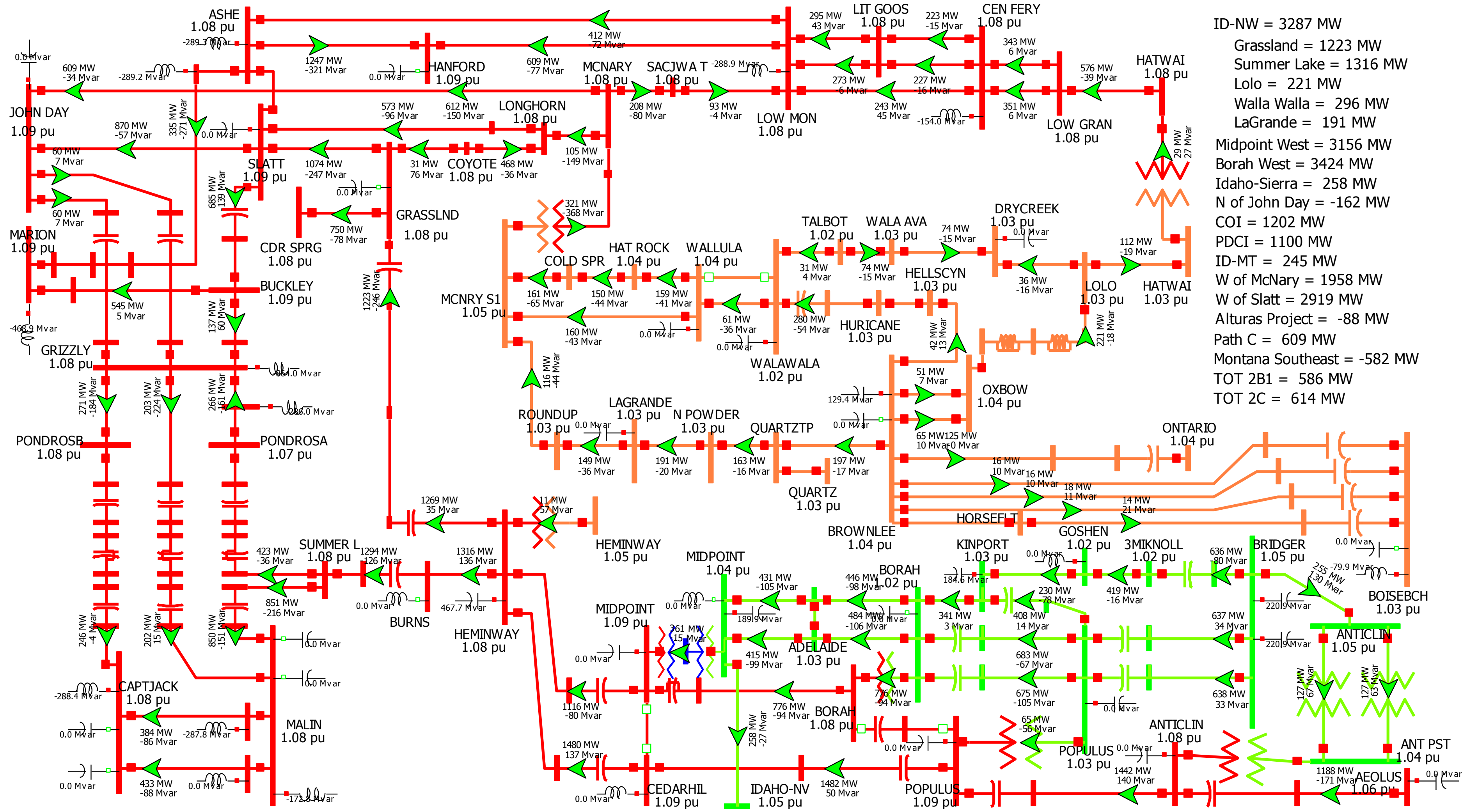

Figure J4: 16la1sa_3400idnw_Path24 Base Case after the contingency **N-2: Round Mtn-Table Mtn #1 & #2 500 kV**

Appendix J - 16la1sa_3400idnw_Path24 Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	No Violations							
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	No Violations							
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4028 Taft-Dworshak & Taft Reactor 500kV	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	151.0	150.0	100.7%	180.0	83.9%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.1	150.0	101.4%	180.0	84.5%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	154.5	150.0	103.0%	180.0	85.9%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	No Violations							
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.6	150.0	100.4%	180.0	83.6%
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	153.5	150.0	102.3%	180.0	85.3%
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.4	150.0	100.3%	180.0	83.6%
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.3	150.0	100.2%	180.0	83.5%
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	No Violations							
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.1	150.0	100.1%	180.0	83.4%
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	No Violations							
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV	No Violations							
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations							
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	No Violations							
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations							
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations							
BF 4502 Paul-Allston & Allston-Keeler 500 kV	No Violations							
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV	No Violations							

Appendix J - 16la1sa_3400idnw_Path24 Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations							
BF 4542 Paul-Allston 500 kV & Center G2	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	151.0	150.0	100.7%	180.0	83.9%
BF 4542 Paul-Napavine 500 kV & Center G1	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.8	150.0	100.5%	180.0	83.8%
BF 4550 Olympia-Paul & Paul-Allston 500 kV	No Violations							
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	No Violations							
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	FRANKLIN (40443) -> FRANKL E (40440) CKT 1 at FRANKLIN	Branch MVA	193.9	267.0	254.0	105.1%	307.0	87.0%
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	No Violations							
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations							
BF 4708 Hatwai 500 kV Bus	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.5	150.0	100.4%	180.0	83.6%
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	151.1	150.0	100.7%	180.0	83.9%
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.7	150.0	100.5%	180.0	83.7%
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	151.5	150.0	101.0%	180.0	84.2%
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	174.4	150.0	116.3%	180.0	96.9%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.8	52.0	50.0	103.9%	55.0	94.5%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	324.5	300.0	108.2%	370.0	87.7%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	324.5	300.0	108.2%	370.0	87.7%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	321.4	315.0	102.0%	394.0	81.6%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	320.8	315.0	101.8%	394.0	81.4%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	428.7	415.7	103.1%	483.5	88.7%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1408.3	2211.8	2000.1	110.6%	3000.0	73.7%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1428.1	2187.8	2000.1	109.4%	3000.0	72.9%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	173.8	150.0	115.9%	180.0	96.6%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.8	52.5	50.0	105.1%	55.0	95.5%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	322.6	300.0	107.5%	370.0	87.2%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	322.6	300.0	107.5%	370.0	87.2%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	320.1	315.0	101.6%	394.0	81.2%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	319.5	315.0	101.4%	394.0	81.1%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	427.6	415.7	102.9%	483.5	88.4%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1408.3	2207.0	2000.1	110.3%	3000.0	73.6%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1428.1	2177.7	2000.1	108.9%	3000.0	72.6%
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	151.9	150.0	101.3%	180.0	84.4%
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	153.8	150.0	102.6%	180.0	85.5%
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.7	150.0	100.4%	180.0	83.7%
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.4	150.0	100.2%	180.0	83.5%
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.3	150.0	100.2%	180.0	83.5%
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	No Violations							

Appendix J - 16la1sa_3400idnw_Path24 Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations							
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations							
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations							
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.2	150.0	100.1%	180.0	83.4%
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	FRANKLIN (40443) -> FRANKL E (40440) CKT 1 at FRANKLIN	Branch MVA	193.9	266.7	254.0	105.0%	307.0	86.9%
BF 5214 Low Mon-McNary & Calpine PH 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.3	150.0	100.2%	180.0	83.5%
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.5	150.0	100.3%	180.0	83.6%
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	170.6	150.0	113.7%	180.0	94.8%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	320.3	300.0	106.8%	370.0	86.6%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	320.3	300.0	106.8%	370.0	86.6%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	318.4	315.0	101.1%	394.0	80.8%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	317.8	315.0	100.9%	394.0	80.7%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	86.7	116.1	112.0	103.6%	146.7	79.1%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1500.7	2315.3	1732.1	133.7%	2338.3	99.0%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	422.8	415.7	101.7%	483.5	87.5%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	PTRSNFUR (62386)	% Δ Volts	0.992	0.927				6.55%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts	0.991	0.930				6.16%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	AMPS (65025)	% Δ Volts	0.991	0.940				5.15%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	172.8	150.0	115.2%	180.0	96.0%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.8	50.8	50.0	101.7%	55.0	92.5%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	322.6	300.0	107.5%	370.0	87.2%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	322.6	300.0	107.5%	370.0	87.2%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	320.0	315.0	101.6%	394.0	81.2%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	319.4	315.0	101.4%	394.0	81.1%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	425.9	415.7	102.5%	483.5	88.1%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1408.3	2267.4	2000.1	113.4%	3000.0	75.6%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1428.1	2240.5	2000.1	112.0%	3000.0	74.7%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	171.9	150.0	114.6%	180.0	95.5%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.8	50.1	50.0	100.1%	55.0	91.0%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	311.4	300.0	103.8%	370.0	84.2%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	311.4	300.0	103.8%	370.0	84.2%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	424.7	415.7	102.2%	483.5	87.9%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	CEDARHIL (60159) -> CEDHEM21 (61992) CKT 2 at CEDHEM21	Branch Amp	1624.5	2393.0	2309.4	103.6%	3464.1	69.1%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	POPULUS (67794) -> POPCED21 (61963) CKT 2 at POPULUS	Branch Amp	1631.1	2368.4	2309.4	102.6%	3464.1	68.4%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	157.5	150.0	105.0%	180.0	87.5%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	319.5	300.0	106.5%	370.0	86.3%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	319.5	300.0	106.5%	370.0	86.3%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	316.7	315.0	100.6%	394.0	80.4%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	316.2	315.0	100.4%	394.0	80.3%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1278.3	2368.6	1732.1	136.7%	2338.3	101.3%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	BORPOP11 (61970) -> BORAH (60060) CKT 1 at BORAH	Branch Amp	1163.5	1867.7	1701.6	109.8%	2108.6	88.6%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	BORPOP21 (61969) -> BORAH (60060) CKT 2 at BORAH	Branch Amp	1147.8	1849.5	1650.1	112.1%	2227.4	83.0%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	POPULUS (67790) -> BORPOP11 (61970) CKT 1 at POPULUS	Branch Amp	1153.7	1862.0	1492.7	124.7%	2264.2	82.2%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	PTRSNFUR (62386)	% Δ Volts	0.992	0.940				5.24%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts	0.991	0.941				5.05%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	167.4	150.0	111.6%	180.0	93.0%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	336.6	300.0	112.2%	370.0	91.0%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	336.6	300.0	112.2%	370.0	91.0%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	329.7	315.0	104.7%	394.0	83.7%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	328.9	315.0	104.4%	394.0	83.5%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	86.7	117.8	112.0	105.2%	146.7	80.3%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	416.0	415.7	100.1%	483.5	86.1%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BORPOP11 (61970) -> BORAH (60060) CKT 1 at BORAH	Branch Amp	1163.5	1784.5	1701.6	104.9%	2108.6	84.6%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BORPOP21 (61969) -> BORAH (60060) CKT 2 at BORAH	Branch Amp	1147.8	1769.3	1650.1	107.2%	2227.4	79.4%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	POPULUS (67790) -> BORPOP11 (61970) CKT 1 at POPULUS	Branch Amp	1153.7	1781.6	1492.7	119.4%	2264.2	78.7%
BF Lolo 230kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	151.3	150.0	100.9%	180.0	84.0%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	171.0	150.0	114.0%	180.0	95.0%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.8	50.3	50.0	100.6%	55.0	91.5%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	320.1	300.0	106.7%	370.0	86.5%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	320.1	300.0	106.7%	370.0	86.5%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	318.2	315.0	101.0%	394.0	80.8%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	317.7	315.0	100.8%	394.0	80.6%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	86.7	114.8	112.0	102.5%	146.7	78.2%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1500.7	2263.0	1732.1	130.7%	2338.3	96.8%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	423.6	415.7	101.9%	483.5	87.6%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PTRSNFUR (62386)	% Δ Volts	0.992	0.930				6.25%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PTRSNFLT (62030)	% Δ Volts	0.991	0.932				5.95%
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	No Violations							
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	151.3	150.0	100.9%	180.0	84.1%
Bus: Alvey 500 kV	No Violations							
Bus: Bell BPA 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.7	150.0	101.8%	180.0	84.8%
Bus: Buckley 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.6	150.0	100.4%	180.0	83.7%
Bus: Dixonville 500 kV	No Violations							
Bus: Hot Springs 500 kV	No Violations							
Bus: Keeler 500 kV	No Violations							
Bus: Rock Creek 500 kV	No Violations							
Bus: Sickler 500 kV	No Violations							
Bus: Summer Lake 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	174.4	150.0	116.2%	180.0	96.9%
Bus: Summer Lake 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.8	52.4	50.0	104.9%	55.0	95.4%
Bus: Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	324.6	300.0	108.2%	370.0	87.7%
Bus: Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	324.6	300.0	108.2%	370.0	87.7%
Bus: Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	321.5	315.0	102.1%	394.0	81.6%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
Bus: Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	320.8	315.0	101.9%	394.0	81.4%
Bus: Summer Lake 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	428.6	415.7	103.1%	483.5	88.6%
Bus: Summer Lake 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1408.3	2210.7	2000.1	110.5%	3000.0	73.7%
Bus: Summer Lake 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1428.1	2186.8	2000.1	109.3%	3000.0	72.9%
N-1: Allston-Keeler 500 kV	No Violations							
N-1: Allston-Napavine 500 kV	No Violations							
N-1: Allston-Paul #2 500 kV	No Violations							
N-1: Alvery-Dixonville 500 kV	No Violations							
N-1: Alvey-Marion 500 kV	No Violations							
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Bell-Coulee 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.4	150.0	100.3%	180.0	83.6%
N-1: Bell-Taft 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.6	150.0	101.8%	180.0	84.8%
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV + RAS	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	151.1	150.0	100.7%	180.0	83.9%
N-1: Broadview-Garrison #1 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.2	150.0	100.2%	180.0	83.5%
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.5	150.0	100.3%	180.0	83.6%
N-1: Cal Sub 120 kV Phase Shifter	No Violations							
N-1: Captain Jack-Olinda 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	153.9	150.0	102.6%	180.0	85.5%
N-1: CaptJack-Kfalls 500 kV	No Violations							
N-1: Cascade Crossing 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.4	150.0	100.3%	180.0	83.6%
N-1: Chief Jo-Coulee 500 kV	No Violations							
N-1: Chief Jo-Monroe 500 kV	No Violations							
N-1: Chief Jo-Sickler 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Covington4-Raver 500 kV	No Violations							
N-1: Covington5-Raver 500 kV	No Violations							
N-1: Coyote-Longhorn 500 kV	No Violations							
N-1: CusterW-Monroe 500 kV	No Violations							
N-1: Dixonville-Meridian 500 kV	No Violations							
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV	No Violations							
N-1: Dworshak-Taft 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Echo Lake-Maple Valley 500 kV	No Violations							
N-1: Echo Lake-Raver 500 kV	No Violations							
N-1: Echo Lake-Schultz 500 kV	No Violations							
N-1: Echo Lake-Snok Tap 500 kV	No Violations							
N-1: Garrison-Taft #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.6	150.0	100.4%	180.0	83.6%
N-1: Goldhill-Placer 115 kV	No Violations							
N-1: Grassland-Coyote 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.8	150.0	100.5%	180.0	83.8%
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.4	150.0	100.3%	180.0	83.6%
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.5	150.0	100.3%	180.0	83.6%
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Harry Allen 345 kV Phase Shifter	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	347.8	315.0	110.4%	394.0	88.3%
N-1: Harry Allen 345 kV Phase Shifter	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	346.6	315.0	110.0%	394.0	88.0%
N-1: Harry Allen 345 kV Phase Shifter	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	153.4	150.0	102.3%	180.0	85.2%
N-1: Hatwai 500/230 kV Xfmr	No Violations							
N-1: Hatwai-Lolo 230 kV	No Violations							
N-1: Hatwai-Low Gran 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.7	150.0	100.5%	180.0	83.7%
N-1: Hatwai-N Lewiston 230 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	No Violations							
N-1: Hells Canyon-Walla Walla 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.2	150.0	101.5%	180.0	84.6%
N-1: Hemingway-Grassland 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	170.3	150.0	113.5%	180.0	94.6%
N-1: Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	318.8	300.0	106.3%	370.0	86.2%
N-1: Hemingway-Grassland 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	318.8	300.0	106.3%	370.0	86.2%
N-1: Hemingway-Grassland 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	317.3	315.0	100.7%	394.0	80.5%
N-1: Hemingway-Grassland 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	316.7	315.0	100.6%	394.0	80.4%
N-1: Hemingway-Grassland 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	86.7	117.2	112.0	104.6%	146.7	79.9%
N-1: Hemingway-Grassland 500 kV	BURNS (45029) -> BURSUM11 (90132) CKT 1 at BURNS	Branch Amp	1500.7	2252.9	1732.1	130.1%	2338.3	96.4%
N-1: Hemingway-Grassland 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	422.3	415.7	101.6%	483.5	87.4%
N-1: Hemingway-Summer Lake 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	173.1	150.0	115.4%	180.0	96.1%
N-1: Hemingway-Summer Lake 500 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.8	52.7	50.0	105.3%	55.0	95.7%
N-1: Hemingway-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	322.4	300.0	107.5%	370.0	87.1%
N-1: Hemingway-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	322.4	300.0	107.5%	370.0	87.1%
N-1: Hemingway-Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	319.9	315.0	101.5%	394.0	81.2%
N-1: Hemingway-Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	319.3	315.0	101.4%	394.0	81.0%
N-1: Hemingway-Summer Lake 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	426.4	415.7	102.6%	483.5	88.2%
N-1: Hemingway-Summer Lake 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1408.3	2215.7	2000.1	110.8%	3000.0	73.9%
N-1: Hemingway-Summer Lake 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1428.1	2191.8	2000.1	109.6%	3000.0	73.1%
N-1: Hill Top 345/230 Xfmr	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	178.7	150.0	119.2%	180.0	99.3%
N-1: Hill Top 345/230 Xfmr	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	436.9	415.7	105.1%	483.5	90.4%
N-1: Horse Hv-McNary 230 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Hot Springs-Taft 500 kV	No Violations							
N-1: Humboldt-Coyote Ck 345 kV	No Violations							
N-1: Huntington-Pinto-Four Corners 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	349.2	300.0	116.4%	370.0	94.4%
N-1: Huntington-Pinto-Four Corners 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	349.2	300.0	116.4%	370.0	94.4%
N-1: Huntington-Pinto-Four Corners 345 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	154.3	150.0	102.9%	180.0	85.7%
N-1: Ing500-CusterW 500 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.1	150.0	100.1%	180.0	83.4%
N-1: Kfalls-Meridian 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.8	52.2	50.0	104.5%	55.0	95.0%
N-1: LaGrande-North Powder 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.9	150.0	100.6%	180.0	83.9%
N-1: Lanes-Marion 500 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-Sac Tap 500 kV	No Violations							
N-1: Malin 500/230 Xfmr	No Violations							
N-1: Malin-Hilltop 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	164.2	150.0	109.5%	180.0	91.2%
N-1: Malin-Round Mtn #1 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.8	150.0	101.9%	180.0	84.9%
N-1: Malin-Round Mtn #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	153.0	150.0	102.0%	180.0	85.0%
N-1: Malin-Summer Lake 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	154.5	150.0	103.0%	180.0	85.9%
N-1: Maple Vly-Rocky RH 345 kV	No Violations							
N-1: Marion-Pearl 500 kV	No Violations							
N-1: Marion-Santiam 500 kV	No Violations							
N-1: McLouglin-Ostrander 230 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Longhorn 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.2	150.0	100.1%	180.0	83.4%
N-1: McNary-Sac Tap-Low Mon 500 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	167.2	150.0	111.5%	180.0	92.9%
N-1: Midpoint-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	306.7	300.0	102.2%	370.0	82.9%
N-1: Midpoint-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	306.7	300.0	102.2%	370.0	82.9%
N-1: Midpoint-Hemingway 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	416.6	415.7	100.2%	483.5	86.2%
N-1: Midpoint-Humboldt 345 kV	No Violations							
N-1: Napavine-Paul 500 kV	No Violations							
N-1: Olympia-Paul 500 kV	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	151.3	150.0	100.9%	180.0	84.1%
N-1: Paul-Satsop 500 kV	No Violations							
N-1: Pearl-Keeler 500 kV	No Violations							
N-1: Pinto-Four Corner 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	346.2	300.0	115.4%	370.0	93.6%
N-1: Pinto-Four Corner 345 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	346.2	300.0	115.4%	370.0	93.6%
N-1: Pinto-Four Corner 345 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	153.7	150.0	102.5%	180.0	85.4%
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Populus-Cedar Hill-Hemingway 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	156.5	150.0	104.3%	180.0	86.9%
N-1: Populus-Cedar Hill-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	318.1	300.0	106.0%	370.0	86.0%
N-1: Populus-Cedar Hill-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	318.1	300.0	106.0%	370.0	86.0%
N-1: Populus-Cedar Hill-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	315.7	315.0	100.2%	394.0	80.1%
N-1: Populus-Cedar Hill-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	315.2	315.0	100.1%	394.0	80.0%
N-1: Populus-Cedar Hill-Hemingway 500 kV	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1278.3	2200.9	1732.1	127.1%	2338.3	94.1%
N-1: Populus-Cedar Hill-Hemingway 500 kV	BORPOP11 (61970) -> BORAH (60060) CKT 1 at BORAH	Branch Amp	1163.5	1869.7	1701.6	109.9%	2108.6	88.7%
N-1: Populus-Cedar Hill-Hemingway 500 kV	BORPOP21 (61969) -> BORAH (60060) CKT 2 at BORAH	Branch Amp	1147.8	1851.4	1650.1	112.2%	2227.4	83.1%
N-1: Populus-Cedar Hill-Hemingway 500 kV	POPULUS (67790) -> BORPOP11 (61970) CKT 1 at POPULUS	Branch Amp	1153.7	1863.9	1492.7	124.9%	2264.2	82.3%
N-1: Raver-Paul 500 kV	No Violations							
N-1: Raver-Tacoma 500 kV	No Violations							
N-1: Red Butte-Harry Allen 345 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.6	347.6	315.0	110.3%	394.0	88.2%
N-1: Red Butte-Harry Allen 345 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.6	346.4	315.0	110.0%	394.0	87.9%
N-1: Red Butte-Harry Allen 345 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	153.5	150.0	102.4%	180.0	85.3%
N-1: Robinson-Harry Allen 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	178.5	150.0	119.0%	180.0	99.2%
N-1: Robinson-Harry Allen 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	304.4	300.0	101.5%	370.0	82.3%
N-1: Robinson-Harry Allen 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	304.4	300.0	101.5%	370.0	82.3%
N-1: Robinson-Harry Allen 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	438.4	415.7	105.5%	483.5	90.7%
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Round Mtn-Table Mtn 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.1	150.0	101.4%	180.0	84.5%
N-1: Roundup-Lagrande 230 kV	HINES (61825) -> HINES (61826) CKT 1 at HINES	Branch MVA	42.8	50.3	50.0	100.5%	55.0	91.4%
N-1: Roundup-Lagrande 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.5	150.0	100.4%	180.0	83.6%
N-1: Schultz-Sickler 500 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Sigurd-Glen Canyon 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.7	150.0	100.4%	180.0	83.7%
N-1: Sigurd-Glen Canyon 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	307.6	300.0	102.5%	370.0	83.1%
N-1: Sigurd-Glen Canyon 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	307.6	300.0	102.5%	370.0	83.1%
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Slatt-Longhorn 500 kV	No Violations							
N-1: Snok Tap-Snoking 500 kV	No Violations							
N-1: Table Mtn-Tesla 500 kV	No Violations							
N-1: Table Mtn-Vaca Dixon 500 kV	No Violations							
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations							
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Buckley 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	151.4	150.0	100.9%	180.0	84.1%
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.9	150.0	100.6%	180.0	83.8%
N-2: Ashe-Slatt & McNary-John Day 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.0	150.0	100.0%	180.0	83.3%
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	154.6	150.0	103.1%	180.0	85.9%
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.3	150.0	100.2%	180.0	83.5%
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.4	150.0	100.3%	180.0	83.6%
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Bridger-Populus #1 & #2 345 kV	BRIDGER (60085) -> BRI3MI11 (61999) CKT 1 at BRIDGER	Branch Amp	1066.1	1761.0	1600.0	110.1%	1840.0	95.7%
N-2: Bridger-Populus #1 & #2 345 kV	BRI3MI11 (61999) -> 3MIKNOLL (60084) CKT 1 at 3MIKNOLL	Branch Amp	1066.1	1734.9	1650.1	105.1%	2227.4	77.9%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	BRIDGER (60085) -> POPBRI11 (61968) CKT 1 at BRIDGER	Branch Amp	1019.3	1809.4	1492.7	121.2%	1849.2	97.8%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	POPBRI11 (61968) -> POPULUS (67790) CKT 1 at POPULUS	Branch Amp	1007.9	1793.0	1650.1	108.7%	2227.6	80.5%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.2	150.0	101.5%	180.0	84.6%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	86.7	122.5	112.0	109.4%	146.7	83.5%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	ABSAROKE (62201)	% Δ Volts	0.955	0.876				8.27%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLUMBUS (62015)	% Δ Volts	0.978	0.902				7.77%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLBUSAT (62224)	% Δ Volts	0.975	0.900				7.69%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	BGTMBERA (62250)	% Δ Volts	1.009	0.935				7.33%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLRPLJE (62220)	% Δ Volts	1.000	0.929				7.10%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	DUCKCR-R (62325)	% Δ Volts	1.015	0.944				7.00%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	WILSALL (62019)	% Δ Volts	1.036	0.965				6.85%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	WILSALL (62016)	% Δ Volts	1.034	0.967				6.48%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	COLRPLJE (62205)	% Δ Volts	1.000	0.936				6.40%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	CLYDE P (62108)	% Δ Volts	1.026	0.965				5.95%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	THRRIVER (62331)	% Δ Volts	1.033	0.979				5.23%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	KINGHILL (62170)	% Δ Volts	1.045	0.991				5.17%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	STANFRDM (62231)	% Δ Volts	1.033	0.980				5.13%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	BENCHLND (62230)	% Δ Volts	1.029	0.977				5.05%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	UTICA (62238)	% Δ Volts	1.029	0.977				5.05%
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	MARTNSDA (62235)	% Δ Volts	1.032	0.980				5.04%
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.8	150.0	101.8%	180.0	84.9%
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	No Violations							
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations							
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations							
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations							
N-2: CusterW-Monroe #1 & #2 500 kV	No Violations							
N-2: DC-BIPOLE	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	315.6	300.0	105.2%	370.0	85.3%
N-2: DC-BIPOLE	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	315.6	300.0	105.2%	370.0	85.3%
N-2: Double Palo Verde	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	357.6	300.0	119.2%	370.0	96.7%
N-2: Double Palo Verde	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	357.6	300.0	119.2%	370.0	96.7%
N-2: Double Palo Verde	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO	Branch MVA	290.6	364.3	315.0	115.7%	394.0	92.5%
N-2: Double Palo Verde	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO	Branch MVA	290.6	362.8	315.0	115.2%	394.0	92.1%
N-2: Double Palo Verde	H ALLEN (18001) -> H ALLEN (18019) CKT 1 at H ALLEN	Branch MVA	286.5	364.7	357.0	102.2%	415.9	87.7%
N-2: Double Palo Verde	H ALLEN (18001) -> H ALLEN (18019) CKT 2 at H ALLEN	Branch MVA	286.5	364.7	357.0	102.2%	415.9	87.7%
N-2: Double Palo Verde	CR_NEST1 (54458) -> CBK 500 (50791) CKT 1 at CR_NEST1	Branch Amp	430.1	1107.8	1085.4	102.1%	1199.7	92.3%
N-2: Double Palo Verde	CHOLLA (14000) -> CHOSAG11 (14014) CKT 1 at CHOSAG11	Branch Amp	961.1	1054.8	1026.0	102.8%	1538.1	68.6%
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations							
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations							
N-2: Garrison-Taft #1 & #2 500 kV + RAS	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	154.5	150.0	103.0%	180.0	85.8%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	PLACIDLK (62344)	% Δ Volts	1.026	0.962				6.24%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	DIXON MV (40348)	% Δ Volts	1.026	0.969				5.56%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	RATTLE S (40867)	% Δ Volts	1.025	0.970				5.37%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	DIAMNDMT (62295)	% Δ Volts	1.022	0.968				5.28%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	SUPERRMT (62296)	% Δ Volts	1.022	0.968				5.28%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	TARKIO-R (62294)	% Δ Volts	1.025	0.971				5.27%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	ST REGIS (62297)	% Δ Volts	1.020	0.967				5.20%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	ALBERTON (62293)	% Δ Volts	1.029	0.976				5.15%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	HUSON-R (62300)	% Δ Volts	1.032	0.980				5.04%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	HAMLTNMT (62074)	% Δ Volts	1.014	0.963				5.03%
N-2: Garrison-Taft #1 & #2 500 kV + RAS	HAUGEN (62298)	% Δ Volts	1.018	0.967				5.01%
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.5	150.0	101.6%	180.0	84.7%
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	No Violations							
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	153.3	150.0	102.2%	180.0	85.2%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	No Violations							
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	159.4	150.0	106.3%	180.0	88.5%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.5	150.0	100.3%	180.0	83.6%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	BENTNAVA (48039) -> TAUNTON (48425) CKT 1 at BENTNAVA	Branch Amp	227.1	268.4	252.0	106.5%	271.1	99.0%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	TAUNTON (48425) -> SOTHELOT (48393) CKT 1 at TAUNTON	Branch Amp	225.5	266.5	266.1	100.2%	1238.4	21.5%
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.5	150.0	101.7%	180.0	84.7%
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.3	150.0	100.2%	180.0	83.5%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.3	150.0	100.2%	180.0	83.5%
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	No Violations							
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	151.1	150.0	100.7%	180.0	83.9%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	176.0	150.0	117.4%	180.0	97.8%
N-2: Malin-Round Mtn #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	302.3	300.0	100.8%	370.0	81.7%
N-2: Malin-Round Mtn #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	302.3	300.0	100.8%	370.0	81.7%
N-2: Malin-Round Mtn #1 & #2 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	426.1	415.7	102.5%	483.5	88.1%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.1	150.0	100.1%	180.0	83.4%
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.2	150.0	100.1%	180.0	83.4%
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.4	150.0	100.3%	180.0	83.5%
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	167.8	150.0	111.9%	180.0	93.2%
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	307.5	300.0	102.5%	370.0	83.1%
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	307.5	300.0	102.5%	370.0	83.1%
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	417.6	415.7	100.5%	483.5	86.4%
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations							
N-2: Napavine-Allston & Paul-Allston #2 500 kV	No Violations							
N-2: Paul-Napavine & Paul-Allston #2 500 kV	No Violations							
N-2: Paul-Raver & Raver-Covingt4 500 kV	No Violations							
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	No Violations							
N-2: Raver-Covington #1 & #2 500 kV	No Violations							
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations							
N-2: Raver-Paul & Napavine-Paul 500 kV	No Violations							
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations							
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations							
N-2: Raver-Schultz #1 & #2 500 kV	No Violations							
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations							
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations							
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	177.8	150.0	118.5%	180.0	98.8%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	302.3	300.0	100.8%	370.0	81.7%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	302.3	300.0	100.8%	370.0	81.7%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	424.6	415.7	102.1%	483.5	87.8%
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	BENTNAVA (48039) -> TAUNTON (48425) CKT 1 at BENTNAVA	Branch Amp	227.1	256.6	252.0	101.8%	271.1	94.7%
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	No Violations							
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	150.7	150.0	100.5%	180.0	83.7%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	284.2	302.1	300.0	100.7%	370.0	81.7%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	284.2	302.1	300.0	100.7%	370.0	81.7%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	384.8	433.6	415.7	104.3%	483.5	89.7%
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.6	150.0	101.8%	180.0	84.8%
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	153.5	150.0	102.3%	180.0	85.3%
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	BENTNAVA (48039) -> TAUNTON (48425) CKT 1 at BENTNAVA	Branch Amp	227.1	255.5	252.0	101.4%	271.1	94.2%

Appendix J - 16la1sa_3400idnw_Path24 Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.6	150.0	101.8%	180.0	84.8%
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	152.9	150.0	101.9%	180.0	85.0%
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	BENTNAVA (48039) -> TAUNTON (48425) CKT 1 at BENTNAVA	Branch Amp	227.1	252.3	252.0	100.1%	271.1	93.1%
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	148.9	151.4	150.0	100.9%	180.0	84.1%
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations							

Appendix J - 16la1sa_3400idnw_Path24 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Cal Sub		Hemingway		Hill top		Humboldt		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 11L12 MERIDIAN-KLAM FALLS 500 KV+KFGEN2+ST	0.7	-854	0.70	-549	0.71	-1827	0.70	-399	0.70	-656	0.74	-1659	0.80	-1502	0.70	-960
BF 11L22 CAPT JACK-KLAM FALLS 500 KV+KFGEN2+ST	0.7	-854	0.70	-549	0.71	-1839	0.70	-400	0.70	-656	0.74	-1668	0.80	-1509	0.70	-960
BF 11R1 MERIDIAN-KLAM FALLS 500 KV & MERIDIAN 500/230 KV XFMR	0.7	-857	0.70	-550	0.70	-1883	0.70	-401	0.70	-660	0.73	-1709	0.80	-1555	0.70	-964
BF 11R6 MERIDIAN-DIXONVILLE 500 KV & MERIDIAN 500/230 KV XFMR	0.7	-857	0.70	-550	0.70	-1902	0.70	-401	0.70	-659	0.73	-1724	0.80	-1567	0.70	-963
BF 4003 HANFORD-VANTAGE & HANFORD CAPS	0.7	-858	0.70	-550	0.70	-1912	0.70	-404	0.70	-660	0.73	-1733	0.80	-1574	0.70	-964
BF 4019 CAPTJACK-MALIN #2 & MALIN 500/230 XFMR	0.7	-832	0.70	-551	0.70	-1921	0.70	-297	0.70	-658	0.73	-1737	0.80	-1576	0.70	-940
BF 4028 TAFT-DWORSHAK & TAFT REACTOR 500KV	0.7	-857	0.70	-550	0.70	-1859	0.70	-404	0.70	-656	0.74	-1687	0.80	-1533	0.70	-962
BF 4046 JOHN DAY-GRIZZLY #2 & GRIZZLY-MALIN #2 500 KV	0.7	-852	0.70	-548	0.70	-1878	0.70	-394	0.70	-655	0.73	-1711	0.80	-1560	0.70	-957
BF 4064 CAPTJACK-MALIN & MALIN-ROUND MTN #1 500 KV	0.7	-859	0.70	-550	0.70	-1933	0.70	-407	0.70	-660	0.73	-1751	0.80	-1590	0.70	-965
BF 4072 GRIZZLY-MALIN #2 & MALIN-ROUND MTN #2 500 KV	0.7	-851	0.70	-547	0.70	-1889	0.70	-392	0.70	-655	0.73	-1724	0.80	-1573	0.70	-955
BF 4095 LOW MON-HANFORD & HANFORD-WAUTOMA 500 KV	0.7	-857	0.70	-550	0.70	-1906	0.70	-404	0.70	-658	0.73	-1727	0.80	-1569	0.70	-963
BF 4104 ASHE-HANFORD & HANFORD-WAUTOMA 500 KV	0.7	-857	0.70	-550	0.70	-1900	0.70	-403	0.70	-659	0.73	-1728	0.80	-1572	0.70	-963
BF 4111 HOT SPRINGS-TAFT & TAFT-DWORSHAK 500 KV	0.7	-857	0.70	-550	0.70	-1864	0.70	-404	0.70	-656	0.74	-1690	0.80	-1536	0.70	-962
BF 4114 GARRISON-TAFT #1 +TAFT REACTOR 500KV	0.7	-855	0.70	-549	0.71	-1812	0.70	-403	0.70	-653	0.74	-1647	0.80	-1493	0.70	-960
BF 4119 GARRISON-TAFT #1 & TAFT-BELL 500KV + RAS	0.7	-850	0.70	-547	0.73	-1647	0.70	-400	0.70	-642	0.76	-1518	0.80	-1375	0.71	-952
BF 4131 SLATT-JOHN DAY & JOHN DAY-GRIZZLY #2 500 KV	0.7	-855	0.70	-549	0.70	-1894	0.70	-400	0.70	-657	0.73	-1728	0.80	-1574	0.70	-960
BF 4143 (OR 4134) JOHN DAY-GRIZZLY #1 & JOHN DAY CAPS 500 KV	0.7	-856	0.70	-549	0.70	-1904	0.70	-401	0.70	-658	0.73	-1726	0.80	-1569	0.70	-962
BF 4148 HOT SPRINGS-TAFT & GARRISON-TAFT #2 500 KV	0.7	-856	0.70	-549	0.71	-1845	0.70	-404	0.70	-654	0.74	-1669	0.80	-1510	0.70	-961
BF 4170 JOHN DAY-MARION & JOHN DAY CAPS 500 KV	0.7	-857	0.70	-550	0.70	-1904	0.70	-402	0.70	-658	0.73	-1727	0.80	-1570	0.70	-963
BF 4186 (OR 4582) MALIN-ROUND MTN 500 KV & MALIN 500/230 XFMR	0.7	-831	0.70	-550	0.70	-1917	0.70	-296	0.70	-657	0.73	-1741	0.80	-1583	0.70	-938
BF 4194 ROCK CK-JOHN DAY & BIG EDDY-JOHN DAY 500 KV	0.7	-858	0.70	-550	0.70	-1912	0.70	-404	0.70	-659	0.73	-1732	0.80	-1574	0.70	-964
BF 4197 JOHN DAY-BIG EDDY #1 & JOHN DAY CAPS 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-660	0.73	-1735	0.80	-1575	0.70	-965
BF 4202 JOHN DAY-BIG EDDY#2 & BIG EDDY-OSTRANDER 500 KV	0.7	-858	0.70	-550	0.70	-1907	0.70	-403	0.70	-659	0.73	-1729	0.80	-1571	0.70	-964
BF 4231 MCNARY-LONGHORN 500 KV & MCNARY 500/230 KV XFMR	0.7	-858	0.70	-550	0.71	-1869	0.70	-405	0.70	-658	0.73	-1719	0.80	-1569	0.70	-964
BF 4234 MCNARY-LONGHORN & MCNARY-HERMCALP 500 KV	0.7	-855	0.70	-549	0.72	-1783	0.70	-403	0.70	-656	0.75	-1626	0.81	-1466	0.70	-961
BF 4247 LIT GOOS-LOW MON #2 & LOW MON-MCNARY 500 KV	0.7	-858	0.70	-550	0.70	-1908	0.70	-404	0.70	-659	0.73	-1730	0.80	-1572	0.70	-964
BF 4259 LIT GOOS-LOW MON #2 & LOW MON-HANFORD 500 KV	0.7	-857	0.70	-550	0.70	-1904	0.70	-404	0.70	-658	0.73	-1726	0.80	-1568	0.70	-963
BF 4268 MONROE-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-659	0.73	-1735	0.80	-1574	0.70	-964
BF 4276 ING500-CUSTERW 500 KV & CUSTERW 500/230 XFMR	0.7	-858	0.70	-550	0.70	-1920	0.70	-405	0.70	-659	0.73	-1736	0.80	-1575	0.70	-964
BF 4280 KEELER-PEARL & PEARL-MARION 500 KV	0.7	-859	0.70	-551	0.70	-1912	0.70	-406	0.70	-661	0.73	-1732	0.80	-1573	0.70	-966
BF 4280 KEELER-PEARL & PEARL-OSTRANDER 500 KV	0.7	-858	0.70	-550	0.70	-1921	0.70	-405	0.70	-660	0.73	-1737	0.80	-1577	0.70	-965
BF 4287 PEARL-OSTRANDER 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.7	-858	0.70	-550	0.70	-1921	0.70	-404	0.70	-660	0.73	-1736	0.80	-1576	0.70	-964
BF 4293 SCHULTZ-RAVER & RAVER COVINGTON5 500 KV	0.7	-858	0.70	-550	0.70	-1916	0.70	-404	0.70	-659	0.73	-1733	0.80	-1573	0.70	-964
BF 4336 CHIEF JO-SICKLER 500 KV & SICKLER 500/230 XFMR	0.7	-858	0.70	-550	0.70	-1918	0.70	-405	0.70	-659	0.73	-1735	0.80	-1574	0.70	-964
BF 4336 SICKLER-SCHULTZ 500 KV & SICKLER 500/230 XFMR	0.7	-858	0.70	-550	0.70	-1918	0.70	-405	0.70	-659	0.73	-1735	0.80	-1574	0.70	-964
BF 4377 ASHE-MARION & MARION-ALVEY 500 KV	0.7	-855	0.70	-549	0.70	-1899	0.70	-400	0.70	-657	0.73	-1724	0.80	-1568	0.70	-960
BF 4386 BUCKLEY-MARION & MARION-SANTIAM 500 KV	0.7	-857	0.70	-550	0.70	-1901	0.70	-402	0.70	-658	0.73	-1727	0.80	-1570	0.70	-963
BF 4439 BIG EDDY-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.7	-858	0.70	-550	0.70	-1907	0.70	-403	0.70	-659	0.73	-1729	0.80	-1571	0.70	-964
BF 4442 BIG EDDY-OSTRANDER 500 KV & OSTRANDER-MCLOUGHLIN 230 KV	0.7	-858	0.70	-550	0.70	-1910	0.70	-404	0.70	-659	0.73	-1730	0.80	-1572	0.70	-964
BF 4448 KNIGHT-OSTRANDER & OSTRANDER-TROUTDALE 500 KV	0.7	-857	0.70	-550	0.70	-1905	0.70	-403	0.70	-659	0.73	-1727	0.80	-1569	0.70	-963
BF 4450 KNIGHT-OSTRANDER & OSTRANDER-PEARL 500 KV	0.7	-857	0.70	-550	0.70	-1908	0.70	-403	0.70	-659	0.73	-1729	0.80	-1571	0.70	-963
BF 4502 PAUL-ALLSTON & ALLSTON-KEELER 500 KV	0.7	-858	0.70	-550	0.70	-1916	0.70	-404	0.70	-659	0.73	-1734	0.80	-1573	0.70	-964
BF 4510 PEARL-MARION 500 KV & PEARL 500/230 XFMR & PEARL CAPS	0.7	-859	0.70	-551	0.70	-1912	0.70	-406	0.70	-660	0.73	-1731	0.80	-1572	0.70	-966
BF 4526 CUSTERW-MONROE & MONROE-ECHO LAKE 500 KV	0.7	-858	0.70	-550	0.70	-1915	0.70	-404	0.70	-659	0.73	-1733	0.80	-1573	0.70	-964
BF 4530 RAVER-PAUL & PAUL-SATSOP 500 KV	0.7	-858	0.70	-550	0.70	-1917	0.70	-404	0.70	-660	0.73	-1734	0.80	-1575	0.70	-965
BF 4540 PAUL-NAPAVINE & PAUL-SATSOP 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-659	0.73	-1735	0.80	-1575	0.70	-964
BF 4542 PAUL-ALLSTON 500 KV & CENTER G2	0.7	-853	0.70	-548	0.72	-1766	0.70	-401	0.70	-654	0.75	-1600	0.81	-1441	0.70	-958
BF 4542 PAUL-NAPAVINE 500 KV & CENTER G1	0.7	-854	0.70	-548	0.72	-1778	0.70	-402	0.70	-654	0.75	-1611	0.81	-1450	0.70	-959
BF 4550 OLYMPIA-PAUL & PAUL-ALLSTON 500 KV	0.7	-858	0.70	-550	0.70	-1916	0.70	-404	0.70	-659	0.73	-1733	0.80	-1573	0.70	-964
BF 4554 OLYMPIA-PAUL 500 KV & TONO 500/115 XFMR	0.7	-858	0.70	-550	0.70	-1920	0.70	-405	0.70	-660	0.73	-1735	0.80	-1574	0.70	-965
BF 4572 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.7	-858	0.70	-550	0.71	-1880	0.70	-405	0.70	-659	0.73	-1722	0.80	-1570	0.70	-964
BF 4630 CEN FERRY-LIT GOOS #1 & LIT GOOS-LOW MON #1 500 KV	0.7	-858	0.70	-550	0.70	-1915	0.70	-404	0.70	-659	0.73	-1732	0.80	-1573	0.70	-964

Appendix J - 16la1sa_3400idnw_Path24 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Cal Sub		Hemingway		Hill top		Humboldt		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BF 4652 TAFT-DWORSHAK & TAFT-HATWAI 500 KV + RAS	0.7	-856	0.70	-549	0.71	-1835	0.70	-404	0.70	-656	0.74	-1654	0.80	-1494	0.70	-962
BF 4672 MONROE-CHIEF JO 500 KV & MONROE CAPS	0.7	-858	0.70	-550	0.70	-1912	0.70	-404	0.70	-659	0.73	-1731	0.80	-1572	0.70	-964
BF 4676 LIT GOOS-LOW MON & LOW MON-ASHE 500 KV	0.7	-858	0.70	-550	0.70	-1924	0.70	-405	0.70	-659	0.73	-1737	0.80	-1575	0.70	-964
BF 4690 PAUL-ALLSTON 500 KV & ALLSTON 500/230 XFMR	0.7	-858	0.70	-550	0.70	-1917	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
BF 4708 HATWAI 500 KV BUS	0.7	-856	0.70	-549	0.70	-1846	0.70	-403	0.70	-654	0.74	-1677	0.80	-1520	0.70	-960
BF 4728 COULEE-CHIEF JO 500 KV & CHEIF JO 500/230 XFMR	0.7	-858	0.70	-550	0.70	-1913	0.70	-404	0.70	-659	0.73	-1731	0.80	-1571	0.70	-964
BF 4775 CEN FERRY-LOW GRAN #1 & #2 500 KV	0.7	-855	0.70	-549	0.70	-1855	0.70	-403	0.70	-653	0.74	-1684	0.80	-1527	0.70	-959
BF 4776 HATWAI-LOW GRAN & LOW GRAN-CEN FERRY 500 KV	0.7	-856	0.70	-549	0.70	-1859	0.70	-403	0.70	-654	0.74	-1688	0.80	-1533	0.70	-960
BF 4870 JOHN DAY-BIG EDDY 500 KV & BIG EDDY 500/230 KV	0.7	-858	0.70	-550	0.70	-1917	0.70	-404	0.70	-660	0.73	-1735	0.80	-1575	0.70	-965
BF 4888 ASHE-SLATT & CGS 500 KV	0.7	-852	0.70	-548	0.73	-1695	0.70	-400	0.70	-652	0.76	-1538	0.81	-1379	0.70	-956
BF 4891 LOW MON-ASHE & ASHE-SLATT 500 KV	0.7	-857	0.70	-550	0.70	-1898	0.70	-403	0.70	-658	0.73	-1725	0.80	-1569	0.70	-963
BF 4901 LOW MON-ASHE & ASHE-HANFORD 500 KV	0.7	-857	0.70	-550	0.70	-1887	0.70	-402	0.70	-659	0.73	-1723	0.80	-1571	0.70	-963
BF 4940 LOW MON-ASHE & ASHE-MARION 500 KV	0.7	-856	0.70	-549	0.70	-1895	0.70	-402	0.70	-657	0.73	-1721	0.80	-1564	0.70	-961
BF 4957 SUMMER L-MALIN & SUMMER L-HEMINGWAY 500 KV	0.7	-828	0.70	-535	0.72	-1429	0.70	-396	0.70	-615	0.73	-1530	0.81	-1607	0.72	-917
BF 4959 GRIZZLY-SUMMER L & SUMMER L-MALIN 500 KV	0.7	-830	0.70	-536	0.73	-1508	0.70	-397	0.70	-624	0.73	-1607	0.81	-1679	0.72	-921
BF 4996 CAPTJACK-MALIN #1 & #2 500 KV	0.7	-861	0.70	-551	0.70	-1932	0.70	-408	0.70	-661	0.73	-1745	0.80	-1582	0.70	-968
BF 5003 SLATT-BUCKLEY & SLATT-BOARDMAN 500 KV	0.7	-854	0.70	-548	0.70	-1883	0.70	-402	0.70	-655	0.73	-1735	0.80	-1585	0.70	-959
BF 5006 SLATT-LONGHORN & SLATT-GRASSLAND 500 KV	0.7	-852	0.70	-547	0.71	-1868	0.70	-402	0.70	-653	0.73	-1738	0.80	-1601	0.70	-956
BF 5015 ASHE-SLATT & SLATT-BUCKLEY 500 KV	0.7	-856	0.70	-549	0.70	-1900	0.70	-402	0.70	-657	0.73	-1733	0.80	-1577	0.70	-961
BF 5018 ASHE-SLATT & SLATT-JOHN DAY 500 KV	0.7	-856	0.70	-549	0.70	-1895	0.70	-403	0.70	-658	0.73	-1735	0.80	-1582	0.70	-962
BF 5021 SLATT-JOHN DAY & SLATT-LONGHORN 500 KV	0.7	-856	0.70	-549	0.70	-1907	0.70	-403	0.70	-657	0.73	-1736	0.80	-1579	0.70	-962
BF 5028 BUCKLEY-GRIZZLY & GRIZZLY-SUMMER LAKE 500 KV	0.7	-857	0.70	-550	0.70	-1883	0.70	-402	0.70	-659	0.73	-1722	0.80	-1573	0.70	-963
BF 5040 GRIZZLY-JOHN DAY & GRIZZLY-ROUND BU 500 KV	0.7	-856	0.70	-549	0.70	-1900	0.70	-401	0.70	-658	0.73	-1724	0.80	-1568	0.70	-962
BF 5114 ECHO LAKE-RAVER & ECHO LAKE- SNOK TAP 500 KV	0.7	-858	0.70	-550	0.70	-1920	0.70	-405	0.70	-660	0.73	-1736	0.80	-1575	0.70	-965
BF 5117 ECHO LAKE-MAPLE VALLEY & ECHO LAKE-RAVER 500 KV	0.7	-858	0.70	-550	0.70	-1914	0.70	-404	0.70	-659	0.73	-1732	0.80	-1573	0.70	-964
BF 5148 COULEE-SCHULTZ & ECHO LAKE-SCHULTZ 500 KV	0.7	-857	0.70	-550	0.70	-1901	0.70	-404	0.70	-658	0.73	-1724	0.80	-1567	0.70	-963
BF 5170 WAUTOMA-SCHULTZ & SCHULTZ-RAVER 500 KV	0.7	-858	0.70	-550	0.70	-1911	0.70	-404	0.70	-660	0.73	-1731	0.80	-1573	0.70	-964
BF 5179 VANTAGE-SCHULTZ & SCHULTZ-RAVER #4	0.7	-858	0.70	-550	0.70	-1914	0.70	-404	0.70	-659	0.73	-1733	0.80	-1573	0.70	-964
BF 5187 MCNARY-LONGHORN & LONGHORN-SLATT 500 KV	0.7	-858	0.70	-550	0.70	-1899	0.70	-404	0.70	-659	0.73	-1733	0.80	-1576	0.70	-964
BF 5193 GRASSLAND-COYOTE & COYOTE-LONGHORN 500 KV	0.7	-855	0.70	-549	0.71	-1770	0.70	-403	0.70	-655	0.75	-1627	0.80	-1471	0.70	-960
BF 5211 LOW MON-MCNARY 500 KV & MCNARY 500/230 KV XFMR	0.7	-858	0.70	-550	0.71	-1886	0.70	-405	0.70	-659	0.73	-1724	0.80	-1571	0.70	-964
BF 5214 LOW MON-MCNARY & CALPINE PH 500 KV	0.7	-855	0.70	-549	0.72	-1768	0.70	-402	0.70	-655	0.75	-1617	0.81	-1458	0.70	-960
BF 5250 HANFORD-WAUTOMA#1 & WAUTOMA-KNIGHT 500 KV	0.7	-857	0.70	-550	0.70	-1908	0.70	-404	0.70	-658	0.73	-1729	0.80	-1571	0.70	-963
BF 5259 HANFORD-WAUTOMA#2 & WAUTOMA-ROCK CK 500 KV	0.7	-858	0.70	-550	0.70	-1910	0.70	-404	0.70	-659	0.73	-1731	0.80	-1572	0.70	-964
BF 5266 SLATT-BUCKLY 500 KV	0.7	-856	0.70	-549	0.70	-1916	0.70	-403	0.70	-657	0.73	-1738	0.80	-1579	0.70	-961
BF 5339 VANTAGE-SCHULTZ 500 KV & VANTAGE 500/230 XFMR #1	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-660	0.73	-1735	0.80	-1575	0.70	-964
BF 5345 VANTAGE-HANFORD 500 KV & VANTAGE 500/230 XFMR #1	0.7	-858	0.70	-550	0.70	-1912	0.70	-404	0.70	-660	0.73	-1733	0.80	-1574	0.70	-964
BF IPC HEM-GRASSLAND 500 KV & HEM 500/230 XFMR	0.7	-825	0.70	-535	0.70	-1109	0.70	-386	0.70	-604	0.74	-1299	0.82	-1384	0.72	-913
BF IPC HEMINGWAY-SUMMER L 500 KV & HEMINGWAY 500/230 XFMR	0.7	-830	0.70	-536	0.70	-1348	0.70	-397	0.70	-619	0.73	-1527	0.81	-1567	0.72	-920
BF IPC MIDPOINT-HEMINGWAY 500 KV & HEMINGWAY 500/230 XFMR	0.7	-831	0.70	-536	0.70	-1211	0.70	-396	0.70	-611	0.71	-1320	0.77	-1292	0.72	-921
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR	0.7	-846	0.70	-544	0.70	-1475	0.70	-404	0.70	-622	0.73	-1271	0.82	-1189	0.72	-939
BF IPC POPULUS-CHILL-HEM 500 KV & HEM 500/230 XFMR + RAS	0.7	-831	0.70	-538	0.70	-1378	0.70	-401	0.70	-586	0.74	-1020	0.83	-1137	0.72	-911
BF LOLO 230KV	0.7	-855	0.70	-549	0.70	-1844	0.70	-403	0.70	-654	0.73	-1705	0.80	-1565	0.70	-959
BF PGE GRASSLAND-CEDAR SPRING & HEMINGWAY-GRASSLAND 500 KV	0.7	-825	0.70	-535	0.71	-1186	0.70	-385	0.70	-605	0.74	-1316	0.82	-1438	0.72	-912
BF PGE GRASSLAND-COYOTE 500 KV & CARTY GAS PROJECT	0.7	-858	0.70	-550	0.70	-1879	0.70	-404	0.70	-659	0.73	-1720	0.80	-1566	0.70	-964
BF PGE SLATT-GRASSLAND 500 KV & BOARDMAN COAL GEN	0.7	-854	0.70	-548	0.71	-1742	0.70	-403	0.70	-654	0.75	-1607	0.81	-1461	0.70	-959
BUS: ALVEY 500 KV	0.7	-856	0.70	-549	0.70	-1904	0.70	-400	0.70	-658	0.73	-1727	0.80	-1569	0.70	-962
BUS: BELL BPA 500 KV	0.7	-852	0.70	-547	0.72	-1711	0.70	-400	0.70	-645	0.75	-1579	0.80	-1437	0.70	-954
BUS: BUCKLEY 500 KV	0.7	-854	0.70	-548	0.70	-1887	0.70	-399	0.70	-656	0.73	-1720	0.80	-1567	0.70	-959
BUS: DIXONVILLE 500 KV	0.7	-857	0.70	-550	0.70	-1907	0.70	-401	0.70	-659	0.73	-1727	0.80	-1569	0.70	-963
BUS: HOT SPRINGS 500 KV	0.7	-858	0.70	-550	0.70	-1923	0.70	-405	0.70	-660	0.73	-1739	0.80	-1578	0.70	-965
BUS: KEELER 500 KV	0.7	-858	0.70	-550	0.70	-1915	0.70	-405	0.70	-659	0.73	-1734	0.80	-1573	0.70	-964

Appendix J - 16la1sa_3400idnw_Path24 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Cal Sub		Hemingway		Hill top		Humboldt		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
BUS: ROCK CREEK 500 KV	0.7	-857	0.70	-550	0.70	-1891	0.70	-403	0.70	-658	0.73	-1714	0.80	-1557	0.70	-963
BUS: SICKLER 500 KV	0.7	-858	0.70	-550	0.70	-1915	0.70	-404	0.70	-659	0.73	-1733	0.80	-1573	0.70	-964
BUS: SUMMER LAKE 500 KV	0.7	-828	0.70	-535	0.72	-1432	0.70	-396	0.70	-615	0.73	-1532	0.81	-1608	0.72	-917
N-1: ALLSTON-KEELER 500 KV	0.7	-858	0.70	-550	0.70	-1916	0.70	-404	0.70	-659	0.73	-1734	0.80	-1573	0.70	-964
N-1: ALLSTON-NAPAVINE 500 KV	0.7	-858	0.70	-550	0.70	-1916	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-1: ALLSTON-PAUL #2 500 KV	0.7	-858	0.70	-550	0.70	-1917	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-1: ALVERY-DIXONVILLE 500 KV	0.7	-857	0.70	-550	0.70	-1912	0.70	-401	0.70	-659	0.73	-1731	0.80	-1572	0.70	-963
N-1: ALVEY-MARION 500 KV	0.7	-857	0.70	-549	0.70	-1916	0.70	-402	0.70	-658	0.73	-1735	0.80	-1575	0.70	-963
N-1: ASHE-HANFORD 500 KV	0.7	-857	0.70	-550	0.70	-1902	0.70	-403	0.70	-659	0.73	-1729	0.80	-1573	0.70	-964
N-1: ASHE-LOW MON 500 KV	0.7	-858	0.70	-550	0.70	-1912	0.70	-404	0.70	-659	0.73	-1731	0.80	-1571	0.70	-964
N-1: ASHE-MARION 500 KV	0.7	-856	0.70	-549	0.70	-1904	0.70	-402	0.70	-658	0.73	-1726	0.80	-1568	0.70	-962
N-1: ASHE-SLATT 500 KV	0.7	-858	0.70	-550	0.70	-1906	0.70	-404	0.70	-659	0.73	-1730	0.80	-1573	0.70	-964
N-1: BELL-COULEE 500 KV	0.7	-856	0.70	-549	0.70	-1859	0.70	-403	0.70	-654	0.74	-1687	0.80	-1532	0.70	-960
N-1: BELL-TAFT 500 KV	0.7	-852	0.70	-547	0.72	-1711	0.70	-400	0.70	-646	0.75	-1581	0.80	-1438	0.70	-954
N-1: BIG EDDY-CELILO 500 KV	0.7	-858	0.70	-550	0.70	-1921	0.70	-405	0.70	-660	0.73	-1736	0.80	-1576	0.70	-965
N-1: BIG EDDY-JOHN DAY 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-660	0.73	-1735	0.80	-1575	0.70	-965
N-1: BIG EDDY-KNIGHT 500 KV	0.7	-858	0.70	-550	0.70	-1916	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-1: BIG EDDY-OSTRANDER 500 KV	0.7	-858	0.70	-550	0.70	-1911	0.70	-404	0.70	-659	0.73	-1731	0.80	-1572	0.70	-964
N-1: BOISE BENCH-BROWNLEE #3 230 KV	0.7	-858	0.70	-550	0.70	-1901	0.70	-405	0.70	-658	0.73	-1713	0.80	-1563	0.70	-964
N-1: BRADY-ANTELOPE 230 KV + RAS	0.7	-855	0.70	-549	0.70	-1832	0.70	-403	0.70	-652	0.73	-1676	0.80	-1543	0.70	-959
N-1: BROADVIEW-GARRISON #1 500 KV	0.7	-856	0.70	-549	0.73	-1767	0.70	-403	0.70	-653	0.75	-1630	0.81	-1465	0.70	-961
N-1: BROWNLEE-ONTARIO 230 KV	0.7	-858	0.70	-550	0.70	-1885	0.70	-405	0.70	-658	0.73	-1703	0.80	-1556	0.70	-964
N-1: BUCKLEY-GRIZZLY 500 KV	0.7	-857	0.70	-549	0.70	-1913	0.70	-402	0.70	-658	0.73	-1732	0.80	-1573	0.70	-962
N-1: BUCKLEY-MARION 500 KV	0.7	-857	0.70	-550	0.70	-1903	0.70	-402	0.70	-658	0.73	-1727	0.80	-1571	0.70	-963
N-1: BUCKLEY-SLATT 500 KV	0.7	-856	0.70	-549	0.70	-1916	0.70	-403	0.70	-657	0.73	-1738	0.80	-1579	0.70	-961
N-1: CAL SUB 120 KV PHASE SHIFTER	0.7	-833	0.70	-463	0.70	-1890	0.70	-396	0.70	-669	0.73	-1718	0.80	-1563	0.70	-926
N-1: CAPTAIN JACK-OLINDA 500 KV	0.7	-856	0.70	-548	0.70	-1920	0.70	-399	0.70	-658	0.73	-1748	0.80	-1591	0.70	-961
N-1: CAPTJACK-KFALLS 500 KV	0.7	-857	0.70	-550	0.70	-1909	0.70	-402	0.70	-659	0.73	-1730	0.80	-1572	0.70	-963
N-1: CASCADE CROSSING 500 KV	0.7	-855	0.70	-549	0.70	-1902	0.70	-401	0.70	-657	0.73	-1733	0.80	-1578	0.70	-960
N-1: CHIEF JO-COULEE 500 KV	0.7	-858	0.70	-550	0.70	-1913	0.70	-404	0.70	-659	0.73	-1731	0.80	-1571	0.70	-964
N-1: CHIEF JO-MONROE 500 KV	0.7	-858	0.70	-550	0.70	-1912	0.70	-404	0.70	-659	0.73	-1731	0.80	-1572	0.70	-964
N-1: CHIEF JO-SICKLER 500 KV	0.7	-858	0.70	-550	0.70	-1917	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-1: COULEE-HANFORD 500 KV	0.7	-858	0.70	-550	0.70	-1913	0.70	-404	0.70	-659	0.73	-1732	0.80	-1574	0.70	-964
N-1: COULEE-SCHULTZ 500 KV	0.7	-858	0.70	-550	0.70	-1910	0.70	-404	0.70	-659	0.73	-1729	0.80	-1570	0.70	-964
N-1: COVINGTON4-RAVER 500 KV	0.7	-858	0.70	-550	0.70	-1921	0.70	-405	0.70	-660	0.73	-1736	0.80	-1575	0.70	-965
N-1: COVINGTON5-RAVER 500 KV	0.7	-858	0.70	-550	0.70	-1920	0.70	-405	0.70	-660	0.73	-1736	0.80	-1575	0.70	-965
N-1: COYOTE-LONGHORN 500 KV	0.7	-858	0.70	-550	0.70	-1912	0.70	-404	0.70	-659	0.73	-1739	0.80	-1580	0.70	-964
N-1: CUSTERW-MONROE 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-659	0.73	-1735	0.80	-1574	0.70	-964
N-1: DIXONVILLE-MERIDIAN 500 KV	0.7	-857	0.70	-550	0.70	-1903	0.70	-401	0.70	-659	0.73	-1725	0.80	-1567	0.70	-963
N-1: DRYCREEK-LOLO 230 KV	0.7	-858	0.70	-550	0.70	-1920	0.70	-405	0.70	-659	0.73	-1736	0.80	-1575	0.70	-964
N-1: DRYCREEK-N LEWISTON 230 KV	0.7	-858	0.70	-550	0.70	-1920	0.70	-405	0.70	-659	0.73	-1736	0.80	-1575	0.70	-964
N-1: DRYCREEK-WALA AVA 230 KV	0.7	-858	0.70	-550	0.70	-1917	0.70	-405	0.70	-659	0.73	-1735	0.80	-1575	0.70	-964
N-1: DWORSHAK-HATWAI 500 KV	0.7	-857	0.70	-550	0.71	-1864	0.70	-404	0.70	-656	0.74	-1688	0.80	-1528	0.70	-962
N-1: DWORSHAK-TAFT 500 KV	0.7	-857	0.70	-550	0.70	-1859	0.70	-404	0.70	-656	0.74	-1687	0.80	-1533	0.70	-962
N-1: ECHO LAKE-MAPLE VALLEY 500 KV	0.7	-858	0.70	-550	0.70	-1915	0.70	-404	0.70	-659	0.73	-1733	0.80	-1573	0.70	-964
N-1: ECHO LAKE-RAVER 500 KV	0.7	-858	0.70	-550	0.70	-1920	0.70	-405	0.70	-660	0.73	-1736	0.80	-1575	0.70	-965
N-1: ECHO LAKE-SCHULTZ 500 KV	0.7	-858	0.70	-550	0.70	-1913	0.70	-404	0.70	-659	0.73	-1731	0.80	-1572	0.70	-964
N-1: ECHO LAKE-SNOK TAP 500 KV	0.7	-858	0.70	-550	0.70	-1921	0.70	-405	0.70	-660	0.73	-1737	0.80	-1576	0.70	-965
N-1: GARRISON-TAFT #2 500 KV	0.7	-855	0.70	-549	0.71	-1812	0.70	-403	0.70	-653	0.74	-1647	0.80	-1493	0.70	-960
N-1: GOLDHILL-PLACER 115 KV	0.7	-859	0.70	-550	0.70	-1922	0.70	-405	0.70	-660	0.73	-1738	0.80	-1577	0.70	-965
N-1: GRASSLAND-COYOTE 500 KV	0.7	-858	0.70	-550	0.70	-1879	0.70	-404	0.70	-659	0.73	-1720	0.80	-1566	0.70	-964
N-1: GRASSLAND-SLATT 500 KV	0.7	-856	0.70	-549	0.70	-1889	0.70	-404	0.70	-657	0.73	-1737	0.80	-1584	0.70	-961

Appendix J - 16la1sa_3400idnw_Path24 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Cal Sub		Hemingway		Hill top		Humboldt		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: GRIZZLY-JOHN DAY #2 500 KV	0.7	-856	0.70	-549	0.70	-1904	0.70	-401	0.70	-658	0.73	-1726	0.80	-1569	0.70	-962
N-1: GRIZZLY-MALIN 500 KV	0.7	-854	0.70	-548	0.70	-1898	0.70	-397	0.70	-657	0.73	-1724	0.80	-1569	0.70	-959
N-1: GRIZZLY-PONDEROSA A-SUMMER L 500 KV	0.7	-858	0.70	-550	0.70	-1889	0.70	-404	0.70	-660	0.73	-1725	0.80	-1575	0.70	-965
N-1: GRIZZLY-PONDEROSA B-CAPT JACK 500 KV	0.7	-854	0.70	-548	0.70	-1896	0.70	-398	0.70	-656	0.73	-1724	0.80	-1569	0.70	-959
N-1: GRIZZLY-ROUND BU 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-1: HANFORD-LOW MON 500 KV	0.7	-858	0.70	-550	0.70	-1908	0.70	-404	0.70	-658	0.73	-1729	0.80	-1570	0.70	-963
N-1: HANFORD-VANTAGE 500 KV	0.7	-858	0.70	-550	0.70	-1912	0.70	-404	0.70	-660	0.73	-1733	0.80	-1574	0.70	-964
N-1: HANFORD-WAUTOMA 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-659	0.73	-1735	0.80	-1575	0.70	-964
N-1: HARRY ALLEN 345 KV PHASE SHIFTER	0.7	-847	0.70	-545	0.73	-1541	0.70	-401	0.70	-611	0.77	-1409	0.82	-1301	0.72	-933
N-1: HATWAI 500/230 KV XFMR	0.7	-858	0.70	-550	0.70	-1920	0.70	-405	0.70	-659	0.73	-1737	0.80	-1576	0.70	-964
N-1: HATWAI-LOLO 230 KV	0.7	-858	0.70	-550	0.70	-1917	0.70	-405	0.70	-659	0.73	-1735	0.80	-1575	0.70	-964
N-1: HATWAI-LOW GRAN 500 KV	0.7	-856	0.70	-549	0.70	-1862	0.70	-403	0.70	-654	0.74	-1689	0.80	-1534	0.70	-960
N-1: HATWAI-N LEWISTON 230 KV	0.7	-858	0.70	-550	0.70	-1921	0.70	-405	0.70	-660	0.73	-1736	0.80	-1575	0.70	-965
N-1: HELLS CANYON-BROWNLEE 230 KV	0.7	-857	0.70	-550	0.71	-1784	0.70	-404	0.70	-658	0.74	-1649	0.80	-1544	0.70	-963
N-1: HELLS CANYON-WALLA WALLA 230 KV	0.7	-854	0.70	-548	0.71	-1775	0.70	-402	0.70	-650	0.73	-1662	0.80	-1544	0.70	-957
N-1: HEMINGWAY-GRASSLAND 500 KV	0.7	-827	0.70	-535	0.70	-1207	0.70	-387	0.70	-608	0.74	-1336	0.82	-1457	0.72	-915
N-1: HEMINGWAY-SUMMER LAKE 500 KV	0.7	-830	0.70	-536	0.72	-1454	0.70	-397	0.70	-619	0.73	-1550	0.81	-1609	0.72	-920
N-1: HILL TOP 345/230 XFMR	0.7	-777	0.70	-544	0.70	-1875	0.70	-234	0.70	-670	0.73	-1707	0.80	-1553	0.70	-887
N-1: HORSE HV-MCNARY 230 KV	0.7	-858	0.70	-550	0.70	-1919	0.70	-404	0.70	-659	0.73	-1736	0.80	-1575	0.70	-964
N-1: HOT SPRINGS-TAFT 500 KV	0.7	-858	0.70	-550	0.70	-1914	0.70	-405	0.70	-659	0.73	-1731	0.80	-1571	0.70	-964
N-1: HUMBOLDT-COYOTE CK 345 KV	0.7	-862	0.70	-555	0.71	-1807	0.70	-408	0.70	-233	0.74	-1615	0.80	-1564	0.74	-935
N-1: HUNTINGTON-PINTO-FOUR CORNERS 345 KV	0.7	-848	0.70	-546	0.73	-1578	0.70	-401	0.70	-620	0.76	-1442	0.82	-1340	0.72	-939
N-1: ING500-CUSTERW 500 KV	0.7	-858	0.70	-550	0.70	-1920	0.70	-405	0.70	-659	0.73	-1736	0.80	-1575	0.70	-964
N-1: JOHN DAY-MARION 500 KV	0.7	-857	0.70	-550	0.70	-1904	0.70	-402	0.70	-658	0.73	-1727	0.80	-1570	0.70	-963
N-1: JOHN DAY-ROCK CK 500 KV	0.7	-858	0.70	-550	0.70	-1916	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-1: JOHN DAY-SLATT 500 KV	0.7	-857	0.70	-549	0.70	-1915	0.70	-403	0.70	-658	0.73	-1740	0.80	-1582	0.70	-962
N-1: KFALLS-MERIDIAN 500 KV	0.7	-857	0.70	-550	0.70	-1882	0.70	-401	0.70	-660	0.73	-1708	0.80	-1554	0.70	-964
N-1: KNIGHT-WAUTOMA 500 KV	0.7	-858	0.70	-550	0.70	-1911	0.70	-404	0.70	-659	0.73	-1731	0.80	-1571	0.70	-964
N-1: LAGRANDE-NORTH POWDER 230 KV	0.7	-856	0.70	-549	0.70	-1856	0.70	-403	0.70	-655	0.73	-1708	0.80	-1564	0.70	-960
N-1: LANES-MARION 500 KV	0.7	-857	0.70	-550	0.70	-1912	0.70	-403	0.70	-659	0.73	-1732	0.80	-1573	0.70	-963
N-1: LIT GOOSE-CENTRAL FERRY 500 KV	0.7	-858	0.70	-550	0.70	-1919	0.70	-405	0.70	-659	0.73	-1735	0.80	-1574	0.70	-964
N-1: LIT GOOSE-LOW MON 500 KV	0.7	-858	0.70	-550	0.70	-1917	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-1: LOW GRAN-CENTRAL FERRY 500 KV	0.7	-858	0.70	-550	0.70	-1916	0.70	-404	0.70	-659	0.73	-1733	0.80	-1573	0.70	-964
N-1: LOW MON-SAC TAP 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-660	0.73	-1736	0.80	-1576	0.70	-964
N-1: MALIN 500/230 XFMR	0.7	-833	0.70	-551	0.70	-1923	0.70	-297	0.70	-658	0.73	-1738	0.80	-1577	0.70	-940
N-1: MALIN-HILLTOP 230 KV	0.7	-785	0.70	-548	0.70	-1895	0.70	-191	0.70	-666	0.73	-1720	0.80	-1564	0.70	-896
N-1: MALIN-ROUND MTN #1 500 KV	0.7	-856	0.70	-548	0.70	-1914	0.70	-400	0.70	-658	0.73	-1738	0.80	-1581	0.70	-961
N-1: MALIN-ROUND MTN #2 500 KV	0.7	-856	0.70	-548	0.70	-1914	0.70	-400	0.70	-658	0.73	-1738	0.80	-1581	0.70	-961
N-1: MALIN-SUMMER LAKE 500 KV	0.7	-853	0.70	-547	0.70	-1879	0.70	-403	0.70	-654	0.73	-1742	0.80	-1604	0.70	-957
N-1: MAPLE VLY-ROCKY RH 345 KV	0.7	-858	0.70	-550	0.70	-1919	0.70	-404	0.70	-659	0.73	-1735	0.80	-1575	0.70	-964
N-1: MARION-PEARL 500 KV	0.7	-859	0.70	-551	0.70	-1913	0.70	-406	0.70	-661	0.73	-1732	0.80	-1573	0.70	-966
N-1: MARION-SANTIAM 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-405	0.70	-659	0.73	-1735	0.80	-1574	0.70	-965
N-1: MCLOUGLIN-OSTRANDER 230 KV	0.7	-858	0.70	-550	0.70	-1920	0.70	-405	0.70	-660	0.73	-1736	0.80	-1575	0.70	-965
N-1: MCNARY 500/230 KV XFMR	0.7	-858	0.70	-550	0.71	-1891	0.70	-405	0.70	-659	0.73	-1726	0.80	-1571	0.70	-964
N-1: MCNARY-BOARD T1 230 KV	0.7	-859	0.70	-550	0.70	-1933	0.70	-405	0.70	-660	0.73	-1748	0.80	-1586	0.70	-965
N-1: MCNARY-JOHN DAY 500 KV	0.7	-857	0.70	-549	0.70	-1908	0.70	-403	0.70	-658	0.73	-1731	0.80	-1572	0.70	-962
N-1: MCNARY-LONGHORN 500 KV	0.7	-858	0.70	-550	0.70	-1905	0.70	-405	0.70	-660	0.73	-1733	0.80	-1574	0.70	-965
N-1: MCNARY-ROSS 345 KV	0.7	-857	0.70	-550	0.70	-1912	0.70	-404	0.70	-659	0.73	-1732	0.80	-1572	0.70	-963
N-1: MCNARY-ROUNDUP 230 KV	0.7	-857	0.70	-549	0.71	-1858	0.70	-404	0.70	-656	0.73	-1705	0.80	-1567	0.70	-962
N-1: MCNARY-SAC TAP-LOW MON 500 KV	0.7	-858	0.70	-550	0.70	-1912	0.70	-404	0.70	-659	0.73	-1733	0.80	-1574	0.70	-964
N-1: MIDPOINT-HEMINGWAY 500 KV	0.7	-836	0.70	-539	0.70	-1461	0.70	-397	0.70	-616	0.70	-1301	0.79	-1355	0.72	-929
N-1: MIDPOINT-HUMBOLDT 345 KV	0.7	-867	0.70	-558	0.71	-1754	0.70	-409	0.70	-405	0.73	-1583	0.80	-1530	0.75	-942

Appendix J - 16la1sa_3400idnw_Path24 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Cal Sub		Hemingway		Hill top		Humboldt		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-1: NAPAVINE-PAUL 500 KV	0.7	-858	0.70	-550	0.70	-1921	0.70	-405	0.70	-660	0.73	-1736	0.80	-1575	0.70	-965
N-1: OLYMPIA-PAUL 500 KV	0.7	-858	0.70	-550	0.70	-1921	0.70	-405	0.70	-660	0.73	-1736	0.80	-1575	0.70	-965
N-1: ONTARIO-CALDWELL 230 KV	0.7	-858	0.70	-550	0.70	-1914	0.70	-405	0.70	-659	0.73	-1729	0.80	-1571	0.70	-964
N-1: OSTRANDER-KNIGHT 500 KV	0.7	-857	0.70	-550	0.70	-1908	0.70	-403	0.70	-659	0.73	-1729	0.80	-1571	0.70	-963
N-1: OSTRANDER-PEARL 500 KV	0.7	-858	0.70	-550	0.70	-1922	0.70	-404	0.70	-660	0.73	-1737	0.80	-1576	0.70	-964
N-1: OSTRANDER-TROUTDALE 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-659	0.73	-1735	0.80	-1574	0.70	-964
N-1: OXBOW-BROWNLEE #2 230 KV	0.7	-858	0.70	-550	0.70	-1916	0.70	-405	0.70	-659	0.73	-1731	0.80	-1574	0.70	-964
N-1: OXBOW-LOLO 230 KV	0.7	-855	0.70	-549	0.70	-1836	0.70	-403	0.70	-654	0.73	-1699	0.80	-1562	0.70	-959
N-1: PAUL-SATSOP 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-659	0.73	-1735	0.80	-1575	0.70	-964
N-1: PEARL-KEELER 500 KV	0.7	-859	0.70	-550	0.70	-1922	0.70	-405	0.70	-660	0.73	-1738	0.80	-1577	0.70	-965
N-1: PINTO-FOUR CORNER 345 KV	0.7	-849	0.70	-546	0.73	-1603	0.70	-401	0.70	-623	0.76	-1465	0.82	-1360	0.72	-941
N-1: PONDEROSA A 500/230 KV XFMR	0.7	-858	0.70	-550	0.70	-1921	0.70	-404	0.70	-659	0.73	-1737	0.80	-1576	0.70	-964
N-1: PONDEROSA B 500/230 KV XFMR	0.7	-858	0.70	-550	0.70	-1919	0.70	-404	0.70	-659	0.73	-1735	0.80	-1575	0.70	-964
N-1: POPULUS-CEDAR HILL-HEMINGWAY 500 KV	0.7	-847	0.70	-545	0.70	-1555	0.70	-403	0.70	-624	0.74	-1277	0.82	-1196	0.72	-941
N-1: RAVER-PAUL 500 KV	0.7	-858	0.70	-550	0.70	-1919	0.70	-405	0.70	-660	0.73	-1735	0.80	-1575	0.70	-965
N-1: RAVER-TACOMA 500 KV	0.7	-858	0.70	-550	0.70	-1919	0.70	-405	0.70	-659	0.73	-1735	0.80	-1575	0.70	-964
N-1: RED BUTTE-HARRY ALLEN 345 KV	0.7	-848	0.70	-546	0.73	-1543	0.70	-401	0.70	-613	0.77	-1411	0.82	-1303	0.72	-936
N-1: ROBINSON-HARRY ALLEN 500 KV	0.7	-831	0.70	-535	0.70	-1885	0.70	-394	0.70	-624	0.73	-1724	0.80	-1573	0.71	-927
N-1: ROCK CK-WAUTOMA 500 KV	0.7	-858	0.70	-550	0.70	-1913	0.70	-404	0.70	-659	0.73	-1732	0.80	-1573	0.70	-964
N-1: ROUND MTN-TABLE MTN 500 KV	0.7	-857	0.70	-549	0.70	-1923	0.70	-403	0.70	-659	0.73	-1742	0.80	-1582	0.70	-963
N-1: ROUNDUP-LAGRANDE 230 KV	0.7	-856	0.70	-549	0.70	-1858	0.70	-403	0.70	-656	0.73	-1706	0.80	-1565	0.70	-961
N-1: SCHULTZ-SICKLER 500 KV	0.7	-858	0.70	-550	0.70	-1919	0.70	-405	0.70	-659	0.73	-1735	0.80	-1575	0.70	-964
N-1: SCHULTZ-VANTAGE 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-660	0.73	-1735	0.80	-1575	0.70	-964
N-1: SCHULTZ-WAUTOMA 500 KV	0.7	-858	0.70	-550	0.70	-1914	0.70	-404	0.70	-660	0.73	-1734	0.80	-1575	0.70	-965
N-1: SIGURD-GLEN CANYON 230 KV	0.7	-856	0.70	-549	0.70	-1849	0.70	-404	0.70	-650	0.74	-1676	0.80	-1529	0.70	-958
N-1: SLATT 500/230 KV XFMR	0.7	-858	0.70	-550	0.70	-1916	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-1: SLATT-LONGHORN 500 KV	0.7	-858	0.70	-550	0.70	-1915	0.70	-404	0.70	-659	0.73	-1734	0.80	-1575	0.70	-964
N-1: SNOK TAP-SNOKING 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-659	0.73	-1734	0.80	-1573	0.70	-964
N-1: TABLE MTN-TESLA 500 KV	0.7	-859	0.70	-550	0.70	-1932	0.70	-405	0.70	-659	0.73	-1749	0.80	-1587	0.70	-965
N-1: TABLE MTN-VACA DIXON 500 KV	0.7	-859	0.70	-550	0.70	-1940	0.70	-404	0.70	-659	0.73	-1757	0.79	-1596	0.70	-964
N-1: VANTAGE 500/230 KV XFMR #1	0.7	-858	0.70	-550	0.70	-1921	0.70	-405	0.70	-660	0.73	-1736	0.80	-1576	0.70	-965
N-1: VANTAGE 500/230 KV XFMR #2	0.7	-858	0.70	-550	0.70	-1921	0.70	-405	0.70	-660	0.73	-1736	0.80	-1575	0.70	-965
N-1: WALLA WALLA-TALBOT 230 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-405	0.70	-659	0.73	-1735	0.80	-1574	0.70	-965
N-1: WALLA WALLA-WALLULA 230 KV	0.7	-858	0.70	-550	0.70	-1899	0.70	-404	0.70	-659	0.73	-1729	0.80	-1572	0.70	-964
N-2: ASHE-MARION & ASHE-SLATT 500 KV	0.7	-856	0.70	-549	0.70	-1886	0.70	-401	0.70	-657	0.73	-1718	0.80	-1564	0.70	-962
N-2: ASHE-MARION & BUCKLEY-MARION 500 KV	0.7	-854	0.70	-549	0.70	-1886	0.70	-399	0.70	-656	0.73	-1718	0.80	-1564	0.70	-960
N-2: ASHE-MARION & SLATT-BUCKLEY 500 KV	0.7	-854	0.70	-548	0.70	-1900	0.70	-400	0.70	-655	0.73	-1729	0.80	-1573	0.70	-958
N-2: ASHE-MARION & SLATT-COYOTE TAP-LONGHORN 500 KV	0.7	-856	0.70	-549	0.70	-1898	0.70	-401	0.70	-657	0.73	-1724	0.80	-1567	0.70	-961
N-2: ASHE-MARION & SLATT-JOHN DAY 500 KV	0.7	-855	0.70	-549	0.70	-1897	0.70	-401	0.70	-656	0.73	-1731	0.80	-1575	0.70	-960
N-2: ASHE-SLATT & MCNARY-JOHN DAY 500 KV	0.7	-856	0.70	-549	0.70	-1891	0.70	-403	0.70	-657	0.73	-1724	0.80	-1569	0.70	-962
N-2: ASHE-SLATT & SLATT-COYOTE TAP-LONGHORN 500 KV	0.7	-857	0.70	-550	0.70	-1899	0.70	-404	0.70	-658	0.73	-1727	0.80	-1571	0.70	-963
N-2: BELL-TAFT & TAFT-DWORSKAK 500 KV + RAS	0.7	-845	0.70	-545	0.73	-1465	0.70	-397	0.70	-639	0.78	-1364	0.81	-1238	0.71	-946
N-2: BETHEL-CEDAR SPRING 500 KV & BETHEL-ROUND BUTTE 230 KV	0.7	-855	0.70	-549	0.70	-1904	0.70	-401	0.70	-657	0.73	-1734	0.80	-1579	0.70	-960
N-2: BETHEL-CEDAR SPRING 500 KV & BETHEL-SANTIAM 230 KV	0.7	-855	0.70	-549	0.70	-1905	0.70	-401	0.70	-657	0.73	-1735	0.80	-1580	0.70	-960
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-CHEMAWA 230 KV	0.7	-857	0.70	-550	0.70	-1908	0.70	-403	0.70	-659	0.73	-1729	0.80	-1571	0.70	-964
N-2: BIG EDDY-OSTRANDER 500 KV & BIG EDDY-TROUTDALE 230 KV	0.7	-858	0.70	-550	0.70	-1909	0.70	-403	0.70	-659	0.73	-1730	0.80	-1571	0.70	-964
N-2: BOISE BENCH-BROWNLEE #1 & #2 230 KV	0.7	-858	0.70	-550	0.70	-1861	0.70	-404	0.70	-655	0.73	-1661	0.80	-1533	0.70	-963
N-2: BOISE BENCH-BROWNLEE #3 & BOISE BENCH-HORSEFLAT#4 230 KV	0.7	-858	0.70	-550	0.70	-1860	0.70	-404	0.70	-655	0.73	-1661	0.80	-1532	0.70	-963
N-2: BRIDGER-POPULUS #1 & #2 345 KV	0.7	-859	0.70	-551	0.73	-1439	0.70	-405	0.70	-651	0.80	-1344	0.84	-968	0.70	-964
N-2: BRIDGER-POPULUS #2 & BRIDGER-3MILEKNOLL 345 KV	0.7	-858	0.70	-550	0.79	-1509	0.70	-404	0.70	-647	0.81	-1296	0.84	-919	0.70	-961
N-2: BROADVIEW-GARRISON #1 & #2 500 KV + RAS	0.7	-848	0.70	-547	0.85	-1249	0.70	-399	0.70	-645	0.86	-1158	0.88	-1061	0.70	-950
N-2: BROWNLEE-HELLS CANYON & OXBOW-LOLO 230 KV	0.7	-853	0.70	-548	0.72	-1657	0.70	-402	0.70	-649	0.74	-1575	0.80	-1523	0.70	-956

Appendix J - 16la1sa_3400idnw_Path24 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Cal Sub		Hemingway		Hill top		Humboldt		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: BROWNLEE-OXBOW & BROWNLEE-HELLS CANYON 230 KV	0.7	-857	0.70	-550	0.71	-1780	0.70	-404	0.70	-657	0.74	-1645	0.80	-1543	0.70	-963
N-2: BUCKLEY-MARION & JOHN DAY-MARION 500 KV	0.7	-855	0.70	-549	0.70	-1884	0.70	-399	0.70	-657	0.73	-1718	0.80	-1565	0.70	-961
N-2: CHIEF JO-MONROE & CHIEF JO-SICKLER 500 KV	0.7	-858	0.70	-550	0.70	-1906	0.70	-404	0.70	-659	0.73	-1727	0.80	-1569	0.70	-964
N-2: CHIEF JO-MONROE 500 KV & CHIEF JO-SNOHOMS4 345 KV	0.7	-858	0.70	-550	0.70	-1909	0.70	-404	0.70	-659	0.73	-1728	0.80	-1570	0.70	-964
N-2: CHIEF JO-MONROE 500 KV & MONROE-SAMMAMSH 230 KV	0.7	-858	0.70	-550	0.70	-1912	0.70	-404	0.70	-659	0.73	-1731	0.80	-1571	0.70	-964
N-2: CHIEF JO-SICKLER 500 KV & CHIEF J3-SNOHOMS3 345 KV	0.7	-858	0.70	-550	0.70	-1914	0.70	-404	0.70	-659	0.73	-1732	0.80	-1573	0.70	-964
N-2: COULEE-CHIEF JO 500 KV & CHIEF J4-SNOHOMS4 345 KV	0.7	-858	0.70	-550	0.70	-1910	0.70	-404	0.70	-659	0.73	-1729	0.80	-1570	0.70	-964
N-2: COULEE-HANFORD & HANFORD-VANTAGE 500 KV	0.7	-858	0.70	-550	0.70	-1902	0.70	-404	0.70	-660	0.73	-1729	0.80	-1573	0.70	-964
N-2: COULEE-SCHULTZ #1 & #2 500 KV	0.7	-857	0.70	-550	0.70	-1892	0.70	-403	0.70	-658	0.73	-1716	0.80	-1560	0.70	-963
N-2: CUSTERW-ING500 & CUSTERW-MONROE 500 KV	0.7	-858	0.70	-550	0.70	-1917	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-2: CUSTERW-MONROE #1 & #2 500 KV	0.7	-858	0.70	-550	0.70	-1913	0.70	-404	0.70	-659	0.73	-1732	0.80	-1572	0.70	-964
N-2: DC-BIPOLE	0.7	-867	0.70	-554	0.70	-2168	0.70	-411	0.70	-654	0.70	-1942	0.78	-1772	0.71	-970
N-2: DOUBLE PALO VERDE	0.7	-873	0.70	-558	0.70	-2145	0.70	-407	0.70	-654	0.72	-1917	0.78	-1709	0.70	-981
N-2: ECHOLAKE-MAPLE VLY 500 KV & COVINGTON-MAPLE VLY 230 KV	0.7	-858	0.70	-550	0.70	-1915	0.70	-404	0.70	-659	0.73	-1733	0.80	-1573	0.70	-964
N-2: ECHOLAKE-MAPLE VLY 500 KV & ROCKY RH-MAPLE VLY 345 KV	0.7	-858	0.70	-550	0.70	-1913	0.70	-404	0.70	-659	0.73	-1731	0.80	-1572	0.70	-964
N-2: GARRISON-TAFT #1 & #2 500 KV + RAS	0.7	-846	0.70	-546	0.73	-1454	0.70	-398	0.70	-639	0.78	-1356	0.82	-1220	0.71	-946
N-2: GRASSLAND-CEDAR SPRING & SLATT - BUCKLEY 500 KV	0.7	-853	0.70	-548	0.70	-1908	0.70	-400	0.70	-654	0.73	-1742	0.80	-1588	0.70	-957
N-2: GRASSLAND-COYOTE & SLATT - LONGHORN 500 KV	0.7	-857	0.70	-550	0.70	-1838	0.70	-404	0.70	-657	0.73	-1700	0.80	-1551	0.70	-963
N-2: GRIZZLY-MALIN & GRIZZLY-CAPTAIN JACK 500 KV	0.7	-849	0.70	-546	0.70	-1877	0.70	-390	0.70	-652	0.73	-1716	0.80	-1567	0.70	-952
N-2: GRIZZLY-MALIN & GRIZZLY-SUMMER LAKE 500 KV	0.7	-854	0.70	-549	0.70	-1863	0.70	-397	0.70	-657	0.73	-1709	0.80	-1565	0.70	-960
N-2: GRIZZLY-MALIN & MALIN-SUMMER LAKE 500 KV	0.7	-846	0.70	-544	0.70	-1866	0.70	-395	0.70	-648	0.73	-1745	0.80	-1619	0.71	-947
N-2: HANFORD-ASHE & HANFORD-LOW MON 500 KV	0.7	-855	0.70	-549	0.70	-1855	0.70	-401	0.70	-656	0.73	-1706	0.80	-1557	0.70	-960
N-2: HANFORD-WAUTOMA #1 & #2 500 KV	0.7	-857	0.70	-550	0.70	-1910	0.70	-404	0.70	-658	0.73	-1729	0.80	-1571	0.70	-963
N-2: HELLS CANYON-BROWNLEE & OXBOW-LOLO 230 KV	0.7	-853	0.70	-548	0.72	-1677	0.70	-402	0.70	-650	0.74	-1593	0.80	-1543	0.70	-956
N-2: JOHN DAY-BIG EDDY #1 & #2 500 KV	0.7	-858	0.70	-550	0.70	-1899	0.70	-403	0.70	-660	0.73	-1726	0.80	-1571	0.70	-965
N-2: JOHN DAY-BIG EDDY & JOHN DAY-MARION 500 KV	0.7	-857	0.70	-550	0.70	-1899	0.70	-402	0.70	-658	0.73	-1725	0.80	-1569	0.70	-963
N-2: JOHN DAY-GRIZZLY #1 & #2 500 KV	0.7	-853	0.70	-548	0.70	-1880	0.70	-395	0.70	-656	0.73	-1711	0.80	-1560	0.70	-958
N-2: JOHN DAY-GRIZZLY #2 & BUCKLEY-GRIZZLY 500 KV	0.7	-854	0.70	-548	0.70	-1895	0.70	-397	0.70	-656	0.73	-1720	0.80	-1566	0.70	-959
N-2: JOHN DAY-MARION & BUCKLEY-MARION 500 KV	0.7	-855	0.70	-549	0.70	-1884	0.70	-399	0.70	-657	0.73	-1718	0.80	-1565	0.70	-961
N-2: JOHN DAY-MARION & MARION-PEARL 500 KV	0.7	-858	0.70	-550	0.70	-1894	0.70	-403	0.70	-659	0.73	-1721	0.80	-1567	0.70	-964
N-2: JOHN DAY-ROCK CREEK 500 KV & MCNARY-ROSS 345 KV	0.7	-857	0.70	-550	0.70	-1907	0.70	-403	0.70	-658	0.73	-1730	0.80	-1571	0.70	-963
N-2: KEELER-PEARL 500 & SHERWOOD-CARLTON 230 KV	0.7	-859	0.70	-550	0.70	-1924	0.70	-405	0.70	-660	0.73	-1740	0.80	-1579	0.70	-965
N-2: KNIGHT-OSTRANDER & OSTRANDER-BIG EDDY 500 KV	0.7	-857	0.70	-549	0.70	-1893	0.70	-402	0.70	-658	0.73	-1720	0.80	-1565	0.70	-962
N-2: KNIGHT-OSTRANDER 500 KV & MCNARY-ROSS 345 KV	0.7	-857	0.70	-549	0.70	-1898	0.70	-402	0.70	-658	0.73	-1724	0.80	-1568	0.70	-962
N-2: KNIGHT-OSTRANDER 500 KV & MIDWAY-BONNEVILLE 230 KV	0.7	-857	0.70	-550	0.70	-1909	0.70	-403	0.70	-659	0.73	-1731	0.80	-1572	0.70	-963
N-2: LOWER GRANITE-CENTRAL FERRY #1 & #2 500 KV	0.7	-855	0.70	-549	0.70	-1855	0.70	-403	0.70	-653	0.74	-1684	0.80	-1527	0.70	-959
N-2: MALIN-ROUND MTN #1 & #2 500 KV	0.7	-850	0.70	-541	0.70	-1944	0.70	-392	0.70	-652	0.72	-1789	0.79	-1644	0.70	-951
N-2: MCNARY-JOHN DAY & ROCK CREEK-JOHN DAY 500 KV	0.7	-856	0.70	-549	0.70	-1902	0.70	-402	0.70	-657	0.73	-1728	0.80	-1570	0.70	-962
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-HORSE HEAVEN 230 KV	0.7	-856	0.70	-549	0.70	-1904	0.70	-403	0.70	-657	0.73	-1730	0.80	-1572	0.70	-962
N-2: MCNARY-JOHN DAY 500 KV & MCNARY-ROSS 345 KV	0.7	-856	0.70	-549	0.70	-1896	0.70	-402	0.70	-656	0.73	-1726	0.80	-1569	0.70	-961
N-2: MCNARY-ROSS 345 KV & MCNARY-HORSE HEAVEN 230 KV	0.7	-857	0.70	-550	0.70	-1909	0.70	-403	0.70	-658	0.73	-1731	0.80	-1572	0.70	-963
N-2: MIDPOINT-SUMMER LAKE 500 KV & MIDPOINT-KING 230 KV	0.7	-835	0.70	-539	0.70	-1453	0.70	-397	0.70	-613	0.70	-1285	0.79	-1336	0.72	-928
N-2: MONROE-CUSTERW & CHIEF JO-MONROE 500 KV	0.7	-858	0.70	-550	0.70	-1909	0.70	-404	0.70	-659	0.73	-1729	0.80	-1570	0.70	-964
N-2: NAPAVINE-ALLSTON & PAUL-ALLSTON #2 500 KV	0.7	-856	0.70	-549	0.70	-1895	0.70	-402	0.70	-657	0.73	-1719	0.80	-1562	0.70	-962
N-2: PAUL-NAPAVINE & PAUL-ALLSTON #2 500 KV	0.7	-858	0.70	-550	0.70	-1912	0.70	-404	0.70	-659	0.73	-1731	0.80	-1571	0.70	-964
N-2: PAUL-RAVER & RAVER-COVINGT4 500 KV	0.7	-858	0.70	-550	0.70	-1919	0.70	-405	0.70	-660	0.73	-1735	0.80	-1575	0.70	-965
N-2: PEARL-KEELER 500 KV & PEARL-SHERWOOD 230 KV	0.7	-859	0.70	-550	0.70	-1923	0.70	-405	0.70	-660	0.73	-1739	0.80	-1577	0.70	-965
N-2: PEARL-OSTRANDER 500 KV & BIG EDDY-MCLOUGLN 230 KV	0.7	-858	0.70	-550	0.70	-1920	0.70	-404	0.70	-659	0.73	-1736	0.80	-1575	0.70	-964
N-2: PEARL-OSTRANDER 500 KV & OSTRANDER-MCLOUGLN 230 KV	0.7	-858	0.70	-550	0.70	-1923	0.70	-405	0.70	-660	0.73	-1737	0.80	-1576	0.70	-964
N-2: RAVER-COVINGTON #1 & #2 500 KV	0.7	-858	0.70	-550	0.70	-1919	0.70	-405	0.70	-660	0.73	-1735	0.80	-1574	0.70	-964
N-2: RAVER-ECHO LAKE & RAVER-SCHULTZ 500 KV	0.7	-858	0.70	-550	0.70	-1916	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-2: RAVER-PAUL & NAPAVINE-PAUL 500 KV	0.7	-858	0.70	-550	0.70	-1919	0.70	-405	0.70	-660	0.73	-1735	0.80	-1575	0.70	-965

Appendix J - 16la1sa_3400idnw_Path24 Base Case VQ Results

V is the voltage at Qm & Qm is the Reactive Margin   Yellow Highlights indicate one of the 10 worst reactive margin contingencies

Contingency Name	Bordertown		Cal Sub		Hemingway		Hill top		Humboldt		Midpoint		Populus		Valley Road	
	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm	V	Qm
N-2: RAVER-PAUL 500 KV & COULEE-OLYMPIA 300 KV	0.7	-858	0.70	-550	0.70	-1916	0.70	-405	0.70	-660	0.73	-1734	0.80	-1574	0.70	-965
N-2: RAVER-PAUL 500 KV & TACOMA A-CHEHALIS 230 KV	0.7	-859	0.70	-550	0.70	-1923	0.70	-405	0.70	-660	0.73	-1739	0.80	-1579	0.70	-965
N-2: RAVER-SCHULTZ #1 & #2 500 KV	0.7	-857	0.70	-550	0.70	-1901	0.70	-404	0.70	-659	0.73	-1724	0.80	-1567	0.70	-963
N-2: RAVER-TACOMA & RAVER-COVINGT4 500 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-2: RAVER-TACOMA 500 KV & TACOMA-CHRISTOP-COVINGTON 230 KV	0.7	-858	0.70	-550	0.70	-1918	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-2: ROUND MTN-TABLE MTN #1 & #2 500 KV	0.7	-854	0.70	-542	0.70	-1994	0.70	-402	0.70	-654	0.72	-1818	0.79	-1663	0.70	-955
N-2: SCHULTZ-WAUTOMA & VANTAGE-SCHULTZ 500 KV	0.7	-858	0.70	-550	0.70	-1910	0.70	-404	0.70	-660	0.73	-1733	0.80	-1575	0.70	-965
N-2: SICKLER-SCHULTZ & SCHULTZ-VANTAGE 500 KV	0.7	-858	0.70	-550	0.70	-1916	0.70	-404	0.70	-659	0.73	-1734	0.80	-1574	0.70	-964
N-2: TABLE MTN-TESLA & TABLE MTN-VACA DIXON 500 KV	0.7	-862	0.70	-549	0.70	-2012	0.70	-406	0.70	-657	0.72	-1826	0.79	-1666	0.70	-965
N-2: TAFT-BELL 500KV & BELL-BOUNDARY #3 230KV	0.7	-852	0.70	-547	0.72	-1710	0.70	-400	0.70	-646	0.75	-1580	0.80	-1438	0.70	-954
N-2: TAFT-BELL 500KV & BELL-LANCASTER 230KV + RAS	0.7	-850	0.70	-547	0.73	-1635	0.70	-399	0.70	-643	0.76	-1520	0.80	-1381	0.71	-951
N-2: TAFT-BELL 500KV & BELL-TRENTWOOD #2 115KV	0.7	-852	0.70	-547	0.72	-1711	0.70	-400	0.70	-646	0.75	-1580	0.80	-1438	0.70	-954
N-2: TAFT-BELL 500KV & LANCASTER-NOXON 230KV + RAS	0.7	-851	0.70	-547	0.73	-1672	0.70	-400	0.70	-645	0.75	-1552	0.80	-1413	0.70	-953
N-2: TAFT-DWORSHAK & GARRISON-TAFT #1 500KV	0.7	-854	0.70	-548	0.72	-1743	0.70	-402	0.70	-649	0.75	-1591	0.80	-1442	0.70	-957
N-2: WAUTOMA-ROCK CK 500 KV & MIDWAY-BIG EDDY 230 KV	0.7	-858	0.70	-550	0.70	-1913	0.70	-404	0.70	-659	0.73	-1733	0.80	-1574	0.70	-964
N-2: WAUTOMA-ROCK CK 500 KV & SPRINGCREEK-BIG EDDY 230 KV	0.7	-858	0.70	-550	0.70	-1913	0.70	-404	0.70	-659	0.73	-1733	0.80	-1574	0.70	-964
N-3: SCHULTZ-RAVER #1 & #2 & #3 500 KV	0.7	-857	0.70	-550	0.70	-1900	0.70	-403	0.70	-658	0.73	-1724	0.80	-1566	0.70	-963

Appendix J - 16la1sa_3400idnw_Path24 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Shunt HANFORD_500.0 (40499) #s
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Bus MALIN R3_500.0 (40688)
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Shunt HOT SPR_500.0 (40553) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN Shunt DWORSHAK_500.0 (40369) #s
BF 4119 Garrison-Taft #1 & Taft-Bell 500kV + RAS	OPEN Shunt HOT SPR_500.0 (40553) #s
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Bus HOT SPR_500.0 (40553)
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt DWORSHAK_500.0 (40369) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 81 MVR
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP S1_ 18.0 (47641)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G2_ 18.0 (47640)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G1_ 18.0 (47639)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 2
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1

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Contingency	Actions Taken in the Contingency
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Bus SANTIAM_500.0 (40941)
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN Bus SNOK TAP_500.0 (41001)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV	OPEN Bus SNOKING_500.0 (41007)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR G2_ 20.0 (47744)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2AX_ 4.2 (47746)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2FG_ 13.8 (47747)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR G1_ 20.0 (47740)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1AX_ 4.2 (47742)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1FG_ 13.8 (47743)
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Transformer TONO_115.0 (42806) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Shunt OLY E_230.0 (40794) #s
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 109.8 MVR
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN Shunt MONROE_500.0 (40749) #s
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Transformer ALLSTON_500.0 (40045) TO ALLSTN E_230.0 (40043) CKT 2

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Contingency	Actions Taken in the Contingency
BF 4708 Hatwai 500 kV Bus	OPEN Bus HATWAI_500.0 (40521)
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Transformer CHIEF JO_500.0 (40233) TO CHIEF J2_230.0 (40232) CKT 3
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Transformer BIG EDDY_500.0 (40111) TO BIGEDDY1_230.0 (41341) CKT 2
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Bus CGS_ 25.0 (40063)
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN Bus BURNS_500.0 (45029)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R3_500.0 (40688)
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN Bus ROUND BU_500.0 (43485)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Bus MAPLE VL_500.0 (40693)
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M1_500.0 (43115)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 81 MVR
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G1_ 18.0 (47639) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G2_ 18.0 (47640) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP S1_ 18.0 (47641) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1

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Contingency	Actions Taken in the Contingency
BF 5266 Slatt-Buckly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Bus BURNS_500.0 (45029)
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 400 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BYPASS SeriesCap MIDPOINT_500.0 (60240) TO MIDHEM11_500.0 (61988) CKT 1
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 400 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	SET SWITCHED SHUNT AT BUS AMPS_ 69.0 (65026) TO 30 MVR
BF Lolo 230kV	OPEN Bus LOLO_230.0 (48197)
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Gen BOARD CT_ 18.5 (43044) #1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Transformer BOARD ST_ 16.0 (43045) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Transformer BOARD CT_ 18.5 (43044) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Gen BOARD ST_ 16.0 (43045) #1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Line COYOTE_500.0 (43123) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Transformer BOARD F_ 24.0 (43047) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Gen BOARD F_ 24.0 (43047) #1
Bus: Alvey 500 kV	OPEN Bus ALVEY_500.0 (40051)
Bus: Bell BPA 500 kV	OPEN Bus BELL BPA_500.0 (40091)
Bus: Bell BPA 500 kV	OPEN Bus COULE R1_500.0 (40288)
Bus: Bell BPA 500 kV	OPEN Bus BELL SC_500.0 (40096)
Bus: Buckley 500 kV	OPEN Bus BUCKLEY_500.0 (40155)
Bus: Dixonville 500 kV	OPEN Bus DIXONVLE_500.0 (45095)
Bus: Hot Springs 500 kV	OPEN Bus HOT SPR_500.0 (40553)
Bus: Keeler 500 kV	OPEN Bus KEELER_500.0 (40601)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_500.0 (41401)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_230.0 (41402)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_230.0 (47386)
Bus: Rock Creek 500 kV	OPEN Bus ENRGZR T_230.0 (47823)
Bus: Rock Creek 500 kV	OPEN Bus WHITE CK_230.0 (47827)
Bus: Rock Creek 500 kV	OPEN Bus IMRIE_230.0 (47822)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_ 34.5 (47387)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC C1_ 34.5 (47388)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC W1_ 0.7 (47389)
Bus: Rock Creek 500 kV	OPEN Bus DOOLEY T_230.0 (47465)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 3_ 34.5 (47496)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 2_ 34.5 (47493)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C2_ 34.5 (47494)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W2_ 0.7 (47495)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C3_ 34.5 (47497)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W3_ 0.7 (47498)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE 1_ 34.5 (47829)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 1_ 34.5 (47825)
Bus: Rock Creek 500 kV	OPEN Bus WILLIS T_230.0 (47824)
Bus: Rock Creek 500 kV	OPEN Bus TULMN 1_ 34.5 (47826)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C1_ 34.5 (47936)
Bus: Rock Creek 500 kV	OPEN Bus TULMN C1_ 34.5 (47938)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 2_ 34.5 (47903)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 1_ 34.5 (47902)

Appendix J - 16la1sa_3400idnw_Path24 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
Bus: Rock Creek 500 kV	OPEN Bus MILLRA S_230.0 (47857)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE C1_ 34.5 (47865)
Bus: Rock Creek 500 kV	OPEN Bus MILLR 1_ 34.5 (47966)
Bus: Rock Creek 500 kV	OPEN Bus HARVST W_230.0 (47858)
Bus: Rock Creek 500 kV	OPEN Bus HRVST 1_ 34.5 (47979)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE W1_ 0.6 (47866)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C1_ 34.5 (47904)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C2_ 34.5 (47905)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W1_ 0.7 (47906)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W2_ 0.7 (47907)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W1_ 0.7 (47937)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W2_ 0.6 (47940)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W1_ 0.7 (47939)
Bus: Rock Creek 500 kV	OPEN Bus MILLR C1_ 34.5 (47967)
Bus: Rock Creek 500 kV	OPEN Bus MILLR W1_ 0.6 (47968)
Bus: Rock Creek 500 kV	OPEN Bus HRVST C1_ 34.5 (47980)
Bus: Rock Creek 500 kV	OPEN Bus HRVST W1_ 0.7 (47981)
Bus: Sickler 500 kV	OPEN Bus SICKLER_500.0 (40973)
Bus: Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
Bus: Summer Lake 500 kV	OPEN Bus SUMMER L_500.0 (41043)
Bus: Summer Lake 500 kV	OPEN Bus BURNS_500.0 (45029)
Bus: Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-1: Allston-Keeler 500 kV	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
N-1: Allston-Napavine 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-1: Allston-Paul #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-1: Alvery-Dixonville 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO DIXONVLE_500.0 (45095) CKT 1
N-1: Alvey-Marion 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
N-1: Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-1: Ashe-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
N-1: Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-1: Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-1: Bell-Coulee 500 kV	OPEN Bus COULE R1_500.0 (40288)
N-1: Bell-Taft 500 kV	OPEN Bus BELL SC_500.0 (40096)
N-1: Big Eddy-Celilo 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO CELILO1_500.0 (41311) CKT 1
N-1: Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-1: Big Eddy-Knight 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO KNIGHT_500.0 (41450) CKT 1
N-1: Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-1: Boise Bench-Brownlee #3 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-1: Brady-Antelope 230 kV + RAS	OPEN Line BRADY_230.0 (60073) TO ANTLOPE_230.0 (65075) CKT 1
N-1: Brady-Antelope 230 kV + RAS	OPEN Bus MLCK PHA_230.0 (62355)
N-1: Brady-Antelope 230 kV + RAS	OPEN Shunt AMPS_ 69.0 (65026) #1
N-1: Broadview-Garrison #1 500 kV	OPEN Bus GAR1EAST_500.0 (40451)
N-1: Broadview-Garrison #1 500 kV	OPEN Bus TOWN1_500.0 (62013)
N-1: Broadview-Garrison #1 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Brownlee-Ontario 230 kV	OPEN MultiSectionLine BROWNLEE_230.0 (60095) TO ONTARIO_230.0 (60265) CKT 1
N-1: Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-1: Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-1: Buckley-Slatt 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-1: Cal Sub 120 kV Phase Shifter	OPEN Transformer CAL SUB_120.0 (64025) TO CAL S PS_120.0 (64023) CKT 1
N-1: Captain Jack-Olinda 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO OLINDA_500.0 (30020) CKT 1
N-1: CaptJack-Kfalls 500 kV	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
N-1: Cascade Crossing 500 kV	OPEN Bus CDR SPRG_500.0 (43950)
N-1: Cascade Crossing 500 kV	OPEN Bus CDRSBET1_500.0 (43951)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHCRS1_500.0 (43491)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHEL5_500.0 (43041)
N-1: Chief Jo-Coulee 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-1: Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-1: Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-1: Coulee-Hanford 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-1: Coulee-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Covington4-Raver 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-1: Covington5-Raver 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
N-1: Coyote-Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
N-1: CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-1: Dixonville-Meridian 500 kV	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
N-1: Drycreek-Lolo 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO LOLO_230.0 (48197) CKT 1
N-1: Drycreek-N Lewiston 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO N LEWIST_230.0 (48255) CKT 1
N-1: Drycreek-Wala Ava 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO WALA AVA_230.0 (48451) CKT 1
N-1: Dworshak-Hatwai 500 kV	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Taft 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-1: Echo Lake-Maple Valley 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO MAPLE VL_500.0 (40693) CKT 1
N-1: Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-1: Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1

Appendix J - 16la1sa_3400idnw_Path24 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
N-1: Echo Lake-Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
N-1: Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-1: Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSHE1_115.0 (32229)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSESHE_115.0 (32230)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTL1_115.0 (32233)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_115.0 (32234)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_ 13.2 (32460)
N-1: Goldhill-Placer 115 kV	OPEN Bus FLINT1_115.0 (32236)
N-1: Grassland-Coyote 500 kV	OPEN Line COYOTE_500.0 (43123) TO GRASSLND_500.0 (43049) CKT 1
N-1: Grassland-Slatt 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
N-1: Grizzly-John Day #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-1: Grizzly-Malin 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN MultiSectionLine PONDROSA_500.0 (40837) TO SUMMER L_500.0 (41043) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZ R3_500.0 (40488) TO PONDROSA_500.0 (40837) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO GRIZZ R3_500.0 (40488) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Grizzly-Round Bu 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO ROUND BU_500.0 (43485) CKT 1
N-1: Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-1: Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-1: Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Harry Allen 345 kV Phase Shifter	OPEN Transformer HA PS_345.0 (18002) TO H ALLEN_345.0 (18001) CKT 1
N-1: Harry Allen 345 kV Phase Shifter	OPEN Transformer HA PS_345.0 (18002) TO H ALLEN_345.0 (18001) CKT 2
N-1: Harry Allen 345 kV Phase Shifter	OPEN Shunt REDBUTTE_345.0 (66280) #1
N-1: Hatwai 500/230 kV Xfmr	OPEN Transformer HATWAI_500.0 (40521) TO HATWAI_230.0 (40519) CKT 1
N-1: Hatwai-Lolo 230 kV	OPEN Line HATWAI_230.0 (40519) TO LOLO_230.0 (48197) CKT 1
N-1: Hatwai-Low Gran 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Hatwai-N Lewiston 230 kV	OPEN Line HATWAI_230.0 (40519) TO N LEWIST_230.0 (48255) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO HURICANE_230.0 (45103) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN MultiSectionLine HURICANE_230.0 (45103) TO WALAWALA_230.0 (45327) CKT 1
N-1: Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
N-1: Hemingway-Summer Lake 500 kV	OPEN Line HEMINWAY_500.0 (60155) TO BURNS_500.0 (45029) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN MultiSectionLine BURNS_500.0 (45029) TO SUMMER L_500.0 (41043) CKT 1
N-1: Hemingway-Summer Lake 500 kV	SET SWITCHED SHUNT AT BUS HARNEY_115.0 (40507) TO 0 MVR
N-1: Hemingway-Summer Lake 500 kV	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
N-1: Hemingway-Summer Lake 500 kV	SET SWITCHED SHUNT AT BUS WALAWALA_230.0 (45327) TO 40 MVR
N-1: Hill Top 345/230 Xfmr	OPEN Transformer HIL TOP_230.0 (40537) TO HIL TOP_345.0 (64058) CKT 1
N-1: Horse Hv-McNary 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-1: Hot Springs-Taft 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line COYOTECR_345.0 (64032) TO HUMBOLDT_345.0 (64059) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line MAGGIECR_120.0 (64070) TO CARLIN_120.0 (64169) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt EIGHTMFK_120.0 (64457) #b
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO &1_345.0 (67582)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO_345.0 (66225)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #2_ 99.0 (65014)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #3_ 99.0 (65017)
N-1: Ing500-CusterW 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-1: John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-1: John Day-Rock Ck 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-1: John Day-Slatt 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-1: Kfalls-Meridian 500 kV	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
N-1: Knight-Wautoma 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
N-1: LaGrande-North Powder 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO N POWDER_230.0 (60312) CKT 1
N-1: Lanes-Marion 500 kV	OPEN Line LANE_500.0 (40629) TO MARION_500.0 (40699) CKT 1
N-1: Lit Goose-Central Ferry 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
N-1: Lit Goose-Low Mon 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
N-1: Low Gran-Central Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Low Mon-Sac Tap 500 kV	OPEN Line LOW MON_500.0 (40683) TO SACJWA T_500.0 (40917) CKT 1
N-1: Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
N-1: Malin-Hilltop 230 kV	OPEN Line CANBYTAP_230.0 (40171) TO HIL TOP_230.0 (40537) CKT 1
N-1: Malin-Hilltop 230 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 0 MVR
N-1: Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-1: Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2

Appendix J - 16la1sa_3400idnw_Path24 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
N-1: Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-1: Maple Vly-Rocky RH 345 kV	OPEN MultiSectionLine MAPLE VL_345.0 (40691) TO ROCKY RH_345.0 (40891) CKT 1
N-1: Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Line MARION_500.0 (40699) TO SANTIAM_500.0 (40941) CKT 1
N-1: McLouglin-Ostrander 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-1: McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary 500/230 kV Xfmr	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 81 MVR
N-1: McNary-Board T1 230 kV	OPEN Line BOARD T1_230.0 (40121) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-1: McNary-Longhorn 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
N-1: McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-1: McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-1: McNary-Roundup 230 kV	OPEN Line MCNRY S1_230.0 (41351) TO ROUNDUP_230.0 (40905) CKT 1
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJWA T_500.0 (40917)
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
N-1: McNary-Sac Tap-Low Mon 500 kV	CLOSE Gen ICE H1-2_ 13.8 (40559) #1
N-1: Midpoint-Hemingway 500 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Humboldt 345 kV	OPEN Bus IDAHO-NV_345.0 (64061)
N-1: Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
N-1: Ontario-Caldwell 230 kV	OPEN MultiSectionLine CALDWELL_230.0 (60110) TO LANGLEY_230.0 (60266) CKT 1
N-1: Ostrander-Knight 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-1: Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-1: Ostrander-Troutdale 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO TROUTDAL_500.0 (41095) CKT 1
N-1: Oxbow-Brownlee #2 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 2
N-1: Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-1: Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-1: Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO SATSOP_500.0 (40949) CKT 1
N-1: Pearl-Keeler 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pinto-Four Corner 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Pinto-Four Corner 345 kV	OPEN Shunt PINTO_138.0 (66230) #1
N-1: Pinto-Four Corner 345 kV	CLOSE Shunt PINTO 2_ 13.8 (66228) #1
N-1: Pinto-Four Corner 345 kV	CLOSE Shunt PINTO 3_ 13.8 (66229) #1
N-1: Ponderosa A 500/230 kV Xfmr	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Ponderosa B 500/230 kV Xfmr	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Populus-Cedar Hill-Hemingway 500 kV	OPEN MultiSectionLine POPULUS_500.0 (67794) TO CEDARHIL_500.0 (60159) CKT 2
N-1: Populus-Cedar Hill-Hemingway 500 kV	OPEN MultiSectionLine CEDARHIL_500.0 (60159) TO HEMINWAY_500.0 (60155) CKT 2
N-1: Populus-Cedar Hill-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS MIDPOINT_500.0 (60240) TO 400 MVR
N-1: Populus-Cedar Hill-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Raver-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-1: Raver-Tacoma 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus H ALLEN_345.0 (18001)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus HA PS_345.0 (18002)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus UTAH-NEV_345.0 (67657)
N-1: Red Butte-Harry Allen 345 kV	OPEN Shunt REDBUTTE_345.0 (66280) #1
N-1: Red Butte-Harry Allen 345 kV	OPEN Shunt GONDER1_230.0 (64205) #v
N-1: Robinson-Harry Allen 500 kV	OPEN Line ROBINSON_500.0 (64895) TO H ALLEN_500.0 (18450) CKT 1
N-1: Rock Ck-Wautoma 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Round Mtn-Table Mtn 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-1: Roundup-Lagrande 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO ROUNDUP_230.0 (40905) CKT 1
N-1: Schultz-Sickler 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-1: Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-1: Schultz-Wautoma 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Sigurd-Glen Canyon 230 kV	OPEN Bus SIGURDPS_230.0 (66355)
N-1: Slatt 500/230 kV Xfmr	OPEN Transformer SLATT_500.0 (40989) TO SLATT_230.0 (40986) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-1: Snok Tap-Snoking 500 kV	OPEN Line SNOK TAP_500.0 (41001) TO SNOKING_500.0 (41007) CKT 1
N-1: Table Mtn-Tesla 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-1: Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-1: Vantage 500/230 kV Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
N-1: Vantage 500/230 kV Xfmr #2	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 2
N-1: Walla Walla-Talbot 230 kV	OPEN Line TALBOT_230.0 (44912) TO WALAWALA_230.0 (45327) CKT 1
N-1: Walla Walla-Wallula 230 kV	OPEN Line WALAWALA_230.0 (45327) TO WALLULA_230.0 (45331) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1

Appendix J - 16la1sa_3400idnw_Path24 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	CLOSE Shunt GARRISON_500.0 (40459) #r
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Line BETHEL_230.0 (43039) TO ROUNDB N_230.0 (43483) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN MultiSectionLine BETHEL_230.0 (43039) TO SANTIAM_230.0 (40939) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN MultiSectionLine BIGEDDY2_230.0 (41342) TO CHEMAWA_230.0 (40213) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Bus PARKDALE_230.0 (40813)
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 2
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIHOR41_230.0 (61995) CKT 4 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO HORSEFLT_230.0 (60102) CKT 4
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO11_230.0 (61998) CKT 1 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO21_230.0 (61997) CKT 2 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 1
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine BRIDGER_345.0 (60085) TO 3MIKNOLL_345.0 (60084) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	CLOSE Shunt KINPORT_345.0 (60190) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Gen COLSTP 2_ 22.0 (62049) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus GAR1EAST_500.0 (40451)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus TOWN1_500.0 (62013)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus GAR2EAST_500.0 (40453)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Bus TOWN2_500.0 (62012)
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS AMPS_ 69.0 (65026) TO 30 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt MILLCKT2_ 13.8 (62333) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	OPEN Shunt MILLCKT1_ 13.8 (62332) #1
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS TAFT_500.0 (41057) TO -186 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS BZ EGALL_ 50.0 (62348) TO 20.4 MVR
N-2: Broadview-Garrison #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS JACKRABB_ 50.0 (62349) TO 19.7 MVR
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Transformer HELLSCYN_230.0 (60150) TO HELSCYN1_ 14.4 (60151) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1

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Contingency	Actions Taken in the Contingency
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine MONROE_230.0 (40747) TO NOVELTY_230.0 (42304) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus CHIEF J3_345.0 (40223)
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus SNOHOMS3_345.0 (40993)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
N-2: DC-BIPOLE	OPEN Bus SYLMAR1_230.0 (26097)
N-2: DC-BIPOLE	OPEN Bus SYLMAR2_230.0 (26099)
N-2: DC-BIPOLE	OPEN Bus CELILO4_230.0 (41314)
N-2: DC-BIPOLE	OPEN Bus CELILO3_230.0 (41313)
N-2: DC-BIPOLE	OPEN Bus CELILO2_500.0 (41312)
N-2: DC-BIPOLE	OPEN Bus CELILO1_500.0 (41311)
N-2: Double Palo Verde	OPEN Gen PALOVRD2_ 24.0 (14932) #1
N-2: Double Palo Verde	OPEN Gen PALOVRD1_ 24.0 (14931) #1
N-2: Double Palo Verde	CHANGE LOAD AT BUS AGUAFAPS_ 69.0 (14400) BY -120 MW (cnst pf)
N-2: Double Palo Verde	CLOSE Shunt ROBINSON_345.0 (64885) #b1
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS PINTO_138.0 (66230) TO 64 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS YORKCANY_115.0 (12091) TO 15 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS DURANGO_115.0 (79023) TO 40 MVR
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS PEIGAN 4_240.0 (54165) TO 0 MVR
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Line COVINGTN_230.0 (40303) TO MAPLEV12_230.0 (40692) CKT 2
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_345.0 (40691)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus ROCKY RH_345.0 (40891)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	OPEN Bus PONDROSB_500.0 (40834)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	OPEN Bus IMNAHA_230.0 (60278)
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1

Appendix J - 16la1sa_3400idnw_Path24 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus CASCADTP_230.0 (40185)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus WINDSHAR_230.0 (41155)
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus ALFALFA_230.0 (40039)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus OUTLOOK_230.0 (45229)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine MCNARY_345.0 (40721) TO ROSS_345.0 (40901) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN Line KING_230.0 (60177) TO MIDPOINT_230.0 (60232) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV	OPEN Line PEARL #_230.0 (43773) TO SHERWOOD_230.0 (43527) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN MultiSectionLine BIGEDDY3_230.0 (41343) TO MCLOUGLN_230.0 (43313) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT5_500.0 (40306)
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus COULEE_300.0 (40285)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus OLYMPIA_300.0 (40795)
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Bus CENTR SS_230.0 (47748)
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN Bus CHRISTOP_230.0 (42505)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 2
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus ADDY N_230.0 (40021)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop

Appendix J - 16la1sa_3400idnw_Path24 Base Case Studied Contingencies & Associated Actions

Contingency	Actions Taken in the Contingency
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV + RAS	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Line BELL BPA_115.0 (40087) TO BIGELOW_115.0 (40113) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN MultiSectionLine LANCASTR_230.0 (40624) TO NOXONBPA_230.0 (40787) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV + RAS	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN Shunt GARRISON_500.0 (40459) #s
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4

Appendix K

16hs2a_2250idnw_N_lh Base Case (Longhorn Terminus Sensitivity Study)

Appendix K – 16hs2a_2250idnw_lh Case Post-Transient Contingency Results

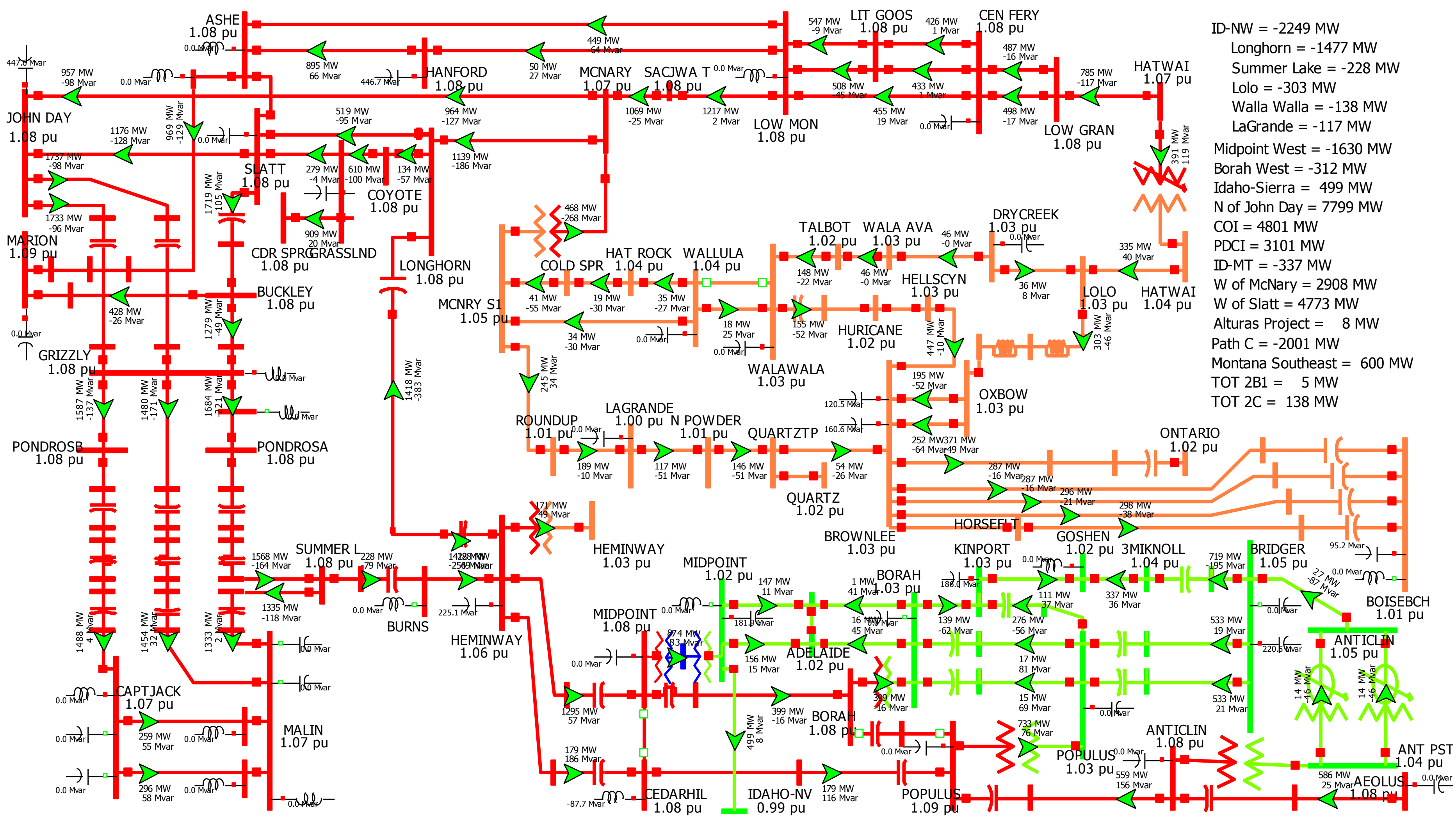

Figure K5: 16hs2a_2250idnw_lh Case **Pre-Contingency**

Appendix K – 16hs2a_2250idnw_lh Case Post-Transient Contingency Results

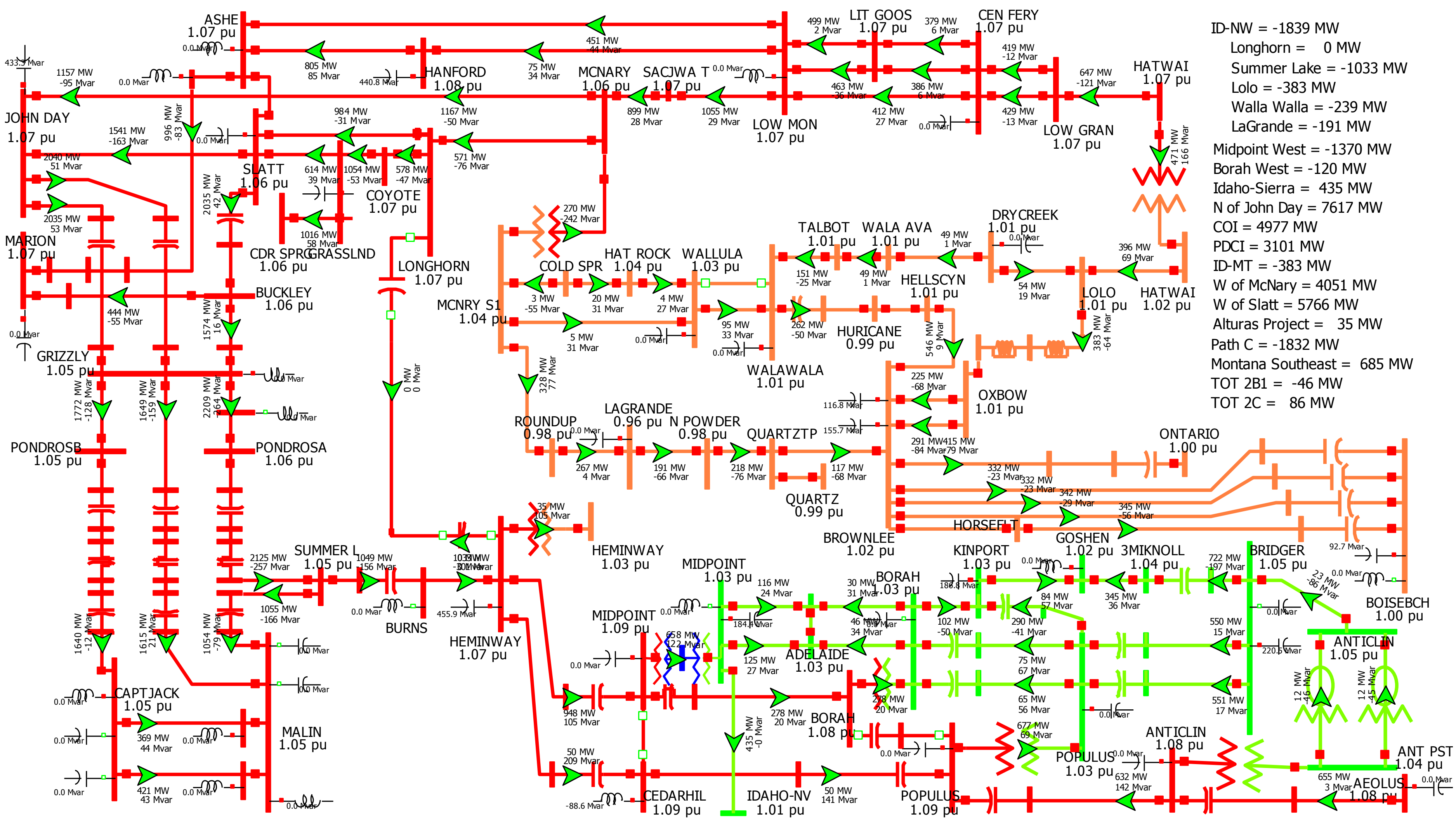

Figure K6: 16hs2a_2250idnw_lh Case **N-1: Hemingway-Longhorn 500 kV+PTSN Shunt**

Appendix K – 16hs2a_2250idnw_lh Case Post-Transient Contingency Results

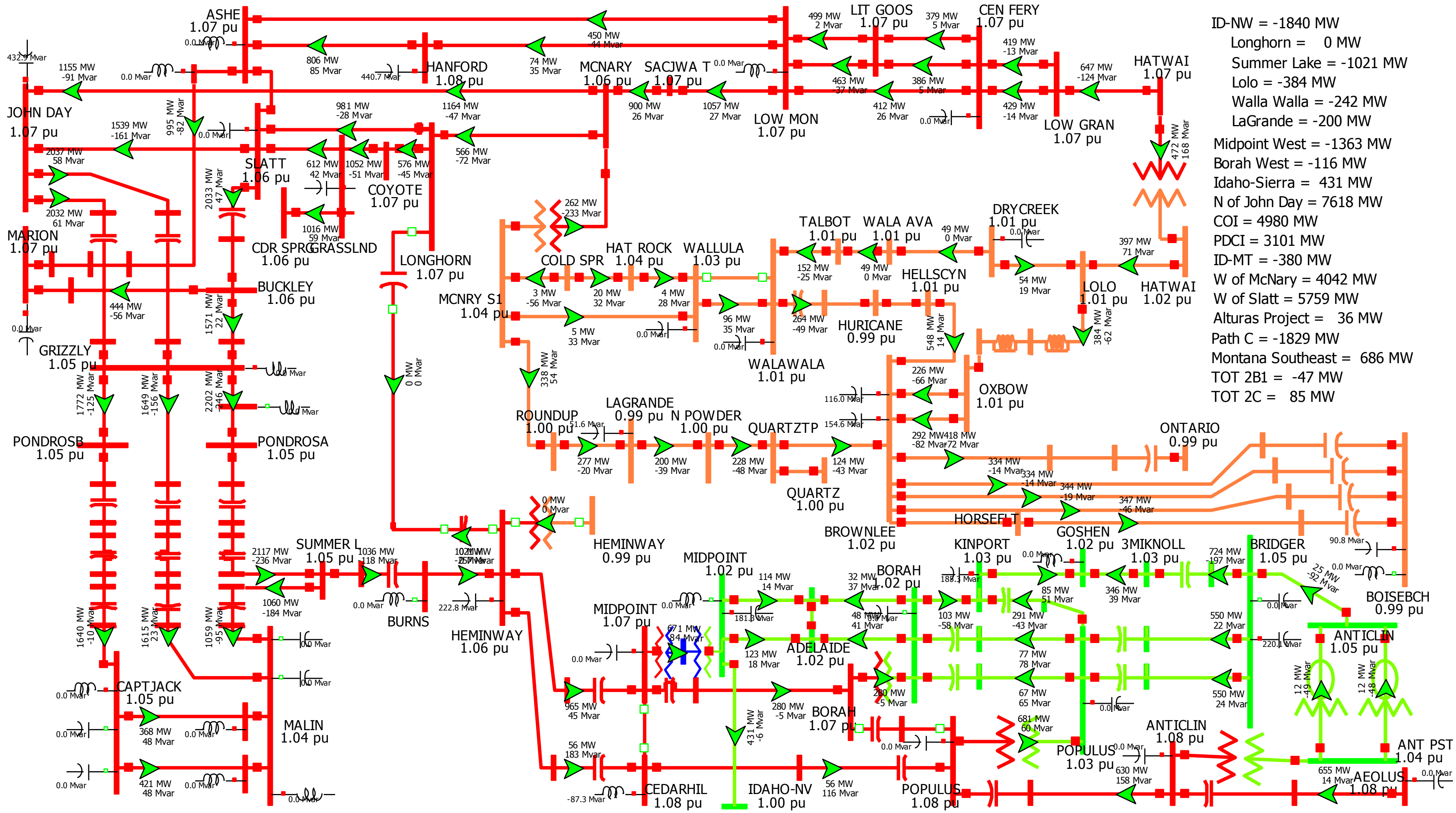

Figure K7: 16hs2a_2250idnw_lh Case **BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr**

Appendix K – 16hs2a_2250idnw_lh Case Post-Transient Contingency Results

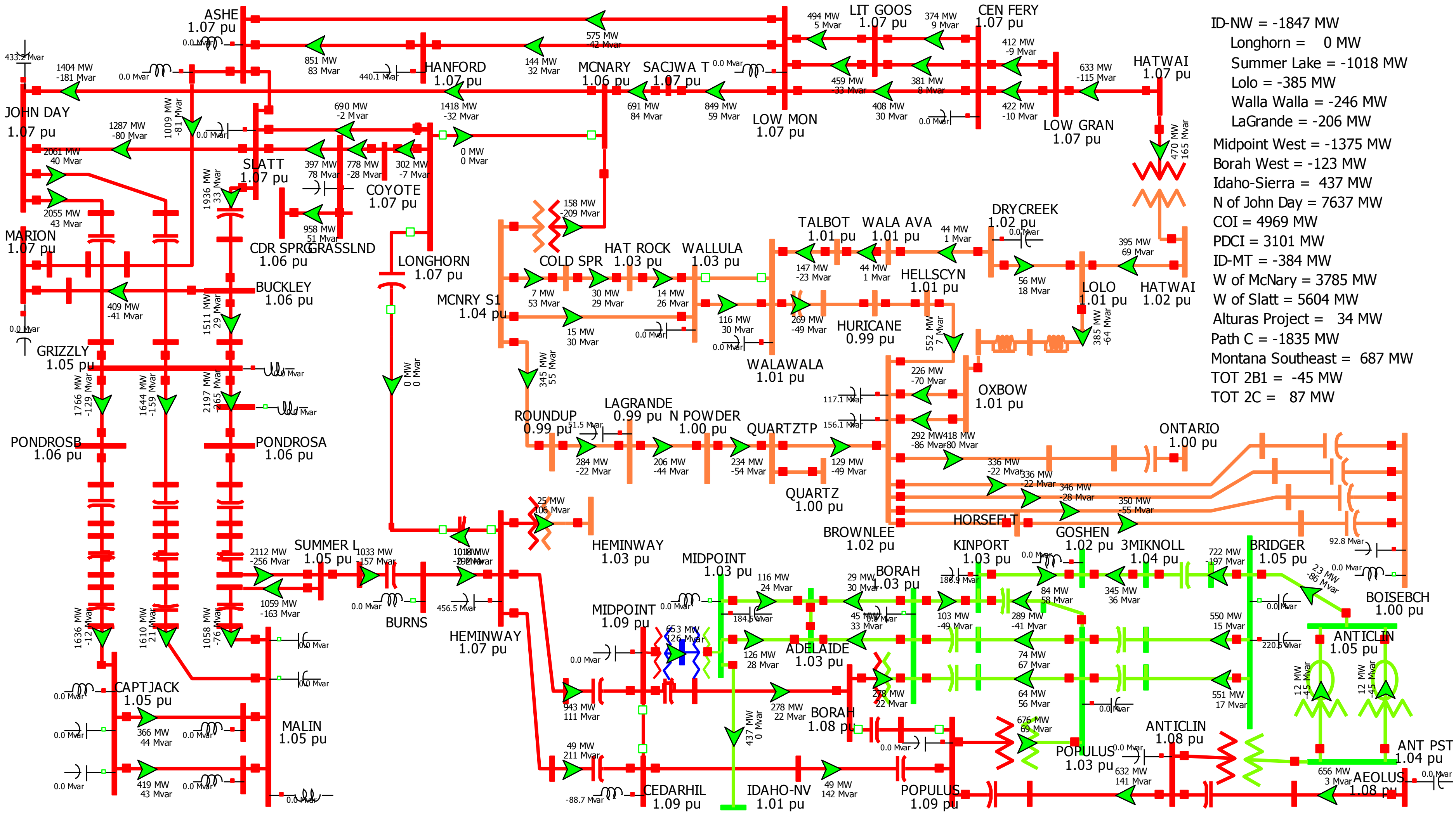

Figure K8: 16hs2a_2250idnw_lh Case **BF LH Hemingway-Longhorn 500 kV & McNary-Longhorn 500 kV**

Appendix K – 16hs2a_2250idnw_lh Base Case Post-Transient Contingency Results

Appendix K - 16hs2a_2250idnw_lh Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	MERIDINP (45197) -> MERIDINP (45195) CKT 2 at MERIDINP	Branch MVA	364.1	674.1	650.0	103.7%	780.0	86.4%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	637.1	1194.7	979.0	122.0%	1287.7	92.8%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	GLENDL (45113) -> GRANT PS (45123) CKT 1 at GLENDL	Branch Amp	303.9	767.0	722.9	106.1%	1265.2	60.6%
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4028 Taft-Dworshak & Taft Reactor 500kV	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	No Violations							
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1713.0	2963.3	2442.0	121.3%	3235.5	91.6%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1713.0	2963.3	2199.9	134.7%	3235.5	91.6%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALROU21	Branch Amp	1712.1	2956.2	2666.9	110.8%	3999.9	73.9%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1702.9	2945.2	2667.0	110.4%	4000.0	73.6%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALROU11	Branch Amp	1666.6	2880.5	2699.7	106.7%	3999.9	72.0%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at ROUND MT	Branch Amp	1658.9	2864.7	2699.7	106.1%	4000.0	71.6%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	No Violations							
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	No Violations							
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	No Violations							
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations							
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1713.0	3000.6	2442.0	122.9%	3235.5	92.7%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1713.0	3000.6	2199.9	136.4%	3235.5	92.7%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1712.1	2993.2	2666.9	112.2%	3999.9	74.8%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1702.9	2982.6	2667.0	111.8%	4000.0	74.6%
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	No Violations							
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	269.9	327.3	320.0	102.3%	370.0	88.5%
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	647.6	1041.4	950.0	109.6%	1286.0	81.0%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	269.9	333.8	320.0	104.3%	370.0	90.2%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	647.6	1053.1	950.0	110.9%	1286.0	81.9%
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations							
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	897.2	1027.4	1009.1	101.8%	1285.2	79.9%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	No Violations							
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations							
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations							
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	No Violations							
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	No Violations							
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations							
BF 4542 Paul-Allston 500 kV & Center G2	No Violations							
BF 4542 Paul-Napavine 500 kV & Center G1	No Violations							
BF 4550 Olympia-Paul & Paul-Allston 500 kV	No Violations							
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	No Violations							
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	No Violations							
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations							
BF 4700 Hatwai 500kV & 230 kV + RAS	No Violations							
BF 4708 Hatwai 500 kV Bus	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.6	814.9	800.0	101.9%	1199.9	67.9%
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	No Violations							
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	765.9	958.7	920.0	104.2%	1046.8	91.6%
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations							
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	No Violations							
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	No Violations							
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	No Violations							
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	No Violations							
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations							
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	No Violations							
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	No Violations							
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations							
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations							
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations							
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	No Violations							
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 5214 Low Mon-McNary & Calpine PH 500 kV	No Violations							
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1088.5	1356.6	1237.0	109.7%	1396.0	97.2%
BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	765.9	1012.6	920.0	110.1%	1046.8	96.7%
BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.6	834.4	800.0	104.3%	1199.9	69.5%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	No Violations							
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	765.9	1030.8	920.0	112.0%	1046.8	98.5%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1088.5	1370.3	1237.0	110.8%	1396.0	98.2%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.6	810.4	800.0	101.3%	1199.9	67.5%
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	No Violations							
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1088.5	1298.7	1237.0	105.0%	1396.0	93.0%
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	765.9	971.9	920.0	105.6%	1046.8	92.9%
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.6	819.5	800.0	102.4%	1199.9	68.3%
BF LH Hemingway-Longhorn & Longhorn-Coyote 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1088.5	1357.0	1237.0	109.7%	1396.0	97.2%
BF LH Hemingway-Longhorn & Longhorn-Coyote 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	765.9	1009.5	920.0	109.7%	1046.8	96.4%
BF LH Hemingway-Longhorn & Longhorn-Coyote 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.6	835.3	800.0	104.4%	1199.9	69.6%
BF LH Hemingway-Longhorn & Longhorn-Slatt 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1088.5	1363.3	1237.0	110.2%	1396.0	97.7%
BF LH Hemingway-Longhorn & Longhorn-Slatt 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	765.9	1012.0	920.0	110.0%	1046.8	96.7%
BF LH Hemingway-Longhorn & Longhorn-Slatt 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.6	836.7	800.0	104.6%	1199.9	69.7%
BF LH Hemingway-Longhorn & McNary-Longhorn 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1088.5	1366.6	1237.0	110.5%	1396.0	97.9%
BF LH Hemingway-Longhorn & McNary-Longhorn 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	765.9	1010.7	920.0	109.9%	1046.8	96.6%
BF LH Hemingway-Longhorn & McNary-Longhorn 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.6	836.3	800.0	104.5%	1199.9	69.7%
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	No Violations							
BF LH Longhorn-Coyote & Longhorn-Slatt 500 kV	No Violations							
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	No Violations							
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	No Violations							
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	No Violations							
BF LH McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations							
BF Lolo 230kV	No Violations							
BF McNary 230 kV SECT 1	No Violations							
BF McNary 230 kV SECT 2	No Violations							
BF McNary 230 kV SECT 3	No Violations							
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	No Violations							
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	No Violations							
Bus: Alvey 500 kV + RAS	No Violations							
Bus: Bell BPA 500 kV	No Violations							
Bus: Buckley 500 kV	No Violations							
Bus: Dixonville 500 kV	No Violations							
Bus: Hot Springs 500 kV	No Violations							
Bus: Keeler 500 kV + RAS	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
Bus: Rock Creek 500 kV	No Violations							
Bus: Sickler 500 kV	No Violations							
Bus: Summer Lake 500 kV	No Violations							
N-1: Allston-Keeler 500 kV + RAS	No Violations							
N-1: Allston-Napavine 500 kV	No Violations							
N-1: Allston-Paul #2 500 kV	No Violations							
N-1: Alvery-Dixonville 500 kV	No Violations							
N-1: Alvey-Marion 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	897.2	1071.9	1009.1	106.2%	1285.2	83.4%
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Bell-Coulee 500 kV	No Violations							
N-1: Bell-Taft 500 kV	No Violations							
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV	No Violations							
N-1: Broadview-Garrison #1 500 kV	No Violations							
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Captain Jack-Olinda 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1713.0	2585.0	2442.0	105.9%	3235.5	79.9%
N-1: Captain Jack-Olinda 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1713.0	2585.0	2199.9	117.5%	3235.5	79.9%
N-1: Captain Jack-Olinda 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1768.1	2389.5	2199.9	108.6%	3280.5	72.8%
N-1: Captain Jack-Olinda 500 kV	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1753.2	2369.3	2199.9	107.7%	3280.5	72.2%
N-1: Captain Jack-Olinda 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1945.6	2596.0	2477.9	104.8%	3999.9	64.9%
N-1: CaptJack-Kfalls 500 kV	No Violations							
N-1: Cascade Crossing 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	897.2	1016.4	1009.1	100.7%	1285.2	79.1%
N-1: Chief Jo-Coulee 500 kV	No Violations							
N-1: Chief Jo-Monroe 500 kV	No Violations							
N-1: Chief Jo-Sickler 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Covington4-Raver 500 kV	No Violations							
N-1: Covington5-Raver 500 kV	No Violations							
N-1: Coyote-Longhorn 500 kV	No Violations							
N-1: CusterW-Monroe 500 kV	No Violations							
N-1: Dixonville-Meridian 500 kV	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	637.1	1152.1	979.0	117.7%	1287.7	89.5%
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.6	815.7	800.0	102.0%	1199.9	68.0%
N-1: Dworshak-Hatwai 500 kV + RAS	PTRSNFLT (62030)	% Δ Volts	0.961	0.911				-5.20%
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.6	818.0	800.0	102.2%	1199.9	68.2%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Echo Lake-Maple Valley 500 kV	No Violations							
N-1: Echo Lake-Raver 500 kV	No Violations							
N-1: Echo Lake-Schultz 500 kV	No Violations							
N-1: Echo Lake-Snok Tap 500 kV	No Violations							
N-1: Garrison-Taft #2 500 kV	No Violations							
N-1: Goldhill-Placer 115 kV	No Violations							
N-1: Grassland-Coyote 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	No Violations							
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Hatwai 500/230 kV Xfmr + RAS	No Violations							
N-1: Hatwai-Lolo 230 kV	No Violations							
N-1: Hatwai-Low Gran 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	765.9	958.3	920.0	104.2%	1046.8	91.6%
N-1: Hatwai-N Lewiston 230 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	765.9	965.8	920.0	105.0%	1046.8	92.3%
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Longhorn 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1088.5	1355.1	1237.0	109.5%	1396.0	97.1%
N-1: Hemingway-Longhorn 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	765.9	1011.5	920.0	109.9%	1046.8	96.6%
N-1: Hemingway-Longhorn 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.6	833.0	800.0	104.1%	1199.9	69.4%
N-1: Hemingway-Longhorn 500 kV	AMPS (65025)	% Δ Volts	0.967	0.902				-6.72%
N-1: Hemingway-Longhorn 500 kV	PTRSNFLT (62030)	% Δ Volts	0.961	0.885				-7.91%
N-1: Hemingway-Longhorn 500 kV + FACRI	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1689.8	2903.2	2400.0	121.0%	3199.9	90.7%
N-1: Hemingway-Longhorn 500 kV + FACRI	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1696.5	2923.3	2400.0	121.8%	3800.0	76.9%
N-1: Hemingway-Longhorn 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1088.5	1349.9	1237.0	109.1%	1396.0	96.7%
N-1: Hemingway-Longhorn 500 kV + PTSN Shunt	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	765.9	1007.0	920.0	109.5%	1046.8	96.2%
N-1: Hemingway-Longhorn 500 kV + PTSN Shunt	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.6	834.0	800.0	104.2%	1199.9	69.5%
N-1: Hemingway-Summer Lake 500 kV	No Violations							
N-1: Hill Top 345/230 Xfmr	No Violations							
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: Hot Springs-Taft 500 kV	No Violations							
N-1: Humboldt-Coyote Ck 345 kV	No Violations							
N-1: Huntington-Pinto-Four Corners 345 kV	No Violations							
N-1: Ing500-CusterW 500 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Kfalls-Meridian 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	No Violations							
N-1: Lanes-Marion 500 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							

Appendix K - 16hs2a_2250idnw_lh Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-Sac Tap 500 kV	No Violations							
N-1: Malin 500/230 Xfmr	No Violations							
N-1: Malin-Hilltop 230 kV	No Violations							
N-1: Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1713.0	2965.5	2442.0	121.4%	3235.5	91.7%
N-1: Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1713.0	2965.5	2199.9	134.8%	3235.5	91.7%
N-1: Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1712.1	2958.1	2666.9	110.9%	3999.9	74.0%
N-1: Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1702.9	2947.7	2667.0	110.5%	4000.0	73.7%
N-1: Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1666.6	2937.7	2699.7	108.8%	3999.9	73.4%
N-1: Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1658.9	2924.5	2699.7	108.3%	4000.0	73.1%
N-1: Malin-Summer Lake 500 kV	No Violations							
N-1: Maple Vly-Rocky RH 345 kV	No Violations							
N-1: Marion-Pearl 500 kV	No Violations							
N-1: Marion-Santiam 500 kV	No Violations							
N-1: McLouglin-Ostrander 230 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary S2-McNary S3 230 kV	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Longhorn 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	No Violations							
N-1: McNary-Sac Tap-Low Mon 500 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV	No Violations							
N-1: Midpoint-Humboldt 345 kV	No Violations							
N-1: Napavine-Paul 500 kV	No Violations							
N-1: Olympia-Paul 500 kV	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	No Violations							
N-1: Paul-Satsop 500 kV	No Violations							
N-1: Pearl-Keeler 500 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at HORIZN	Branch MVA	269.9	350.1	320.0	109.4%	370.0	94.6%
N-1: Pearl-Keeler 500 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	647.6	1180.7	950.0	124.3%	1286.0	91.8%
N-1: Pearl-Keeler 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	269.9	325.8	320.0	101.8%	370.0	88.1%
N-1: Pearl-Keeler 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	647.6	1036.2	950.0	109.1%	1286.0	80.6%
N-1: Pinto-Four Corner 345 kV	No Violations							
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Raver-Paul 500 kV	No Violations							
N-1: Raver-Tacoma 500 kV	No Violations							
N-1: Red Butte-Harry Allen 345 kV	No Violations							
N-1: Robinson-Harry Allen 500 kV	No Violations							
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1768.1	3179.2	2199.9	144.5%	3280.5	96.9%

Appendix K - 16hs2a_2250idnw_lh Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Round Mtn-Table Mtn 500 kV	ROUND MT (30005) -> ROUTAB21 (30018) CKT 2 at ROUTAB21	Branch Amp	1768.1	3179.2	2667.0	119.2%	4000.0	79.5%
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB22 (30019) -> TABLE MT (30015) CKT 2 at TABLE MT	Branch Amp	1758.0	3165.3	2667.0	118.7%	4000.0	79.1%
N-1: Roundup-Lagrande 230 kV	No Violations							
N-1: Schultz-Sickler 500 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Sigurd-Glen Canyon 230 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Slatt-Longhorn 500 kV	No Violations							
N-1: Snok Tap-Snoking 500 kV	No Violations							
N-1: Table Mtn-Tesla 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1945.6	2892.7	2477.9	116.7%	3999.9	72.3%
N-1: Table Mtn-Tesla 500 kV	TABLE MT (30015) -> TABVAC11 (30031) CKT 1 at TABLE MT	Branch Amp	1945.6	2892.7	2667.0	108.5%	4000.0	72.3%
N-1: Table Mtn-Tesla 500 kV	TABVAC12 (30032) -> VACA-DIX (30030) CKT 1 at VACA-DIX	Branch Amp	1919.6	2872.2	2667.0	107.7%	4000.0	71.8%
N-1: Table Mtn-Vaca Dixon 500 kV	TABTES11 (30041) -> TABTES12 (30043) CKT 1 at TABTES11	Branch Amp	1453.5	2598.1	2230.0	116.5%	3555.9	73.1%
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations							
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.6	814.3	800.0	101.8%	1199.9	67.9%
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	897.2	1035.8	1009.1	102.6%	1285.2	80.6%
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	897.2	1101.3	1009.1	109.1%	1285.2	85.7%
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Bridger-Populus #1 & #2 345 kV	BRIDGER (60085) -> BRI3MI11 (61999) CKT 1 at BRIDGER	Branch Amp	1190.4	1731.0	1600.0	108.2%	1919.0	90.2%
N-2: Bridger-Populus #1 & #2 345 kV	SODA (66385) -> GRACE (65695) CKT 1 at SODA	Branch Amp	392.0	539.9	539.7	100.0%	644.3	83.8%
N-2: Bridger-Populus #1 & #2 345 kV	BRI3MI11 (61999) -> 3MIKNOLL (60084) CKT 1 at 3MIKNOLL	Branch Amp	1163.2	1686.8	1650.1	102.2%	2227.4	75.7%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	BRIDGER (60085) -> BRIDGER (65220) CKT 2 at BRIDGER	Branch MVA	114.0	206.4	200.0	103.2%	220.0	93.8%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	BRIDGER (60085) -> BRIDGER (65220) CKT 1 at BRIDGER	Branch MVA	112.1	203.0	200.0	101.5%	220.0	92.3%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	BRIDGER (60085) -> BRIDGER (65220) CKT 3 at BRIDGER	Branch MVA	112.1	203.0	200.0	101.5%	220.0	92.3%
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	No Violations							
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	No Violations							
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	765.9	937.8	920.0	101.9%	1046.8	89.6%
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations							
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations							
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							

Appendix K - 16hs2a_2250idnw_lh Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations							
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	No Violations							
N-2: DC-BIPOLE	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1689.8	2739.0	2400.0	114.1%	3199.9	85.6%
N-2: DC-BIPOLE	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1713.0	2382.8	2199.9	108.3%	3235.5	73.6%
N-2: DC-BIPOLE	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1768.1	2379.5	2199.9	108.2%	3280.5	72.5%
N-2: DC-BIPOLE	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1696.5	2753.3	2400.0	114.7%	3800.0	72.5%
N-2: DC-BIPOLE	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1753.2	2359.4	2199.9	107.2%	3280.5	71.9%
N-2: DC-BIPOLE	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1945.6	2549.0	2477.9	102.9%	3999.9	63.7%
N-2: DC-BIPOLE	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1488.8	2181.9	2134.0	102.2%	3499.9	62.3%
N-2: DC-BIPOLE	MIDWAY (30060) -> MIDVIN11 (30061) CKT 1 at MIDWAY	Branch Amp	1470.7	2152.3	2134.0	100.9%	3499.9	61.5%
N-2: Double Palo Verde	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1689.8	2524.1	2400.0	105.2%	3199.9	78.9%
N-2: Double Palo Verde	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1696.5	2542.8	2400.0	105.9%	3800.0	66.9%
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations							
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations							
N-2: Garrison-Taft #1 & #2 500 kV + RAS	No Violations							
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	No Violations							
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	No Violations							
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1696.5	3292.2	2400.0	137.2%	3800.0	86.6%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM11	Branch Amp	1430.3	3225.4	2700.0	119.5%	4000.0	80.6%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	1615.3	3125.6	2400.0	130.2%	3800.0	82.3%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1600.6	3112.0	2400.0	129.7%	3800.0	81.9%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON16	Branch Amp	1615.3	3176.2	2400.0	132.3%	3800.0	83.6%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1600.6	3165.6	2400.0	131.9%	3800.0	83.3%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations							
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	1840.8	3121.7	2900.0	107.6%	4350.0	71.8%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH12	Branch Amp	1844.3	3469.8	3000.0	115.7%	4050.0	85.7%
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at HORIZN	Branch MVA	269.9	346.7	320.0	108.3%	370.0	93.7%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	647.6	1181.0	950.0	124.3%	1286.0	91.8%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	79.2	96.3	94.0	102.5%	139.0	69.3%
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	No Violations							
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1842.0	3905.7	2667.4	146.4%	4099.2	95.3%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI11	Branch Amp	1808.4	3792.1	2667.4	142.2%	4099.2	92.5%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPOLI11	Branch Amp	1808.4	3792.1	2667.4	142.2%	4099.2	92.5%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	1922.7	3239.2	2993.0	108.2%	4514.9	71.7%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	1922.7	3239.2	2993.0	108.2%	4514.9	71.7%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	1891.8	3204.3	2993.0	107.1%	4514.9	71.0%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at OLIMAX12	Branch Amp	1891.8	3204.3	2993.0	107.1%	4514.9	71.0%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	1870.5	3165.6	2993.0	105.8%	4514.9	70.1%

Appendix K - 16hs2a_2250idnw_lh Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Malin-Round Mtn #1 & #2 500 kV	OLINDA (30020)	% Δ Volts	1.056	1.003				-5.02%
N-2: Malin-Round Mtn #1 & #2 500 kV	WDJCT L1 (45522)	% Δ Volts	1.007	0.951				-5.56%
N-2: Malin-Round Mtn #1 & #2 500 kV	WEED JCT (45525)	% Δ Volts	1.007	0.951				-5.56%
N-2: Malin-Round Mtn #1 & #2 500 kV	WEED (45524)	% Δ Volts	1.003	0.946				-5.68%
N-2: Malin-Round Mtn #1 & #2 500 kV	MTSHASTA (44970)	% Δ Volts	0.989	0.931				-5.86%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXWELL (30025)	% Δ Volts	1.041	0.978				-6.05%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	HORSE HV (40547)	% Δ Volts	1.032	0.980				-5.04%
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	No Violations							
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations							
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	No Violations							
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	No Violations							
N-2: Paul-Raver & Raver-Covingt4 500 kV	No Violations							
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	269.9	327.8	320.0	102.5%	370.0	88.6%
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	647.6	1041.9	950.0	109.7%	1286.0	81.0%
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	No Violations							
N-2: Raver-Covington #1 & #2 500 kV	No Violations							
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations							
N-2: Raver-Paul & Napavine-Paul 500 kV	No Violations							
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations							
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations							
N-2: Raver-Schultz #1 & #2 500 kV	No Violations							
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations							
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations							
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	DELEVN (30114) -> CORTINA (30450) CKT 1 at CORTINA	Branch Amp	670.9	860.1	830.9	103.5%	926.3	92.9%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1842.0	3598.8	2667.4	134.9%	4099.2	87.8%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI12	Branch Amp	1808.4	3500.2	2667.4	131.2%	4099.2	85.4%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPTJACK	Branch Amp	1808.4	3489.4	2667.4	130.8%	4099.2	85.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	1922.7	3436.0	2993.0	114.8%	4514.9	76.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	1922.7	3436.0	2993.0	114.8%	4514.9	76.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	1891.8	3415.3	2993.0	114.1%	4514.9	75.6%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at OLIMAX12	Branch Amp	1891.8	3415.3	2993.0	114.1%	4514.9	75.6%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	1870.5	3382.3	2993.0	113.0%	4514.9	74.9%
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	No Violations							
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	No Violations							
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHE (30790) -> MCMULLN1 (30825) CKT 1 at MCMULLN1	Branch Amp	286.9	922.6	825.9	111.7%	976.5	94.5%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	MCMULLN1 (30825) -> KEARNEY (30830) CKT 1 at MCMULLN1	Branch Amp	233.9	864.1	825.1	104.7%	975.0	88.6%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHEJ (34159) -> HAMMONDS (34160) CKT 1 at HAMMONDS	Branch Amp	393.2	470.8	462.9	101.7%	579.9	81.2%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1945.6	2487.0	2477.9	100.4%	3999.9	62.2%
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	No Violations							
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	No Violations							
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	No Violations							

Appendix K - 16hs2a_2250idnw_lh Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations							

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Shunt HANFORD_500.0 (40499) #s
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Bus MALIN R3_500.0 (40688)
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Bus HOT SPR_500.0 (40553)
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HERMCALP_500.0 (47638)

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP S1_ 18.0 (47641)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G2_ 18.0 (47640)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G1_ 18.0 (47639)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 2
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN Bus ASHE R1_500.0 (40062)
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Bus SANTIAM_500.0 (40941)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Shunt OSTRNDER_500.0 (40809) #s
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	CLOSE MultiSectionLine PEARL_500.0 (40827) TO KNIGHT_500.0 (41450) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOK TAP_500.0 (41001)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOKING_500.0 (41007)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt MONROE_500.0 (40749) #s
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR G2_ 20.0 (47744)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2AX_ 4.2 (47746)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2FG_ 13.8 (47747)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR G1_ 20.0 (47740)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1AX_ 4.2 (47742)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1FG_ 13.8 (47743)
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Transformer TONO_115.0 (42806) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Shunt OLY E_230.0 (40794) #s
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN Shunt MONROE_500.0 (40749) #s
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Transformer ALLSTON_500.0 (40045) TO ALLSTN E_230.0 (40043) CKT 2
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Bus HATWAI_500.0 (40521)
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Bus HATWAI_230.0 (40519)
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line NPULLMAN_115.0 (48291) TO SHAWNEE_115.0 (48383) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line MOSCITYT_115.0 (48245) TO SPULLMAN_115.0 (48413) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS HOT SPR_500.0 (40553) TO -148.3 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	CLOSE Line LEON_115.0 (48183) TO MOSCCITY_115.0 (48243) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line MOSCCITY_115.0 (48243) TO MOSCITYT_115.0 (48245) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS N LEWIST_115.0 (48253) TO 44.4 MVR
BF 4708 Hatwai 500 kV Bus	OPEN Bus HATWAI_500.0 (40521)
BF 4708 Hatwai 500 kV Bus	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4708 Hatwai 500 kV Bus	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4708 Hatwai 500 kV Bus	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Transformer CHIEF JO_500.0 (40233) TO CHIEF J2_230.0 (40232) CKT 3

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN InjectionGroup RAS Lower Granite Gen Drop
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Transformer BIG EDDY_500.0 (40111) TO BIGEDDY1_230.0 (41341) CKT 2
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Bus CGS_ 25.0 (40063)
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN Bus BURNS_500.0 (45029)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R3_500.0 (40688)
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN Bus ROUND BU_500.0 (43485)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Bus MAPLE VL_500.0 (40693)
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M1_500.0 (43115)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus HERMCALP_500.0 (47638)

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G1_ 18.0 (47639) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G2_ 18.0 (47640) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP S1_ 18.0 (47641) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
BF 5266 Slatt-Buckly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO LONGHORN_500.0 (40724) CKT 1
BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Bus BURNS_500.0 (45029)
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO LONGHORN_500.0 (40724) CKT 1
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus LNGHRN1_230.0 (99000)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus LNGHRN1A_230.0 (99001)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0362 1_ 34.5 (99003)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0362 C1_ 34.5 (99004)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0362 W1_ 0.6 (99005)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0362 2_ 34.5 (99006)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0362 C2_ 34.5 (99007)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0362 W2_ 0.6 (99008)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0363 1_ 34.5 (99009)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0363 C1_ 34.5 (99010)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0363 W1_ 0.6 (99011)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0363 2_ 34.5 (99012)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0363 C2_ 34.5 (99013)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0363 W2_ 0.6 (99014)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0365 1_ 34.5 (99015)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0365 C1_ 34.5 (99016)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0365 W1_ 0.6 (99017)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0365 2_ 34.5 (99018)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0365 C2_ 34.5 (99019)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0365 W2_ 0.6 (99020)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0366 1_ 34.5 (99021)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0366 C1_ 34.5 (99022)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0366 W1_ 0.6 (99023)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0366 2_ 34.5 (99024)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0366 C2_ 34.5 (99025)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0366 W2_ 0.6 (99026)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0341 1_ 34.5 (99103)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0341 C1_ 34.5 (99104)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0341 W1_ 0.6 (99105)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0341 2_ 34.5 (99106)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0341 C2_ 34.5 (99107)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0341 W2_ 0.6 (99108)
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
BF LH Hemingway-Longhorn & Longhorn 500/230 Xfmr	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
BF LH Hemingway-Longhorn & Longhorn-Coyote 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO LONGHORN_500.0 (40724) CKT 1
BF LH Hemingway-Longhorn & Longhorn-Coyote 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
BF LH Hemingway-Longhorn & Longhorn-Coyote 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF LH Hemingway-Longhorn & Longhorn-Coyote 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF LH Hemingway-Longhorn & Longhorn-Coyote 500 kV	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
BF LH Hemingway-Longhorn & Longhorn-Slatt 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO LONGHORN_500.0 (40724) CKT 1
BF LH Hemingway-Longhorn & Longhorn-Slatt 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
BF LH Hemingway-Longhorn & Longhorn-Slatt 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF LH Hemingway-Longhorn & Longhorn-Slatt 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF LH Hemingway-Longhorn & Longhorn-Slatt 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
BF LH Hemingway-Longhorn & Longhorn-Slatt 500 kV	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
BF LH Hemingway-Longhorn & McNary-Longhorn 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF LH Hemingway-Longhorn & McNary-Longhorn 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO LONGHORN_500.0 (40724) CKT 1
BF LH Hemingway-Longhorn & McNary-Longhorn 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
BF LH Hemingway-Longhorn & McNary-Longhorn 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
BF LH Hemingway-Longhorn & McNary-Longhorn 500 kV	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
BF LH Hemingway-Longhorn & McNary-Longhorn 500 kV	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus LNGHRN1_230.0 (99000)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus LNGHRN1A_230.0 (99001)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0362 1_ 34.5 (99003)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0362 C1_ 34.5 (99004)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0362 W1_ 0.6 (99005)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0362 2_ 34.5 (99006)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0362 C2_ 34.5 (99007)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0362 W2_ 0.6 (99008)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0363 1_ 34.5 (99009)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0363 C1_ 34.5 (99010)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0363 W1_ 0.6 (99011)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0363 2_ 34.5 (99012)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0363 C2_ 34.5 (99013)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0363 W2_ 0.6 (99014)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0365 1_ 34.5 (99015)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0365 C1_ 34.5 (99016)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0365 W1_ 0.6 (99017)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0365 2_ 34.5 (99018)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0365 C2_ 34.5 (99019)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0365 W2_ 0.6 (99020)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0366 1_ 34.5 (99021)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0366 C1_ 34.5 (99022)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0366 W1_ 0.6 (99023)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0366 2_ 34.5 (99024)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0366 C2_ 34.5 (99025)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0366 W2_ 0.6 (99026)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0341 1_ 34.5 (99103)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0341 C1_ 34.5 (99104)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0341 W1_ 0.6 (99105)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0341 2_ 34.5 (99106)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0341 C2_ 34.5 (99107)
BF LH Longhorn-Coyote & Longhorn 500/230 Xfmr	OPEN Bus G0341 W2_ 0.6 (99108)
BF LH Longhorn-Coyote & Longhorn-Slatt 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
BF LH Longhorn-Coyote & Longhorn-Slatt 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF LH Longhorn-Coyote & Longhorn-Slatt 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus COYOTETP_500.0 (40725)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus LNGHRN1_230.0 (99000)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus LNGHRN1A_230.0 (99001)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0362 1_ 34.5 (99003)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0362 C1_ 34.5 (99004)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0362 W1_ 0.6 (99005)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0362 2_ 34.5 (99006)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0362 C2_ 34.5 (99007)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0362 W2_ 0.6 (99008)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0363 1_ 34.5 (99009)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0363 C1_ 34.5 (99010)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0363 W1_ 0.6 (99011)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0363 2_ 34.5 (99012)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0363 C2_ 34.5 (99013)

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0363 W2_ 0.6 (99014)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0365 1_ 34.5 (99015)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0365 C1_ 34.5 (99016)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0365 W1_ 0.6 (99017)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0365 2_ 34.5 (99018)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0365 C2_ 34.5 (99019)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0365 W2_ 0.6 (99020)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0366 1_ 34.5 (99021)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0366 C1_ 34.5 (99022)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0366 W1_ 0.6 (99023)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0366 2_ 34.5 (99024)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0366 C2_ 34.5 (99025)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0366 W2_ 0.6 (99026)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0341 1_ 34.5 (99103)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0341 C1_ 34.5 (99104)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0341 W1_ 0.6 (99105)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0341 2_ 34.5 (99106)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0341 C2_ 34.5 (99107)
BF LH Longhorn-Slatt & Longhorn 500/230 Xfmr	OPEN Bus G0341 W2_ 0.6 (99108)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus LNGHRN1_230.0 (99000)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus LNGHRN1A_230.0 (99001)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0362 1_ 34.5 (99003)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0362 C1_ 34.5 (99004)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0362 W1_ 0.6 (99005)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0362 2_ 34.5 (99006)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0362 C2_ 34.5 (99007)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0362 W2_ 0.6 (99008)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0363 1_ 34.5 (99009)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0363 C1_ 34.5 (99010)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0363 W1_ 0.6 (99011)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0363 2_ 34.5 (99012)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0363 C2_ 34.5 (99013)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0363 W2_ 0.6 (99014)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0365 1_ 34.5 (99015)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0365 C1_ 34.5 (99016)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0365 W1_ 0.6 (99017)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0365 2_ 34.5 (99018)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0365 C2_ 34.5 (99019)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0365 W2_ 0.6 (99020)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0366 1_ 34.5 (99021)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0366 C1_ 34.5 (99022)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0366 W1_ 0.6 (99023)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0366 2_ 34.5 (99024)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0366 C2_ 34.5 (99025)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0366 W2_ 0.6 (99026)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0341 1_ 34.5 (99103)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0341 C1_ 34.5 (99104)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0341 W1_ 0.6 (99105)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0341 2_ 34.5 (99106)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0341 C2_ 34.5 (99107)
BF LH McNary-Longhorn & Longhorn 500/230 Xfmr	OPEN Bus G0341 W2_ 0.6 (99108)
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
BF LH McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF LH McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
BF LH McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF Lolo 230kV	OPEN Bus LOLO_230.0 (48197)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1G_ 18.0 (45454)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1S_ 13.8 (45455)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2G_ 18.0 (45456)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2S_ 13.8 (45457)
BF McNary 230 kV SECT 1	OPEN Bus MCN 01_ 13.8 (44101)

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF McNary 230 kV SECT 1	OPEN Bus MCN 02_ 13.8 (44102)
BF McNary 230 kV SECT 1	OPEN Bus MCN 03_ 13.8 (44103)
BF McNary 230 kV SECT 1	OPEN Bus MCN 04_ 13.8 (44104)
BF McNary 230 kV SECT 1	OPEN Bus BOARD T1_230.0 (40121)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_230.0 (40129)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_115.0 (40127)
BF McNary 230 kV SECT 1	OPEN Bus MORROW 1_115.0 (47334)
BF McNary 230 kV SECT 1	OPEN Bus PORT MOR_115.0 (47335)
BF McNary 230 kV SECT 1	OPEN Bus MORRO G1_ 13.8 (47658)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN T_ 69.0 (40608)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN_ 69.0 (47332)
BF McNary 230 kV SECT 1	OPEN Bus KINZ WW_ 12.5 (47331)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_ 69.0 (40125)
BF McNary 230 kV SECT 1	OPEN Bus IONE_ 69.0 (40575)
BF McNary 230 kV SECT 1	OPEN Bus TOWER RD_115.0 (41324)
BF McNary 230 kV SECT 1	OPEN Bus ALKALI C_115.0 (41319)
BF McNary 230 kV SECT 1	OPEN Bus HERMISTN_230.0 (45137)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH1_230.0 (44122)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH2_230.0 (44123)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX1_100.0 (44115)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX2_100.0 (44116)
BF McNary 230 kV SECT 2	OPEN Bus MCNRY S2_230.0 (41352)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH34_230.0 (44125)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH3_230.0 (44124)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH4_230.0 (44126)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX3_100.0 (44117)
BF McNary 230 kV SECT 2	OPEN Bus MCN 05_ 13.8 (44105)
BF McNary 230 kV SECT 2	OPEN Bus MCN 06_ 13.8 (44106)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX4_100.0 (44118)
BF McNary 230 kV SECT 2	OPEN Bus MCN 07_ 13.8 (44107)
BF McNary 230 kV SECT 2	OPEN Bus MCN 08_ 13.8 (44108)
BF McNary 230 kV SECT 2	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 52.2 MVR
BF McNary 230 kV SECT 3	OPEN Bus MCNRY S3_230.0 (41353)
BF McNary 230 kV SECT 3	OPEN Bus MCN PH5_230.0 (44127)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX5_100.0 (44119)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX6_100.0 (44120)
BF McNary 230 kV SECT 3	OPEN Bus MCN 09_ 13.8 (44109)
BF McNary 230 kV SECT 3	OPEN Bus MCN 10_ 13.8 (44110)
BF McNary 230 kV SECT 3	OPEN Bus MCN 11_ 13.8 (44111)
BF McNary 230 kV SECT 3	OPEN Bus MCN 12_ 13.8 (44112)
BF McNary 230 kV SECT 3	OPEN Bus MCNARY_345.0 (40721)
BF McNary 230 kV SECT 3	OPEN Bus FRANKLIN_230.0 (40443)
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Gen BOARD CT_ 18.5 (43044) #1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Transformer BOARD ST_ 16.0 (43045) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Transformer BOARD CT_ 18.5 (43044) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Gen BOARD ST_ 16.0 (43045) #1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Transformer BOARD F_ 24.0 (43047) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Gen BOARD F_ 24.0 (43047) #1
Bus: Alvey 500 kV + RAS	OPEN Bus ALVEY_500.0 (40051)
Bus: Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
Bus: Bell BPA 500 kV	OPEN Bus BELL BPA_500.0 (40091)
Bus: Bell BPA 500 kV	OPEN Bus COULE R1_500.0 (40288)
Bus: Bell BPA 500 kV	OPEN Bus BELL SC_500.0 (40096)
Bus: Buckley 500 kV	OPEN Bus BUCKLEY_500.0 (40155)
Bus: Dixonville 500 kV	OPEN Bus DIXONVLE_500.0 (45095)
Bus: Dixonville 500 kV	SET SWITCHED SHUNT AT BUS GRANT PS_230.0 (45123) TO 147.4 MVR
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #2
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #3
Bus: Hot Springs 500 kV	OPEN Bus HOT SPR_500.0 (40553)
Bus: Keeler 500 kV + RAS	OPEN Bus KEELER_500.0 (40601)

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
Bus: Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
Bus: Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_500.0 (41401)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_230.0 (41402)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_230.0 (47386)
Bus: Rock Creek 500 kV	OPEN Bus ENRGZR T_230.0 (47823)
Bus: Rock Creek 500 kV	OPEN Bus WHITE CK_230.0 (47827)
Bus: Rock Creek 500 kV	OPEN Bus IMRIE_230.0 (47822)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_ 34.5 (47387)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC C1_ 34.5 (47388)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC W1_ 0.7 (47389)
Bus: Rock Creek 500 kV	OPEN Bus DOOLEY T_230.0 (47465)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 3_ 34.5 (47496)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 2_ 34.5 (47493)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C2_ 34.5 (47494)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W2_ 0.7 (47495)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C3_ 34.5 (47497)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W3_ 0.7 (47498)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE 1_ 34.5 (47829)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 1_ 34.5 (47825)
Bus: Rock Creek 500 kV	OPEN Bus WILLIS T_230.0 (47824)
Bus: Rock Creek 500 kV	OPEN Bus TULMN 1_ 34.5 (47826)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C1_ 34.5 (47936)
Bus: Rock Creek 500 kV	OPEN Bus TULMN C1_ 34.5 (47938)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 2_ 34.5 (47903)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 1_ 34.5 (47902)
Bus: Rock Creek 500 kV	OPEN Bus MILLRA S_230.0 (47857)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE C1_ 34.5 (47865)
Bus: Rock Creek 500 kV	OPEN Bus MILLR 1_ 34.5 (47966)
Bus: Rock Creek 500 kV	OPEN Bus HARVST W_230.0 (47858)
Bus: Rock Creek 500 kV	OPEN Bus HRVST 1_ 34.5 (47979)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE W1_ 0.6 (47866)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C1_ 34.5 (47904)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C2_ 34.5 (47905)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W1_ 0.7 (47906)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W2_ 0.7 (47907)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W1_ 0.7 (47937)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W2_ 0.6 (47940)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W1_ 0.7 (47939)
Bus: Rock Creek 500 kV	OPEN Bus MILLR C1_ 34.5 (47967)
Bus: Rock Creek 500 kV	OPEN Bus MILLR W1_ 0.6 (47968)
Bus: Rock Creek 500 kV	OPEN Bus HRVST C1_ 34.5 (47980)
Bus: Rock Creek 500 kV	OPEN Bus HRVST W1_ 0.7 (47981)
Bus: Sickler 500 kV	OPEN Bus SICKLER_500.0 (40973)
Bus: Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
Bus: Summer Lake 500 kV	OPEN Bus SUMMER L_500.0 (41043)
Bus: Summer Lake 500 kV	OPEN Bus BURNS_500.0 (45029)
Bus: Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-1: Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
N-1: Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
N-1: Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
N-1: Allston-Napavine 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-1: Allston-Paul #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-1: Alvery-Dixonville 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO DIXONVLE_500.0 (45095) CKT 1
N-1: Alvey-Marion 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
N-1: Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-1: Ashe-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
N-1: Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-1: Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-1: Bell-Coulee 500 kV	OPEN Bus COULE R1_500.0 (40288)
N-1: Bell-Taft 500 kV	OPEN Bus BELL SC_500.0 (40096)

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Big Eddy-Celilo 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO CELILO1_500.0 (41311) CKT 1
N-1: Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-1: Big Eddy-Knight 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO KNIGHT_500.0 (41450) CKT 1
N-1: Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-1: Boise Bench-Brownlee #3 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-1: Brady-Antelope 230 kV	OPEN Line BRADY_230.0 (60073) TO ANTLOPE_230.0 (65075) CKT 1
N-1: Broadview-Garrison #1 500 kV	OPEN Bus GAR1EAST_500.0 (40451)
N-1: Broadview-Garrison #1 500 kV	OPEN Bus TOWN1_500.0 (62013)
N-1: Brownlee-Ontario 230 kV	OPEN MultiSectionLine BROWNLEE_230.0 (60095) TO ONTARIO_230.0 (60265) CKT 1
N-1: Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-1: Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-1: Buckley-Slatt 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-1: Captain Jack-Olinda 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO OLINDA_500.0 (30020) CKT 1
N-1: CaptJack-Kfalls 500 kV	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
N-1: Cascade Crossing 500 kV	OPEN Bus CDR SPRG_500.0 (43950)
N-1: Cascade Crossing 500 kV	OPEN Bus CDRSBET1_500.0 (43951)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHCRS1_500.0 (43491)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHEL5_500.0 (43041)
N-1: Chief Jo-Coulee 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-1: Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-1: Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-1: Coulee-Hanford 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-1: Coulee-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Covington4-Raver 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-1: Covington5-Raver 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
N-1: Coyote-Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
N-1: CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-1: Dixonville-Meridian 500 kV	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
N-1: Drycreek-Lolo 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO LOLO_230.0 (48197) CKT 1
N-1: Drycreek-N Lewiston 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO N LEWIST_230.0 (48255) CKT 1
N-1: Drycreek-Wala Ava 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO WALA AVA_230.0 (48451) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Dworshak-Taft 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-1: Echo Lake-Maple Valley 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO MAPLE VL_500.0 (40693) CKT 1
N-1: Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-1: Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Echo Lake-Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
N-1: Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-1: Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSHE1_115.0 (32229)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSESHE_115.0 (32230)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTL1_115.0 (32233)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_115.0 (32234)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_ 13.2 (32460)
N-1: Goldhill-Placer 115 kV	OPEN Bus FLINT1_115.0 (32236)
N-1: Grassland-Coyote 500 kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-1: Grassland-Slatt 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
N-1: Grizzly-John Day #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-1: Grizzly-Malin 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN MultiSectionLine PONDROSA_500.0 (40837) TO SUMMER L_500.0 (41043) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZ R3_500.0 (40488) TO PONDROSA_500.0 (40837) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO GRIZZ R3_500.0 (40488) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Grizzly-Round Bu 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO ROUND BU_500.0 (43485) CKT 1

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-1: Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-1: Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Transformer HATWAI_500.0 (40521) TO HATWAI_230.0 (40519) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 67.1 MVR
N-1: Hatwai-Lolo 230 kV	OPEN Line HATWAI_230.0 (40519) TO LOLO_230.0 (48197) CKT 1
N-1: Hatwai-Low Gran 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Hatwai-N Lewiston 230 kV	OPEN Line HATWAI_230.0 (40519) TO N LEWIST_230.0 (48255) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO HURICANE_230.0 (45103) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN MultiSectionLine HURICANE_230.0 (45103) TO WALAWALA_230.0 (45327) CKT 1
N-1: Hemingway-Longhorn 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO LONGHORN_500.0 (40724) CKT 1
N-1: Hemingway-Longhorn 500 kV	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Longhorn 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Hemingway-Longhorn 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
N-1: Hemingway-Longhorn 500 kV + FACRI	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO LONGHORN_500.0 (40724) CKT 1
N-1: Hemingway-Longhorn 500 kV + FACRI	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Longhorn 500 kV + FACRI	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-1: Hemingway-Longhorn 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-1: Hemingway-Longhorn 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-1: Hemingway-Longhorn 500 kV + FACRI	OPEN Shunt MALIN_500.0 (40687) #s
N-1: Hemingway-Longhorn 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c1
N-1: Hemingway-Longhorn 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c2
N-1: Hemingway-Longhorn 500 kV + FACRI	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-1: Hemingway-Longhorn 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-1: Hemingway-Longhorn 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-1: Hemingway-Longhorn 500 kV + FACRI	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-1: Hemingway-Longhorn 500 kV + FACRI	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-1: Hemingway-Longhorn 500 kV + FACRI	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-1: Hemingway-Longhorn 500 kV + PTSN Shunt	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO LONGHORN_500.0 (40724) CKT 1
N-1: Hemingway-Longhorn 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Hemingway-Longhorn 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
N-1: Hemingway-Longhorn 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Hemingway-Summer Lake 500 kV	OPEN Line HEMINWAY_500.0 (60155) TO BURNS_500.0 (45029) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN MultiSectionLine BURNS_500.0 (45029) TO SUMMER L_500.0 (41043) CKT 1
N-1: Hill Top 345/230 Xfmr	OPEN Transformer HIL TOP_230.0 (40537) TO HIL TOP_345.0 (64058) CKT 1
N-1: Horse Hv-McNary 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-1: Hot Springs-Taft 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line COYOTECR_345.0 (64032) TO HUMBOLDT_345.0 (64059) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line MAGGIECR_120.0 (64070) TO CARLIN_120.0 (64169) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt EIGHTMFK_120.0 (64457) #b
N-1: Humboldt-Coyote Ck 345 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 10.8 MVR
N-1: Humboldt-Coyote Ck 345 kV	CLOSE Shunt HUMBOLT1_ 24.9 (64216) #b
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO &1_345.0 (67582)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO_345.0 (66225)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #2_ 99.0 (65014)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #3_ 99.0 (65017)
N-1: Ing500-CusterW 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-1: John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-1: John Day-Rock Ck 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-1: John Day-Slatt 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-1: Kfalls-Meridian 500 kV	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
N-1: Knight-Wautoma 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
N-1: LaGrande-North Powder 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO N POWDER_230.0 (60312) CKT 1
N-1: Lanes-Marion 500 kV	OPEN Line LANE_500.0 (40629) TO MARION_500.0 (40699) CKT 1
N-1: Lit Goose-Central Ferry 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
N-1: Lit Goose-Low Mon 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
N-1: Low Gran-Central Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Low Mon-Sac Tap 500 kV	OPEN Line LOW MON_500.0 (40683) TO SACJWA T_500.0 (40917) CKT 1
N-1: Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Malin-Hilltop 230 kV	OPEN Line CANBYTAP_230.0 (40171) TO HIL TOP_230.0 (40537) CKT 1
N-1: Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-1: Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-1: Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-1: Maple Vly-Rocky RH 345 kV	OPEN MultiSectionLine MAPLE VL_345.0 (40691) TO ROCKY RH_345.0 (40891) CKT 1
N-1: Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Line MARION_500.0 (40699) TO SANTIAM_500.0 (40941) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Shunt SANTIAM_230.0 (40939) #s
N-1: McLouglin-Ostrander 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-1: McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary S2-McNary S3 230 kV	OPEN Line MCNRY S2_230.0 (41352) TO MCNRY S3_230.0 (41353) CKT 1
N-1: McNary-Board T1 230 kV	OPEN Line BOARD T1_230.0 (40121) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-1: McNary-Longhorn 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
N-1: McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-1: McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-1: McNary-Roundup 230 kV	OPEN Line MCNRY S1_230.0 (41351) TO ROUNDUP_230.0 (40905) CKT 1
N-1: McNary-Roundup 230 kV	SET SWITCHED SHUNT AT BUS LAGRANDE_230.0 (40621) TO 52.2 MVR
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJWA T_500.0 (40917)
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
N-1: McNary-Sac Tap-Low Mon 500 kV	CLOSE Gen ICE H1-2_ 13.8 (40559) #1
N-1: Midpoint-Hemingway 500 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Midpoint-Humboldt 345 kV	OPEN Bus IDAHO-NV_345.0 (64061)
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS HIL TOP_230.0 (40537) TO 52.2 MVR
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 10.8 MVR
N-1: Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
N-1: Ontario-Caldwell 230 kV	OPEN MultiSectionLine CALDWELL_230.0 (60110) TO LANGLEY_230.0 (60266) CKT 1
N-1: Ostrander-Knight 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-1: Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-1: Ostrander-Troutdale 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO TROUTDAL_500.0 (41095) CKT 1
N-1: Oxbow-Brownlee #2 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 2
N-1: Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-1: Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-1: Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO SATSOP_500.0 (40949) CKT 1
N-1: Pearl-Keeler 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-1: Pinto-Four Corner 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Ponderosa A 500/230 kV Xfmr	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Ponderosa B 500/230 kV Xfmr	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Raver-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-1: Raver-Tacoma 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus H ALLEN_345.0 (18001)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus HA PS_345.0 (18002)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus UTAH-NEV_345.0 (67657)
N-1: Robinson-Harry Allen 500 kV	OPEN Line ROBINSON_500.0 (64895) TO H ALLEN_500.0 (18450) CKT 1
N-1: Rock Ck-Wautoma 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Round Mtn-Table Mtn 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-1: Roundup-Lagrande 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO ROUNDUP_230.0 (40905) CKT 1
N-1: Schultz-Sickler 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-1: Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-1: Schultz-Wautoma 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Sigurd-Glen Canyon 230 kV	OPEN Bus SIGURDPS_230.0 (66355)
N-1: Slatt 500/230 kV Xfmr	OPEN Transformer SLATT_500.0 (40989) TO SLATT_230.0 (40986) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-1: Snok Tap-Snoking 500 kV	OPEN Line SNOK TAP_500.0 (41001) TO SNOKING_500.0 (41007) CKT 1
N-1: Table Mtn-Tesla 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-1: Vantage 500/230 kV Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
N-1: Vantage 500/230 kV Xfmr #2	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 2
N-1: Walla Walla-Talbot 230 kV	OPEN Line TALBOT_230.0 (44912) TO WALAWALA_230.0 (45327) CKT 1
N-1: Walla Walla-Wallula 230 kV	OPEN Line WALAWALA_230.0 (45327) TO WALLULA_230.0 (45331) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Line BETHEL_230.0 (43039) TO ROUNDB N_230.0 (43483) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Bus BETHEL5_500.0 (43041)
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN MultiSectionLine BETHEL_230.0 (43039) TO SANTIAM_230.0 (40939) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Bus BETHEL5_500.0 (43041)
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN MultiSectionLine BIGEDDY2_230.0 (41342) TO CHEMAWA_230.0 (40213) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Bus PARKDALE_230.0 (40813)
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 2
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIHOR41_230.0 (61995) CKT 4 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO HORSEFLT_230.0 (60102) CKT 4
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO11_230.0 (61998) CKT 1 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO21_230.0 (61997) CKT 2 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 1
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine BRIDGER_345.0 (60085) TO 3MIKNOLL_345.0 (60084) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	CLOSE Shunt KINPORT_345.0 (60190) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	SET SWITCHED SHUNT AT BUS POPULUS_345.0 (67790) TO 200 MVR
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Series Cap GAR1EAST_500.0 (40451) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line GAR1EAST_500.0 (40451) TO TOWN1_500.0 (62013) CKT 1

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Series Cap GAR2EAST_500.0 (40453) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line GAR2EAST_500.0 (40453) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 2_ 22.0 (62049) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt PTRSNFLT_230.0 (62030) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt OREBASIN_230.0 (66145) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt FRANNIE2_ 34.5 (67145) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS ROSEBUD_230.0 (63012) TO -10 MVR
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt GARLAND1_ 34.5 (67147) #1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Transformer HELLSCYN_230.0 (60150) TO HELSCYN1_ 14.4 (60151) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN Line MONROE_230.0 (40747) TO NOVELTY_230.0 (42304) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus CHIEF J3_345.0 (40223)
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus SNOHOMS3_345.0 (40993)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #I
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO3_ 13.8 (41216) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO4_ 13.8 (41217) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO5_ 13.8 (41218) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO6_ 13.8 (41219) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO7_ 13.8 (41220) #F
N-2: DC-BIPOLE	OPEN Shunt MALIN_500.0 (40687) #s
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: DC-BIPOLE	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: DC-BIPOLE	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: DC-BIPOLE	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: DC-BIPOLE	CHANGE INJECTION GROUP RAS PDCI Gen Drop Units BY 'PDCI_gen_drop_value_less300' MW in generator merit order by opening
N-2: DC-BIPOLE	OPEN Bus SYLMAR1_230.0 (26097)
N-2: DC-BIPOLE	OPEN Bus SYLMAR2_230.0 (26099)
N-2: DC-BIPOLE	OPEN Shunt SYLMAR S_230.0 (24147) #b
N-2: DC-BIPOLE	OPEN Shunt SYLMARLA_230.0 (26094) #b
N-2: DC-BIPOLE	OPEN Shunt BIGEDDY2_230.0 (41342) #s
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #b
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS ANTELOPE_230.0 (24401) TO 158.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt BARRE_230.0 (24016) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS BARRE_230.0 (24016) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt CHINO_230.0 (24025) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS CHINO_230.0 (24025) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt DEVERS_230.0 (24804) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS DEVERS_230.0 (24804) TO 316.8 MVR
N-2: DC-BIPOLE	CLOSE Shunt EL NIDO_230.0 (24040) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS EL NIDO_230.0 (24040) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt GOULD_230.0 (24059) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS GOULD_230.0 (24059) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LCIENEGA_230.0 (24082) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LCIENEGA_230.0 (24082) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LAGUBELL_230.0 (24076) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LAGUBELL_230.0 (24076) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOMW_230.0 (24093) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOMW_230.0 (24093) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOME_230.0 (25656) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOME_230.0 (25656) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRAGE_230.0 (24806) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRAGE_230.0 (24806) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MOORPARK_230.0 (24099) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MOORPARK_230.0 (24099) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_230.0 (24100) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS OLINDA_230.0 (24100) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt PADUA_230.0 (24112) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PADUA_230.0 (24112) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt PARDEE_230.0 (24114) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PARDEE_230.0 (24114) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt RIOHONDO_230.0 (24126) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS RIOHONDO_230.0 (24126) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt SANBRDNO_230.0 (24132) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS SANBRDNO_230.0 (24132) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt S.CLARA_230.0 (24128) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS S.CLARA_230.0 (24128) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #b
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #2
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VALLEYSC_115.0 (24160) TO 187.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt VILLA PK_230.0 (24154) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VILLA PK_230.0 (24154) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VINCENT_230.0 (24155) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VINCENT_230.0 (24155) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VSTA_230.0 (24901) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VSTA_230.0 (24901) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt WALNUT_230.0 (24158) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS WALNUT_230.0 (24158) TO 79.2 MVR
N-2: DC-BIPOLE	OPEN Bus CELILO4_230.0 (41314)
N-2: DC-BIPOLE	OPEN Bus CELILO3_230.0 (41313)
N-2: DC-BIPOLE	OPEN Bus CELILO2_500.0 (41312)
N-2: DC-BIPOLE	OPEN Bus CELILO1_500.0 (41311)
N-2: Double Palo Verde	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c1

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-2: Double Palo Verde	OPEN Shunt MALIN_500.0 (40687) #s
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: Double Palo Verde	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: Double Palo Verde	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: Double Palo Verde	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: Double Palo Verde	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: Double Palo Verde	OPEN Gen PALOVRD2_ 24.0 (14932) #1
N-2: Double Palo Verde	OPEN Gen PALOVRD1_ 24.0 (14931) #1
N-2: Double Palo Verde	CHANGE LOAD AT BUS AGUAFAPS_ 69.0 (14400) BY -120 MW (cnst pf)
N-2: Double Palo Verde	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Line COVINGTN_230.0 (40303) TO MAPLEV12_230.0 (40692) CKT 2
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_345.0 (40691)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus ROCKY RH_345.0 (40891)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN Bus PONDROSB_500.0 (40834)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus PONDROSA_500.0 (40837)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus GRIZZ R3_500.0 (40488)
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus CASCADTP_230.0 (40185)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus WINDSHAR_230.0 (41155)
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus ALFALFA_230.0 (40039)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus OUTLOOK_230.0 (45229)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN InjectionGroup RAS Lower Granite Gen Drop
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #6
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG2_ 13.2 (38755) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #10
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #11
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine MCNARY_345.0 (40721) TO ROSS_345.0 (40901) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN Line KING_230.0 (60177) TO MIDPOINT_230.0 (60232) CKT 1
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line PEARL #_230.0 (43773) TO SHERWOOD_230.0 (43527) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN MultiSectionLine BIGEDDY3_230.0 (41343) TO MCLOUGLN_230.0 (43313) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT5_500.0 (40306)
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus COULEE_300.0 (40285)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus OLYMPIA_300.0 (40795)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Bus CENTR SS_230.0 (47748)
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN Bus CHRISTOP_230.0 (42505)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 2
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD2_ 13.2 (38790)

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Transformer ROUND MT_500.0 (30005) TO RD MT 1M_500.0 (30065) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_DLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_SLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 1_ 12.5 (38825)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 2_ 12.5 (38830)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 3_ 12.5 (38835)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 4_ 12.5 (38840)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 5_ 12.5 (38845)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT1_ 13.8 (38700)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT2_ 13.8 (38705)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT3_ 13.8 (38710)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT4_ 13.8 (38715)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 4-5_ 13.8 (31782)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBOU2-3_ 11.5 (31808)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 1_ 11.5 (31810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 1_ 18.0 (34600)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 2_ 18.0 (34602)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 3_ 18.0 (34604)
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus ADDY N_230.0 (40021)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Line BELL BPA_115.0 (40087) TO BIGELOW_115.0 (40113) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Bus BELL SC_500.0 (40096)

Appendix K - 16hs2a_2250idnw_N_lh Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine LANCASTR_230.0 (40624) TO NOXONBPA_230.0 (40787) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4

Appendix L

16hs2a_2250idnw_N_nvmod Base Case (NV Energy Updates Sensitivity Study

Appendix L – 16hs2a_2250idnw_nvmod Case Post-Transient Contingency Results

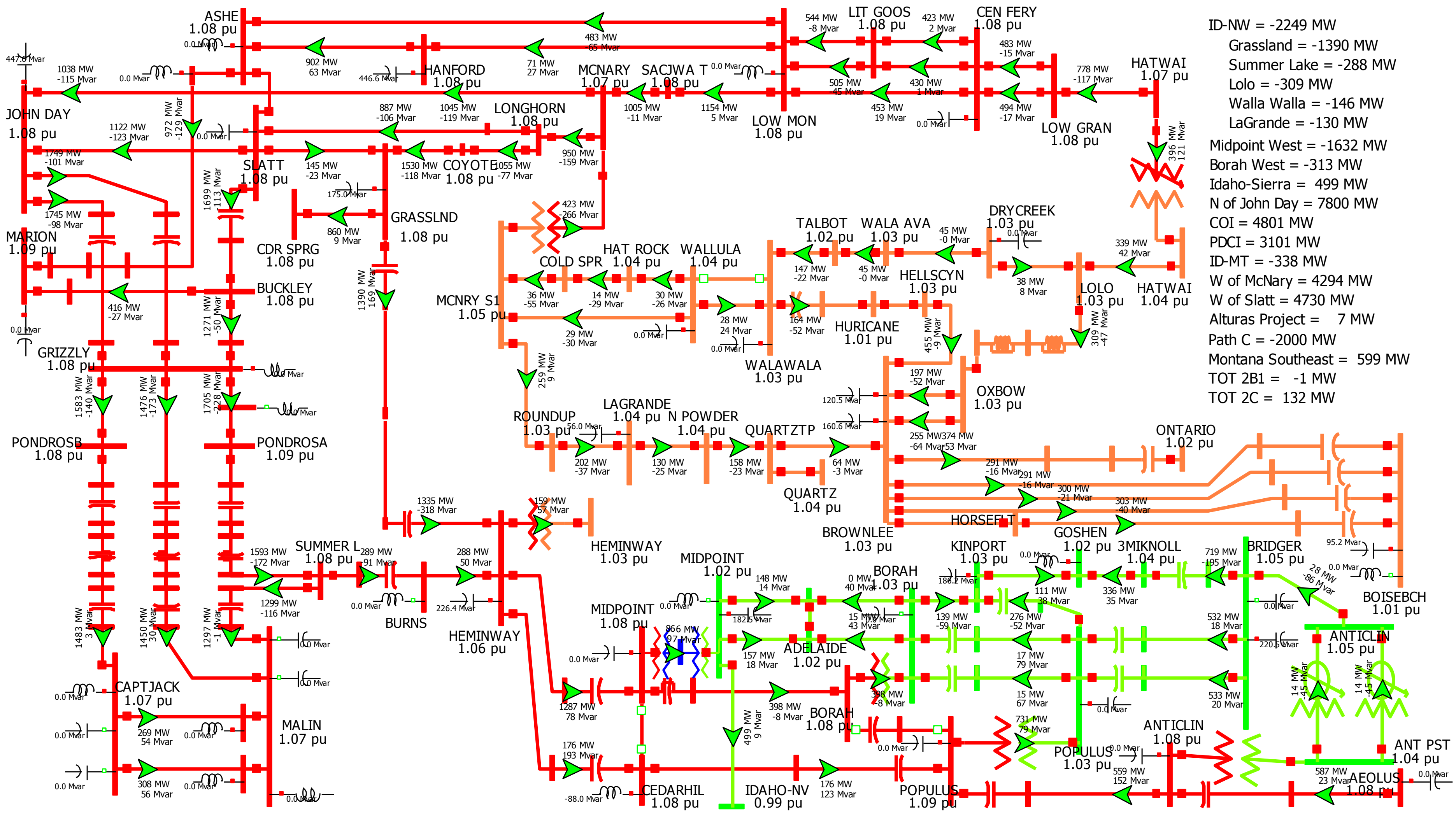

Figure L9: 16hs2a_2250idnw_nvmod Case **Pre-Contingency**

Appendix L – 16hs2a_2250idnw_nvmod Case Post-Transient Contingency Results

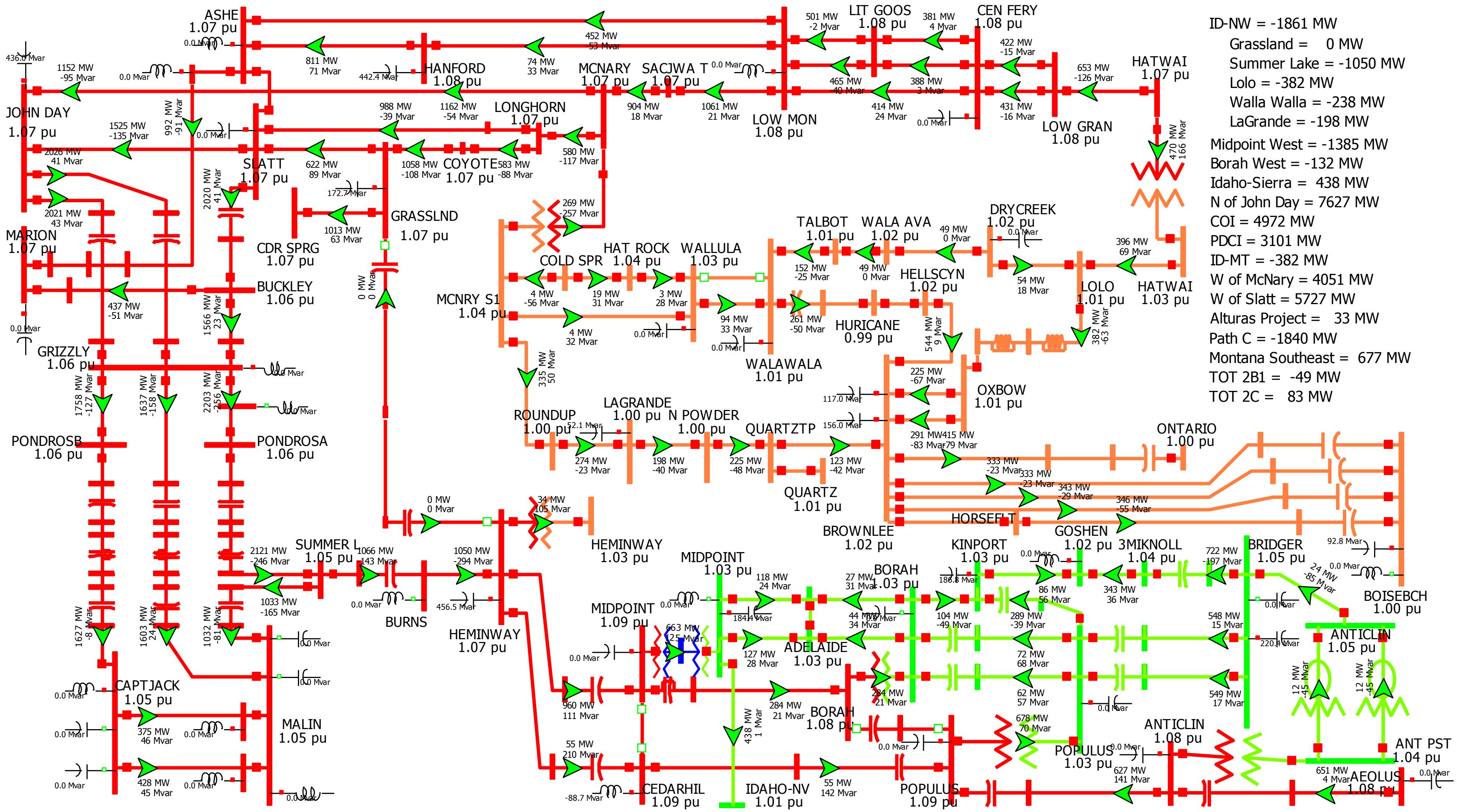

Figure L10: 16hs2a_2250idnw_nvmod Case **N-1: Hemingway-Grassland 500 kV + PTSN Shunt**

Appendix L – 16hs2a_2250idnw_nvmod Case Post-Transient Contingency Results

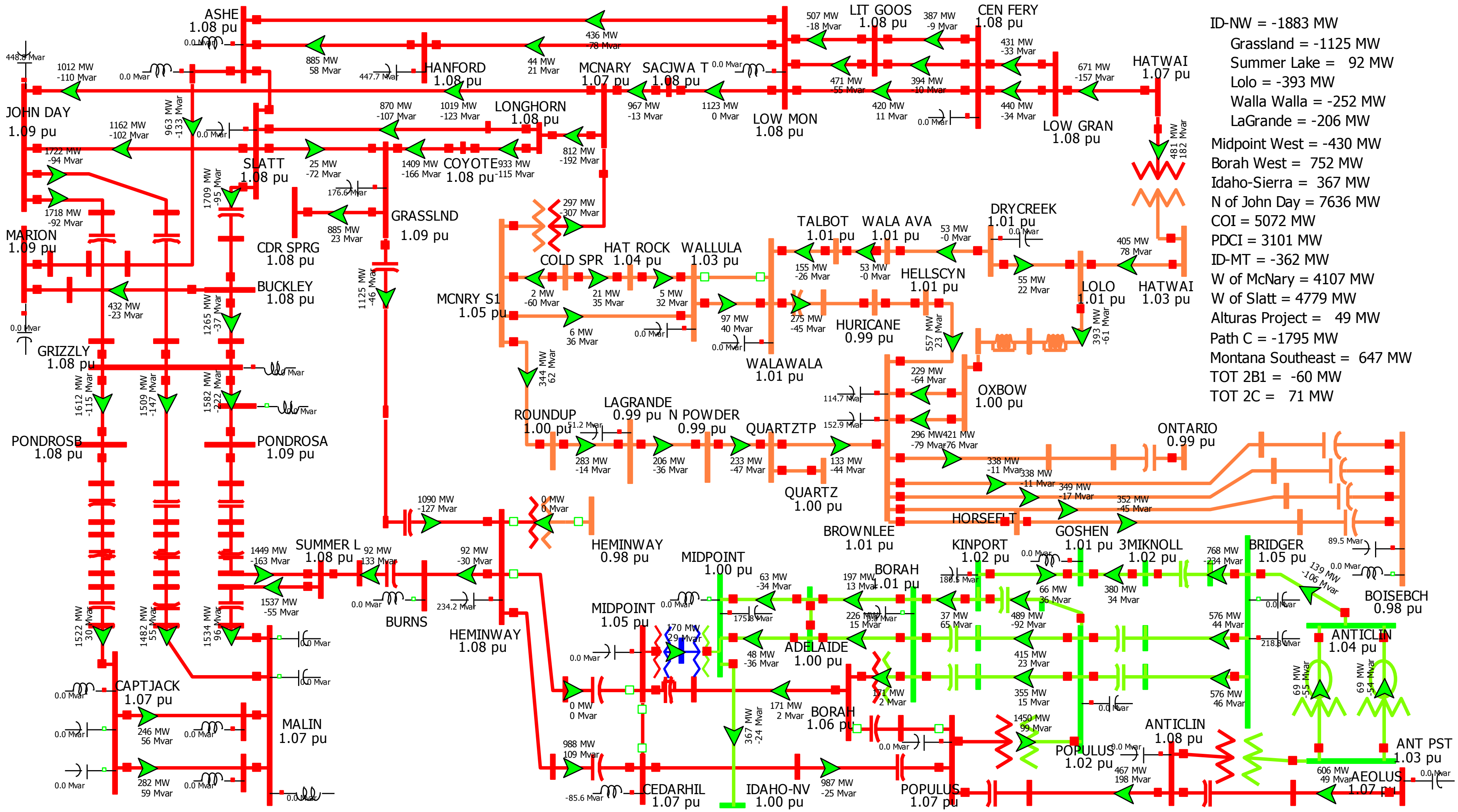

Figure L11: 16hs2a_2250idnw_nvmod Case **BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr**

Appendix L - 16hs2a_2250idnw_N_nvmod Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	No Violations							
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	614.0	1156.6	979.0	118.1%	1287.7	89.8%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	GLENDL (45113) -> GRANT PS (45123) CKT 1 at GLENDL	Branch Amp	297.6	748.0	722.9	103.5%	1265.2	59.1%
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4028 Taft-Dworshak & Taft Reactor 500kV	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	No Violations							
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1711.7	2960.5	2442.0	121.2%	3235.5	91.5%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1711.7	2960.5	2199.9	134.6%	3235.5	91.5%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1710.6	2953.3	2666.9	110.7%	3999.9	73.8%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1701.8	2942.6	2667.0	110.3%	4000.0	73.6%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1665.2	2877.8	2699.7	106.6%	3999.9	71.9%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1657.8	2862.3	2699.7	106.0%	4000.0	71.6%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	No Violations							
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	No Violations							
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	No Violations							
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations							
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1711.7	2995.4	2442.0	122.7%	3235.5	92.6%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1711.7	2995.4	2199.9	136.2%	3235.5	92.6%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1710.6	2987.8	2666.9	112.0%	3999.9	74.7%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1701.8	2977.5	2667.0	111.6%	4000.0	74.4%
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	No Violations							
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.3	328.1	320.0	102.5%	370.0	88.7%
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	647.5	1043.8	950.0	109.9%	1286.0	81.2%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.3	334.6	320.0	104.6%	370.0	90.4%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	647.5	1055.5	950.0	111.1%	1286.0	82.1%
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations							
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	898.4	1024.6	1009.1	101.5%	1285.2	79.7%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	No Violations							

Appendix L - 16hs2a_2250idnw_N_nvmod Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations							
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations							
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	No Violations							
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	No Violations							
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations							
BF 4542 Paul-Allston 500 kV & Center G2	No Violations							
BF 4542 Paul-Napavine 500 kV & Center G1	No Violations							
BF 4550 Olympia-Paul & Paul-Allston 500 kV	No Violations							
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	No Violations							
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	No Violations							
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations							
BF 4700 Hatwai 500kV & 230 kV + RAS	No Violations							
BF 4708 Hatwai 500 kV Bus	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.7	811.6	800.0	101.4%	1199.9	67.6%
BF 4708 Hatwai 500 kV Bus	AMPS (65025)	% Δ Volts	0.967	0.916				-5.27%
BF 4708 Hatwai 500 kV Bus	PTRSNFLT (62030)	% Δ Volts	0.961	0.901				-6.24%
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	No Violations							
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	782.0	972.5	920.0	105.7%	1046.8	92.9%
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations							
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	No Violations							
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	No Violations							
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	No Violations							
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	No Violations							
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations							
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	No Violations							
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	No Violations							
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations							
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations							
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations							

Appendix L - 16hs2a_2250idnw_N_nvmod Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	No Violations							
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 5214 Low Mon-McNary & Calpine PH 500 kV	No Violations							
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1108.1	1358.1	1237.0	109.8%	1396.0	97.3%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	782.0	1014.6	920.0	110.3%	1046.8	96.9%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.7	824.1	800.0	103.0%	1199.9	68.7%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	AMPS (65025)	% Δ Volts	0.967	0.907				-6.20%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts	0.961	0.889				-7.49%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	No Violations							
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	782.0	1041.1	920.0	113.2%	1046.8	99.5%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1108.1	1382.6	1237.0	111.8%	1396.0	99.0%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.7	806.0	800.0	100.7%	1199.9	67.2%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	AMPS (65025)	% Δ Volts	0.967	0.909				-6.00%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	PTRSNFLT (62030)	% Δ Volts	0.961	0.897				-6.66%
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	No Violations							
BF Lolo 230kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1108.1	1248.0	1237.0	100.9%	1396.0	89.4%
BF McNary 230 kV SECT 1	No Violations							
BF McNary 230 kV SECT 3	FRANKLIN (40443)	% Δ Volts	1.005	0.943				-6.17%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1108.1	1369.8	1237.0	110.7%	1396.0	98.1%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	782.0	1023.6	920.0	111.3%	1046.8	97.8%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.7	831.8	800.0	104.0%	1199.9	69.3%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	DILLON S (62084)	% Δ Volts	0.980	0.929				-5.20%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	AMPS (65025)	% Δ Volts	0.967	0.901				-6.83%
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	PTRSNFLT (62030)	% Δ Volts	0.961	0.883				-8.12%
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	No Violations							
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	No Violations							
Bus: Alvey 500 kV + RAS	No Violations							
Bus: Bell BPA 500 kV	No Violations							
Bus: Buckley 500 kV	No Violations							
Bus: Dixonville 500 kV	No Violations							
Bus: Hot Springs 500 kV	No Violations							
Bus: Keeler 500 kV + RAS	No Violations							
Bus: Rock Creek 500 kV	No Violations							
Bus: Sickler 500 kV	No Violations							
Bus: Summer Lake 500 kV	No Violations							
N-1: Allston-Keeler 500 kV + RAS	No Violations							
N-1: Allston-Napavine 500 kV	No Violations							
N-1: Allston-Paul #2 500 kV	No Violations							
N-1: Alvery-Dixonville 500 kV	No Violations							
N-1: Alvey-Marion 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	898.4	1069.8	1009.1	106.0%	1285.2	83.2%
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							

Appendix L - 16hs2a_2250idnw_N_nvmod Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Bell-Coulee 500 kV	No Violations							
N-1: Bell-Taft 500 kV	No Violations							
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV	No Violations							
N-1: Broadview-Garrison #1 500 kV	No Violations							
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Captain Jack-Olinda 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1711.7	2603.3	2442.0	106.6%	3235.5	80.5%
N-1: Captain Jack-Olinda 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1711.7	2603.3	2199.9	118.3%	3235.5	80.5%
N-1: Captain Jack-Olinda 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1767.5	2402.3	2199.9	109.2%	3280.5	73.2%
N-1: Captain Jack-Olinda 500 kV	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1752.6	2382.0	2199.9	108.3%	3280.5	72.6%
N-1: Captain Jack-Olinda 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1944.2	2606.5	2477.9	105.2%	3999.9	65.2%
N-1: CaptJack-Kfalls 500 kV	No Violations							
N-1: Cascade Crossing 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	898.4	1014.1	1009.1	100.5%	1285.2	78.9%
N-1: Chief Jo-Coulee 500 kV	No Violations							
N-1: Chief Jo-Monroe 500 kV	No Violations							
N-1: Chief Jo-Sickler 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Covington4-Raver 500 kV	No Violations							
N-1: Covington5-Raver 500 kV	No Violations							
N-1: Coyote-Longhorn 500 kV	No Violations							
N-1: CusterW-Monroe 500 kV	No Violations							
N-1: Dixonville-Meridian 500 kV	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	614.0	1117.8	979.0	114.2%	1287.7	86.8%
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.7	815.3	800.0	101.9%	1199.9	67.9%
N-1: Dworshak-Hatwai 500 kV + RAS	PTRSNFLT (62030)	% Δ Volts	0.961	0.911				-5.20%
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.7	817.6	800.0	102.2%	1199.9	68.1%
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Echo Lake-Maple Valley 500 kV	No Violations							
N-1: Echo Lake-Raver 500 kV	No Violations							
N-1: Echo Lake-Schultz 500 kV	No Violations							
N-1: Echo Lake-Snok Tap 500 kV	No Violations							
N-1: Garrison-Taft #2 500 kV	No Violations							
N-1: Goldhill-Placer 115 kV	No Violations							
N-1: Grassland-Coyote 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	No Violations							
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							

Appendix L - 16hs2a_2250idnw_N_nvmod Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Hatwai 500/230 kV Xfmr + RAS	No Violations							
N-1: Hatwai-Lolo 230 kV	No Violations							
N-1: Hatwai-Low Gran 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	782.0	972.1	920.0	105.7%	1046.8	92.9%
N-1: Hatwai-N Lewiston 230 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	782.0	985.4	920.0	107.1%	1046.8	94.1%
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Grassland 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1108.1	1350.5	1237.0	109.2%	1396.0	96.7%
N-1: Hemingway-Grassland 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	782.0	1008.2	920.0	109.6%	1046.8	96.3%
N-1: Hemingway-Grassland 500 kV	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.7	824.3	800.0	103.0%	1199.9	68.7%
N-1: Hemingway-Grassland 500 kV	AMPS (65025)	% Δ Volts	0.967	0.908				-6.10%
N-1: Hemingway-Grassland 500 kV	PTRSNFLT (62030)	% Δ Volts	0.961	0.891				-7.28%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1717.4	2896.0	2400.0	120.7%	3199.9	90.5%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1724.3	2915.8	2400.0	121.5%	3800.0	76.7%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1108.1	1345.4	1237.0	108.8%	1396.0	96.4%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	782.0	1003.8	920.0	109.1%	1046.8	95.9%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.7	825.5	800.0	103.2%	1199.9	68.8%
N-1: Hemingway-Summer Lake 500 kV	No Violations							
N-1: Hill Top 345/230 Xfmr	No Violations							
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: Hot Springs-Taft 500 kV	No Violations							
N-1: Humboldt-Coyote Ck 345 kV	No Violations							
N-1: Huntington-Pinto-Four Corners 345 kV	No Violations							
N-1: Ing500-CusterW 500 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Kfalls-Meridian 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	No Violations							
N-1: Lanes-Marion 500 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-Sac Tap 500 kV	No Violations							
N-1: Malin 500/230 Xfmr	No Violations							
N-1: Malin-Hilltop 230 kV	No Violations							
N-1: Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1711.7	2963.1	2442.0	121.3%	3235.5	91.6%
N-1: Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1711.7	2963.1	2199.9	134.7%	3235.5	91.6%
N-1: Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1710.6	2955.7	2666.9	110.8%	3999.9	73.9%
N-1: Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1701.8	2945.5	2667.0	110.4%	4000.0	73.6%
N-1: Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1665.2	2935.2	2699.7	108.7%	3999.9	73.4%
N-1: Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1657.8	2922.3	2699.7	108.2%	4000.0	73.1%

Appendix L - 16hs2a_2250idnw_N_nvmod Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Malin-Summer Lake 500 kV	No Violations							
N-1: Maple Vly-Rocky RH 345 kV	No Violations							
N-1: Marion-Pearl 500 kV	No Violations							
N-1: Marion-Santiam 500 kV	No Violations							
N-1: McLouglin-Ostrander 230 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary S2-McNary S3 230 kV	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Longhorn 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	No Violations							
N-1: McNary-Sac Tap-Low Mon 500 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	No Violations							
N-1: Midpoint-Humboldt 345 kV	No Violations							
N-1: Napavine-Paul 500 kV	No Violations							
N-1: Olympia-Paul 500 kV	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1108.1	1252.2	1237.0	101.2%	1396.0	89.7%
N-1: Paul-Satsop 500 kV	No Violations							
N-1: Pearl-Keeler 500 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.3	350.9	320.0	109.7%	370.0	94.8%
N-1: Pearl-Keeler 500 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	647.5	1183.3	950.0	124.6%	1286.0	92.0%
N-1: Pearl-Keeler 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.3	326.6	320.0	102.1%	370.0	88.3%
N-1: Pearl-Keeler 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	647.5	1038.6	950.0	109.3%	1286.0	80.8%
N-1: Pinto-Four Corner 345 kV	No Violations							
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Raver-Paul 500 kV	No Violations							
N-1: Raver-Tacoma 500 kV	No Violations							
N-1: Red Butte-Harry Allen 345 kV	No Violations							
N-1: Robinson-Harry Allen 500 kV	No Violations							
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1767.5	3178.1	2199.9	144.5%	3280.5	96.9%
N-1: Round Mtn-Table Mtn 500 kV	ROUND MT (30005) -> ROUTAB21 (30018) CKT 2 at ROUND MT	Branch Amp	1767.5	3178.1	2667.0	119.2%	4000.0	79.5%
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB22 (30019) -> TABLE MT (30015) CKT 2 at ROUTAB22	Branch Amp	1757.6	3164.4	2667.0	118.6%	4000.0	79.1%
N-1: Roundup-Lagrande 230 kV	No Violations							
N-1: Schultz-Sickler 500 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Sigurd-Glen Canyon 230 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Slatt-Longhorn 500 kV	No Violations							
N-1: Snok Tap-Snoking 500 kV	No Violations							

Appendix L - 16hs2a_2250idnw_N_nvmod Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Table Mtn-Tesla 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1944.2	2891.7	2477.9	116.7%	3999.9	72.3%
N-1: Table Mtn-Tesla 500 kV	TABLE MT (30015) -> TABVAC11 (30031) CKT 1 at TABLE MT	Branch Amp	1944.2	2891.7	2667.0	108.4%	4000.0	72.3%
N-1: Table Mtn-Tesla 500 kV	TABVAC12 (30032) -> VACA-DIX (30030) CKT 1 at TABVAC12	Branch Amp	1918.3	2871.4	2667.0	107.7%	4000.0	71.8%
N-1: Table Mtn-Vaca Dixon 500 kV	TABTES11 (30041) -> TABTES12 (30043) CKT 1 at TABTES11	Branch Amp	1454.0	2597.8	2230.0	116.5%	3555.9	73.1%
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations							
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	MLCK PHA (62355) -> PTRSNFLT (62030) CKT 1 at PTRSNFLT	Branch Amp	715.7	812.8	800.0	101.6%	1199.9	67.7%
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	AMPS (65025)	% Δ Volts	0.967	0.916				-5.27%
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	PTRSNFLT (62030)	% Δ Volts	0.961	0.900				-6.35%
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	898.4	1033.4	1009.1	102.4%	1285.2	80.4%
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	BETHEL5 (43041)	% Δ Volts	1.054	0.996				-5.50%
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	898.4	1099.2	1009.1	108.9%	1285.2	85.5%
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Bridger-Populus #1 & #2 345 kV	BRIDGER (60085) -> BRI3MI11 (61999) CKT 1 at BRIDGER	Branch Amp	1189.6	1729.0	1600.0	108.1%	1919.0	90.1%
N-2: Bridger-Populus #1 & #2 345 kV	SODA (66385) -> GRACE (65695) CKT 1 at SODA	Branch Amp	393.0	540.1	539.7	100.1%	644.3	83.8%
N-2: Bridger-Populus #1 & #2 345 kV	BRI3MI11 (61999) -> 3MIKNOLL (60084) CKT 1 at BRI3MI11	Branch Amp	1162.5	1684.5	1650.1	102.1%	2227.4	75.6%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	BRIDGER (60085) -> BRIDGER (65220) CKT 2 at BRIDGER	Branch MVA	114.7	208.6	200.0	104.3%	220.0	94.8%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	BRIDGER (60085) -> BRIDGER (65220) CKT 1 at BRIDGER	Branch MVA	112.8	205.3	200.0	102.6%	220.0	93.3%
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	BRIDGER (60085) -> BRIDGER (65220) CKT 3 at BRIDGER	Branch MVA	112.8	205.3	200.0	102.6%	220.0	93.3%
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	No Violations							
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	No Violations							
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	782.0	957.1	920.0	104.0%	1046.8	91.4%
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations							
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations							
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations							
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	No Violations							
N-2: DC-BIPOLE	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM14	Branch Amp	1717.4	2792.7	2400.0	116.4%	3199.9	87.3%
N-2: DC-BIPOLE	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1724.3	2807.4	2400.0	117.0%	3800.0	73.9%
N-2: DC-BIPOLE	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1711.7	2380.0	2199.9	108.2%	3235.5	73.6%
N-2: DC-BIPOLE	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1767.5	2377.6	2199.9	108.1%	3280.5	72.5%

Appendix L - 16hs2a_2250idnw_N_nvmod Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: DC-BIPOLE	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1752.6	2357.5	2199.9	107.2%	3280.5	71.9%
N-2: DC-BIPOLE	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1944.2	2546.6	2477.9	102.8%	3999.9	63.7%
N-2: DC-BIPOLE	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at VINCENT	Branch Amp	1499.6	2192.3	2134.0	102.7%	3499.9	62.6%
N-2: DC-BIPOLE	MIDWAY (30060) -> MIDVIN11 (30061) CKT 1 at MIDWAY	Branch Amp	1481.2	2162.4	2134.0	101.3%	3499.9	61.8%
N-2: Double Palo Verde	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM14	Branch Amp	1717.4	2587.2	2400.0	107.8%	3199.9	80.9%
N-2: Double Palo Verde	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1724.3	2606.3	2400.0	108.6%	3800.0	68.6%
N-2: Double Palo Verde	AMPS (65025)	% Δ Volts	0.967	0.913				-5.58%
N-2: Double Palo Verde	PTRSNFLT (62030)	% Δ Volts	0.961	0.900				-6.35%
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations							
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations							
N-2: Garrison-Taft #1 & #2 500 kV + RAS	No Violations							
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	No Violations							
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	No Violations							
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	1724.3	3310.0	2400.0	137.9%	3800.0	87.1%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM12	Branch Amp	1391.0	3176.7	2700.0	117.7%	4000.0	79.4%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON16	Branch Amp	1609.0	3130.5	2400.0	130.4%	3800.0	82.4%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1594.2	3116.7	2400.0	129.9%	3800.0	82.0%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	1609.0	3140.0	2400.0	130.8%	3800.0	82.6%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1594.2	3129.4	2400.0	130.4%	3800.0	82.4%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations							
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	1819.8	3113.6	2900.0	107.4%	4350.0	71.6%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH11	Branch Amp	1857.1	3483.3	3000.0	116.1%	4050.0	86.0%
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at HORIZN	Branch MVA	270.3	347.5	320.0	108.6%	370.0	93.9%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	647.5	1183.6	950.0	124.6%	1286.0	92.0%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	79.4	96.5	94.0	102.7%	139.0	69.4%
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	782.0	1023.4	920.0	111.2%	1046.8	97.8%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1841.9	3902.0	2667.4	146.3%	4099.2	95.2%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI11	Branch Amp	1808.1	3788.4	2667.4	142.0%	4099.2	92.4%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPTJACK	Branch Amp	1808.1	3788.4	2667.4	142.0%	4099.2	92.4%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	1923.8	3238.0	2993.0	108.2%	4514.9	71.7%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	1923.8	3238.0	2993.0	108.2%	4514.9	71.7%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	1893.1	3203.3	2993.0	107.0%	4514.9	71.0%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at OLIMAX12	Branch Amp	1893.1	3203.3	2993.0	107.0%	4514.9	71.0%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	1871.9	3164.8	2993.0	105.7%	4514.9	70.1%
N-2: Malin-Round Mtn #1 & #2 500 kV	WDJCT L1 (45522)	% Δ Volts	1.006	0.950				-5.57%
N-2: Malin-Round Mtn #1 & #2 500 kV	WEED JCT (45525)	% Δ Volts	1.006	0.950				-5.57%
N-2: Malin-Round Mtn #1 & #2 500 kV	WEED (45524)	% Δ Volts	1.002	0.945				-5.69%
N-2: Malin-Round Mtn #1 & #2 500 kV	MTSHASTA (44970)	% Δ Volts	0.988	0.930				-5.87%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXWELL (30025)	% Δ Volts	1.042	0.979				-6.05%

Appendix L - 16hs2a_2250idnw_N_nvmod Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	HORSE HV (40547)	% Δ Volts	1.032	0.980				-5.04%
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	PTRSNFLT (62030)	% Δ Volts	0.961	0.911				-5.20%
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations							
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	No Violations							
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	No Violations							
N-2: Paul-Raver & Raver-Covingt4 500 kV	No Violations							
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.3	328.6	320.0	102.7%	370.0	88.8%
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	647.5	1044.2	950.0	109.9%	1286.0	81.2%
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	No Violations							
N-2: Raver-Covington #1 & #2 500 kV	No Violations							
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations							
N-2: Raver-Paul & Napavine-Paul 500 kV	No Violations							
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations							
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations							
N-2: Raver-Schultz #1 & #2 500 kV	No Violations							
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations							
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations							
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	DELEVN (30114) -> CORTINA (30450) CKT 1 at CORTINA	Branch Amp	670.2	859.3	830.9	103.4%	926.3	92.8%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1841.9	3595.3	2667.4	134.8%	4099.2	87.7%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI12	Branch Amp	1808.1	3497.0	2667.4	131.1%	4099.2	85.3%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPOLI11	Branch Amp	1808.1	3485.9	2667.4	130.7%	4099.2	85.0%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	1923.8	3434.9	2993.0	114.8%	4514.9	76.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	1923.8	3434.9	2993.0	114.8%	4514.9	76.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	1893.1	3414.4	2993.0	114.1%	4514.9	75.6%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at OLIMAX12	Branch Amp	1893.1	3414.4	2993.0	114.1%	4514.9	75.6%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	1871.9	3381.5	2993.0	113.0%	4514.9	74.9%
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	No Violations							
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	No Violations							
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHE (30790) -> MCMULLN1 (30825) CKT 1 at MCMULLN1	Branch Amp	286.9	922.5	825.9	111.7%	976.5	94.5%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	MCMULLN1 (30825) -> KEARNEY (30830) CKT 1 at MCMULLN1	Branch Amp	233.8	864.0	825.1	104.7%	975.0	88.6%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PANOCHEJ (34159) -> HAMMONDS (34160) CKT 1 at HAMMONDS	Branch Amp	392.7	470.2	462.9	101.6%	579.9	81.1%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1944.2	2485.0	2477.9	100.3%	3999.9	62.1%
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	No Violations							
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	No Violations							
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations							

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-CT2M_ 18.0 (45451)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALLCT2_ 18.0 (45449)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFC-STMD_ 18.0 (45452)
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	OPEN Bus KFALL ST_ 18.0 (45447)
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	OPEN Transformer MERIDINP_230.0 (45195) TO MERIDINP_500.0 (45197) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 4003 Hanford-Vantage & Hanford Caps	OPEN Shunt HANFORD_500.0 (40499) #s
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Bus MALIN R3_500.0 (40688)
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4028 Taft-Dworshak & Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt MALIN_500.0 (40687) #c1
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	OPEN Shunt GARRISON_500.0 (40459) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt TAFT_500.0 (41057) #s
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Bus HOT SPR_500.0 (40553)
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
BF 4170 John Day-Marion & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1

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Contingency Studied	Actions Taken in the Contingency
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP S1_ 18.0 (47641)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G2_ 18.0 (47640)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Bus HPP G1_ 18.0 (47639)
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 2
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	OPEN Transformer CUSTER W_500.0 (40323) TO CUSTER W_230.0 (40321) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
BF 4293 Schultz-Raver & Raver Covington5 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	OPEN Transformer SICKLER_500.0 (40973) TO DOUGLAS_230.0 (47031) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN Bus ASHE R1_500.0 (40062)
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	OPEN Bus SANTIAM_500.0 (40941)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Shunt OSTRNDER_500.0 (40809) #s
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	CLOSE MultiSectionLine PEARL_500.0 (40827) TO KNIGHT_500.0 (41450) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN Bus TROUTDAL_500.0 (41095)
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Shunt PEARL_500.0 (40827) #s
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	OPEN Transformer PEARL_500.0 (40827) TO PEARL E_230.0 (40824) CKT 1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2

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Contingency Studied	Actions Taken in the Contingency
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOK TAP_500.0 (41001)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Bus SNOKING_500.0 (41007)
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt JOHN DAY_500.0 (40585) #s
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	OPEN Shunt MONROE_500.0 (40749) #s
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Bus SATSOP_500.0 (40949)
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Bus SATSOP_500.0 (40949)
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR G2_ 20.0 (47744)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2AX_ 4.2 (47746)
BF 4542 Paul-Allston 500 kV & Center G2	OPEN Bus CENTR2FG_ 13.8 (47747)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR G1_ 20.0 (47740)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1AX_ 4.2 (47742)
BF 4542 Paul-Napavine 500 kV & Center G1	OPEN Bus CENTR1FG_ 13.8 (47743)
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4550 Olympia-Paul & Paul-Allston 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Transformer TONO_115.0 (42806) TO PAUL_500.0 (40821) CKT 1
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	OPEN Shunt OLY E_230.0 (40794) #s
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	OPEN Shunt MONROE_500.0 (40749) #s
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	OPEN Shunt LOW MON_500.0 (40683) #s
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	OPEN Transformer ALLSTON_500.0 (40045) TO ALLSTN E_230.0 (40043) CKT 2
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Bus HATWAI_500.0 (40521)
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Bus HATWAI_230.0 (40519)
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Lancaster Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN InjectionGroup RAS Dworshak Gen Drop
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line NPULLMAN_115.0 (48291) TO SHAWNEE_115.0 (48383) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line MOSCITYT_115.0 (48245) TO SPULLMAN_115.0 (48413) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS HOT SPR_500.0 (40553) TO -148.3 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4700 Hatwai 500kV & 230 kV + RAS	CLOSE Line LEON_115.0 (48183) TO MOSCCITY_115.0 (48243) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	OPEN Line MOSCCITY_115.0 (48243) TO MOSCITYT_115.0 (48245) CKT 1
BF 4700 Hatwai 500kV & 230 kV + RAS	SET SWITCHED SHUNT AT BUS N LEWIST_115.0 (48253) TO 44.4 MVR
BF 4708 Hatwai 500 kV Bus	OPEN Bus HATWAI_500.0 (40521)
BF 4708 Hatwai 500 kV Bus	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
BF 4708 Hatwai 500 kV Bus	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 134.2 MVR
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	OPEN Transformer CHIEF JO_500.0 (40233) TO CHIEF J2_230.0 (40232) CKT 3

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Contingency Studied	Actions Taken in the Contingency
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN InjectionGroup RAS Lower Granite Gen Drop
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	OPEN Transformer BIG EDDY_500.0 (40111) TO BIGEDDY1_230.0 (41341) CKT 2
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4888 Ashe-Slatt & CGS 500 kV	OPEN Bus CGS_ 25.0 (40063)
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN Bus BURNS_500.0 (45029)
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R1_500.0 (40684)
BF 4996 CaptJack-Malin #1 & #2 500 kV	OPEN Bus MALIN R3_500.0 (40688)
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN Bus ROUND BU_500.0 (43485)
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Bus MAPLE VL_500.0 (40693)
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4
BF 5179 Vantage-Schultz & Schultz-Raver #4	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	OPEN Bus COYOTETP_500.0 (40725)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M1_500.0 (43115)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G1_ 18.0 (43111)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S1_ 13.8 (43119)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYOTE_500.0 (43123)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO M2_ 1.0 (48519)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO G2_ 18.0 (48516)
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	OPEN Bus COYO S2_ 13.8 (48518)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJWA T_500.0 (40917)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Bus SACJAWEA_500.0 (40913)
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJWA T_500.0 (40917)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus SACJAWEA_500.0 (40913)

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Bus HERMCALP_500.0 (47638)
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G1_ 18.0 (47639) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP G2_ 18.0 (47640) CKT 1
BF 5214 Low Mon-McNary & Calpine PH 500 kV	OPEN Transformer HERMCALP_500.0 (47638) TO HPP S1_ 18.0 (47641) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
BF 5266 Slatt-Buckly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Bus BURNS_500.0 (45029)
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Bus CEDARHIL_500.0 (60159)
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	OPEN Transformer HEMINWAY_500.0 (60155) TO HEMINWAY_230.0 (60156) CKT 1
BF Lolo 230kV	OPEN Bus LOLO_230.0 (48197)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1G_ 18.0 (45454)
BF McNary 230 kV SECT 1	OPEN Bus HERM 1S_ 13.8 (45455)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2G_ 18.0 (45456)
BF McNary 230 kV SECT 1	OPEN Bus HERM 2S_ 13.8 (45457)
BF McNary 230 kV SECT 1	OPEN Bus MCN 01_ 13.8 (44101)
BF McNary 230 kV SECT 1	OPEN Bus MCN 02_ 13.8 (44102)
BF McNary 230 kV SECT 1	OPEN Bus MCN 03_ 13.8 (44103)
BF McNary 230 kV SECT 1	OPEN Bus MCN 04_ 13.8 (44104)
BF McNary 230 kV SECT 1	OPEN Bus BOARD T1_230.0 (40121)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_230.0 (40129)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_115.0 (40127)
BF McNary 230 kV SECT 1	OPEN Bus MORROW 1_115.0 (47334)
BF McNary 230 kV SECT 1	OPEN Bus PORT MOR_115.0 (47335)
BF McNary 230 kV SECT 1	OPEN Bus MORRO G1_ 13.8 (47658)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN T_ 69.0 (40608)
BF McNary 230 kV SECT 1	OPEN Bus KINGEN_ 69.0 (47332)
BF McNary 230 kV SECT 1	OPEN Bus KINZ WW_ 12.5 (47331)
BF McNary 230 kV SECT 1	OPEN Bus BOARDMAN_ 69.0 (40125)
BF McNary 230 kV SECT 1	OPEN Bus IONE_ 69.0 (40575)
BF McNary 230 kV SECT 1	OPEN Bus TOWER RD_115.0 (41324)
BF McNary 230 kV SECT 1	OPEN Bus ALKALI C_115.0 (41319)
BF McNary 230 kV SECT 1	OPEN Bus HERMISTN_230.0 (45137)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH1_230.0 (44122)
BF McNary 230 kV SECT 1	OPEN Bus MCN PH2_230.0 (44123)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX1_100.0 (44115)
BF McNary 230 kV SECT 1	OPEN Bus MCN TX2_100.0 (44116)
BF McNary 230 kV SECT 2	OPEN Bus MCNRY S2_230.0 (41352)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH34_230.0 (44125)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH3_230.0 (44124)
BF McNary 230 kV SECT 2	OPEN Bus MCN PH4_230.0 (44126)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX3_100.0 (44117)
BF McNary 230 kV SECT 2	OPEN Bus MCN 05_ 13.8 (44105)
BF McNary 230 kV SECT 2	OPEN Bus MCN 06_ 13.8 (44106)
BF McNary 230 kV SECT 2	OPEN Bus MCN TX4_100.0 (44118)
BF McNary 230 kV SECT 2	OPEN Bus MCN 07_ 13.8 (44107)
BF McNary 230 kV SECT 2	OPEN Bus MCN 08_ 13.8 (44108)
BF McNary 230 kV SECT 2	SET SWITCHED SHUNT AT BUS JONESCYN_230.0 (47814) TO 52.2 MVR
BF McNary 230 kV SECT 3	OPEN Bus MCNRY S3_230.0 (41353)
BF McNary 230 kV SECT 3	OPEN Bus MCN PH5_230.0 (44127)
BF McNary 230 kV SECT 3	OPEN Bus MCN TX5_100.0 (44119)

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
BF McNary 230 kV SECT 3	OPEN Bus MCN TX6_100.0 (44120)
BF McNary 230 kV SECT 3	OPEN Bus MCN 09_ 13.8 (44109)
BF McNary 230 kV SECT 3	OPEN Bus MCN 10_ 13.8 (44110)
BF McNary 230 kV SECT 3	OPEN Bus MCN 11_ 13.8 (44111)
BF McNary 230 kV SECT 3	OPEN Bus MCN 12_ 13.8 (44112)
BF McNary 230 kV SECT 3	OPEN Bus MCNARY_345.0 (40721)
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Cedar Spring & Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Gen BOARD CT_ 18.5 (43044) #1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Transformer BOARD ST_ 16.0 (43045) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Transformer BOARD CT_ 18.5 (43044) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Gen BOARD ST_ 16.0 (43045) #1
BF PGE Grassland-Coyote 500 kV & Carty Gas Project	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Transformer BOARD F_ 24.0 (43047) TO GRASSLND_500.0 (43049) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	OPEN Gen BOARD F_ 24.0 (43047) #1
Bus: Alvey 500 kV + RAS	OPEN Bus ALVEY_500.0 (40051)
Bus: Alvey 500 kV + RAS	CHANGE INJECTION GROUP RAS Low Gen Drop Units BY 'Low_gen_drop_value_less300' MW in generator merit order by opening
Bus: Bell BPA 500 kV	OPEN Bus BELL BPA_500.0 (40091)
Bus: Bell BPA 500 kV	OPEN Bus COULE R1_500.0 (40288)
Bus: Bell BPA 500 kV	OPEN Bus BELL SC_500.0 (40096)
Bus: Buckley 500 kV	OPEN Bus BUCKLEY_500.0 (40155)
Bus: Dixonville 500 kV	OPEN Bus DIXONVLE_500.0 (45095)
Bus: Dixonville 500 kV	SET SWITCHED SHUNT AT BUS GRANT PS_230.0 (45123) TO 147.4 MVR
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #2
Bus: Dixonville 500 kV	CLOSE Shunt ROGUE_115.0 (40893) #3
Bus: Hot Springs 500 kV	OPEN Bus HOT SPR_500.0 (40553)
Bus: Keeler 500 kV + RAS	OPEN Bus KEELER_500.0 (40601)
Bus: Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
Bus: Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_500.0 (41401)
Bus: Rock Creek 500 kV	OPEN Bus ROCK CK_230.0 (41402)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_230.0 (47386)
Bus: Rock Creek 500 kV	OPEN Bus ENRGZR T_230.0 (47823)
Bus: Rock Creek 500 kV	OPEN Bus WHITE CK_230.0 (47827)
Bus: Rock Creek 500 kV	OPEN Bus IMRIE_230.0 (47822)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC 1_ 34.5 (47387)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC C1_ 34.5 (47388)
Bus: Rock Creek 500 kV	OPEN Bus JNPRC W1_ 0.7 (47389)
Bus: Rock Creek 500 kV	OPEN Bus DOOLEY T_230.0 (47465)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 3_ 34.5 (47496)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 2_ 34.5 (47493)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C2_ 34.5 (47494)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W2_ 0.7 (47495)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C3_ 34.5 (47497)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W3_ 0.7 (47498)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE 1_ 34.5 (47829)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF 1_ 34.5 (47825)
Bus: Rock Creek 500 kV	OPEN Bus WILLIS T_230.0 (47824)
Bus: Rock Creek 500 kV	OPEN Bus TULMN 1_ 34.5 (47826)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF C1_ 34.5 (47936)
Bus: Rock Creek 500 kV	OPEN Bus TULMN C1_ 34.5 (47938)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 2_ 34.5 (47903)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK 1_ 34.5 (47902)
Bus: Rock Creek 500 kV	OPEN Bus MILLRA S_230.0 (47857)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE C1_ 34.5 (47865)
Bus: Rock Creek 500 kV	OPEN Bus MILLR 1_ 34.5 (47966)
Bus: Rock Creek 500 kV	OPEN Bus HARVST W_230.0 (47858)
Bus: Rock Creek 500 kV	OPEN Bus HRVST 1_ 34.5 (47979)
Bus: Rock Creek 500 kV	OPEN Bus GDNOE W1_ 0.6 (47866)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C1_ 34.5 (47904)

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
Bus: Rock Creek 500 kV	OPEN Bus WHTCK C2_ 34.5 (47905)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W1_ 0.7 (47906)
Bus: Rock Creek 500 kV	OPEN Bus WHTCK W2_ 0.7 (47907)
Bus: Rock Creek 500 kV	OPEN Bus WNDYF W1_ 0.7 (47937)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W2_ 0.6 (47940)
Bus: Rock Creek 500 kV	OPEN Bus TULMN W1_ 0.7 (47939)
Bus: Rock Creek 500 kV	OPEN Bus MILLR C1_ 34.5 (47967)
Bus: Rock Creek 500 kV	OPEN Bus MILLR W1_ 0.6 (47968)
Bus: Rock Creek 500 kV	OPEN Bus HRVST C1_ 34.5 (47980)
Bus: Rock Creek 500 kV	OPEN Bus HRVST W1_ 0.7 (47981)
Bus: Sickler 500 kV	OPEN Bus SICKLER_500.0 (40973)
Bus: Summer Lake 500 kV	OPEN Bus PONDROSA_500.0 (40837)
Bus: Summer Lake 500 kV	OPEN Bus SUMMER L_500.0 (41043)
Bus: Summer Lake 500 kV	OPEN Bus BURNS_500.0 (45029)
Bus: Summer Lake 500 kV	OPEN Bus GRIZZ R3_500.0 (40488)
N-1: Allston-Keeler 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO KEELER_500.0 (40601) CKT 1
N-1: Allston-Keeler 500 kV + RAS	SET GENERATION AT BUS YALE GEN_ 13.2 (45351) TO 70 MW
N-1: Allston-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'South_of_Allston_gen_drop_value_less300' MW in generator merit order by opening
N-1: Allston-Napavine 500 kV	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-1: Allston-Paul #2 500 kV	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-1: Alvery-Dixonville 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO DIXONVLE_500.0 (45095) CKT 1
N-1: Alvey-Marion 500 kV	OPEN MultiSectionLine ALVEY_500.0 (40051) TO MARION_500.0 (40699) CKT 1
N-1: Ashe-Hanford 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-1: Ashe-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO LOW MON_500.0 (40683) CKT 1
N-1: Ashe-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-1: Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-1: Bell-Coulee 500 kV	OPEN Bus COULE R1_500.0 (40288)
N-1: Bell-Taft 500 kV	OPEN Bus BELL SC_500.0 (40096)
N-1: Big Eddy-Celilo 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO CELILO1_500.0 (41311) CKT 1
N-1: Big Eddy-John Day 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-1: Big Eddy-Knight 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO KNIGHT_500.0 (41450) CKT 1
N-1: Big Eddy-Ostrander 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-1: Boise Bench-Brownlee #3 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-1: Brady-Antelope 230 kV	OPEN Line BRADY_230.0 (60073) TO ANTLOPE_230.0 (65075) CKT 1
N-1: Broadview-Garrison #1 500 kV	OPEN Bus GAR1EAST_500.0 (40451)
N-1: Broadview-Garrison #1 500 kV	OPEN Bus TOWN1_500.0 (62013)
N-1: Brownlee-Ontario 230 kV	OPEN MultiSectionLine BROWNLEE_230.0 (60095) TO ONTARIO_230.0 (60265) CKT 1
N-1: Buckley-Grizzly 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-1: Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-1: Buckley-Slatt 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-1: Captain Jack-Olinda 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO OLINDA_500.0 (30020) CKT 1
N-1: CaptJack-Kfalls 500 kV	OPEN Line CAPTJACK_500.0 (45035) TO KFALLS_500.0 (45262) CKT 1
N-1: Cascade Crossing 500 kV	OPEN Bus CDR SPRG_500.0 (43950)
N-1: Cascade Crossing 500 kV	OPEN Bus CDRSBET1_500.0 (43951)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHCRS1_500.0 (43491)
N-1: Cascade Crossing 500 kV	OPEN Bus BETHEL5_500.0 (43041)
N-1: Chief Jo-Coulee 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-1: Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-1: Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-1: Coulee-Hanford 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-1: Coulee-Schultz 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Covington4-Raver 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-1: Covington5-Raver 500 kV	OPEN Line COVINGT5_500.0 (40306) TO RAVER_500.0 (40869) CKT 2
N-1: Coyote-Longhorn 500 kV	OPEN Line COYOTE_500.0 (43123) TO LONGHORN_500.0 (40724) CKT 1
N-1: CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-1: Dixonville-Meridian 500 kV	OPEN MultiSectionLine DIXONVLE_500.0 (45095) TO MERIDINP_500.0 (45197) CKT 1
N-1: Drycreek-Lolo 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO LOLO_230.0 (48197) CKT 1
N-1: Drycreek-N Lewiston 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO N LEWIST_230.0 (48255) CKT 1
N-1: Drycreek-Wala Ava 230 kV	OPEN Line DRYCREEK_230.0 (48512) TO WALA AVA_230.0 (48451) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #s

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	OPEN Line DWORSHAK_500.0 (40369) TO HATWAI_500.0 (40521) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	OPEN Shunt GARRISON_500.0 (40459) #s
N-1: Dworshak-Hatwai 500 kV + RAS+PTSN	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Dworshak-Taft 500 kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-1: Echo Lake-Maple Valley 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO MAPLE VL_500.0 (40693) CKT 1
N-1: Echo Lake-Raver 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-1: Echo Lake-Schultz 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-1: Echo Lake-Snok Tap 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO SNOK TAP_500.0 (41001) CKT 1
N-1: Garrison-Taft #2 500 kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-1: Garrison-Taft #2 500 kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSHE1_115.0 (32229)
N-1: Goldhill-Placer 115 kV	OPEN Bus HORSESHE_115.0 (32230)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTL1_115.0 (32233)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_115.0 (32234)
N-1: Goldhill-Placer 115 kV	OPEN Bus NEWCSTLE_ 13.2 (32460)
N-1: Goldhill-Placer 115 kV	OPEN Bus FLINT1_115.0 (32236)
N-1: Grassland-Coyote 500 kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-1: Grassland-Slatt 500 kV	OPEN Line GRASSLND_500.0 (43049) TO SLATT_500.0 (40989) CKT 1
N-1: Grizzly-John Day #2 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-1: Grizzly-Malin 500 kV	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN MultiSectionLine PONDROSA_500.0 (40837) TO SUMMER L_500.0 (41043) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZ R3_500.0 (40488) TO PONDROSA_500.0 (40837) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO GRIZZ R3_500.0 (40488) CKT 1
N-1: Grizzly-Ponderosa A-Summer L 500 kV	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN MultiSectionLine CAPTJACK_500.0 (45035) TO PONDROSB_500.0 (40834) CKT 1
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Grizzly-Round Bu 500 kV	OPEN Line GRIZZLY_500.0 (40489) TO ROUND BU_500.0 (43485) CKT 1
N-1: Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-1: Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-1: Hanford-Wautoma 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Transformer HATWAI_500.0 (40521) TO HATWAI_230.0 (40519) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	OPEN Line DWOR 1_ 13.8 (40361) TO DWOR 2_ 13.8 (40363) CKT 1
N-1: Hatwai 500/230 kV Xfmr + RAS	SET SWITCHED SHUNT AT BUS DRYCREEK_230.0 (48512) TO 67.1 MVR
N-1: Hatwai-Lolo 230 kV	OPEN Line HATWAI_230.0 (40519) TO LOLO_230.0 (48197) CKT 1
N-1: Hatwai-Low Gran 500 kV	OPEN Line HATWAI_500.0 (40521) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Hatwai-N Lewiston 230 kV	OPEN Line HATWAI_230.0 (40519) TO N LEWIST_230.0 (48255) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-1: Hells Canyon-Brownlee 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO HURICANE_230.0 (45103) CKT 1
N-1: Hells Canyon-Walla Walla 230 kV	OPEN MultiSectionLine HURICANE_230.0 (45103) TO WALAWALA_230.0 (45327) CKT 1
N-1: Hemingway-Grassland 500 kV	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 31.7 MVR
N-1: Hemingway-Grassland 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_161.0 (62084) TO 27.9 MVR
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 200 MVR
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	OPEN Shunt MALIN_500.0 (40687) #s
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt MALIN_500.0 (40687) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-1: Hemingway-Grassland 500 kV + FACRI	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-1: Hemingway-Grassland 500 kV + FACRI	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	OPEN MultiSectionLine HEMINWAY_500.0 (60155) TO GRASSLND_500.0 (43049) CKT 1
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS HEMINWAY_500.0 (60155) TO 400 MVR
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Hemingway-Summer Lake 500 kV	OPEN Line HEMINWAY_500.0 (60155) TO BURNS_500.0 (45029) CKT 1
N-1: Hemingway-Summer Lake 500 kV	OPEN MultiSectionLine BURNS_500.0 (45029) TO SUMMER L_500.0 (41043) CKT 1
N-1: Hill Top 345/230 Xfmr	OPEN Transformer HIL TOP_230.0 (40537) TO HIL TOP_345.0 (64058) CKT 1
N-1: Horse Hv-McNary 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-1: Hot Springs-Taft 500 kV	OPEN Line HOT SPR_500.0 (40553) TO TAFT_500.0 (41057) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line COYOTECR_345.0 (64032) TO HUMBOLDT_345.0 (64059) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Line MAGGIECR_120.0 (64070) TO CARLIN_120.0 (64169) CKT 1
N-1: Humboldt-Coyote Ck 345 kV	OPEN Shunt EIGHTMFK_120.0 (64457) #b
N-1: Humboldt-Coyote Ck 345 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 10.8 MVR
N-1: Humboldt-Coyote Ck 345 kV	CLOSE Shunt HUMBOLT1_ 24.9 (64216) #b
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO &1_345.0 (67582)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO_345.0 (66225)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #2_ 99.0 (65014)
N-1: Huntington-Pinto-Four Corners 345 kV	OPEN Bus PINTO #3_ 99.0 (65017)
N-1: Ing500-CusterW 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-1: John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-1: John Day-Rock Ck 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-1: John Day-Slatt 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-1: Kfalls-Meridian 500 kV	OPEN Line KFALLS_500.0 (45262) TO MERIDINP_500.0 (45197) CKT 1
N-1: Knight-Wautoma 500 kV	OPEN MultiSectionLine KNIGHT_500.0 (41450) TO WAUTOMA_500.0 (41138) CKT 1
N-1: LaGrande-North Powder 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO N POWDER_230.0 (60312) CKT 1
N-1: Lanes-Marion 500 kV	OPEN Line LANE_500.0 (40629) TO MARION_500.0 (40699) CKT 1
N-1: Lit Goose-Central Ferry 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO CEN FERY_500.0 (40666) CKT 1
N-1: Lit Goose-Low Mon 500 kV	OPEN Line LIT GOOS_500.0 (40665) TO LOW MON_500.0 (40683) CKT 1
N-1: Low Gran-Central Ferry 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-1: Low Mon-Sac Tap 500 kV	OPEN Line LOW MON_500.0 (40683) TO SACJWA T_500.0 (40917) CKT 1
N-1: Malin 500/230 Xfmr	OPEN Transformer MALIN_230.0 (45189) TO MALIN_500.0 (40687) CKT 1
N-1: Malin-Hilltop 230 kV	OPEN Line CANBYTAP_230.0 (40171) TO HIL TOP_230.0 (40537) CKT 1
N-1: Malin-Round Mtn #1 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-1: Malin-Round Mtn #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-1: Malin-Summer Lake 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-1: Maple Vly-Rocky RH 345 kV	OPEN MultiSectionLine MAPLE VL_345.0 (40691) TO ROCKY RH_345.0 (40891) CKT 1
N-1: Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Line MARION_500.0 (40699) TO SANTIAM_500.0 (40941) CKT 1
N-1: Marion-Santiam 500 kV	OPEN Shunt SANTIAM_230.0 (40939) #s
N-1: McLouglin-Ostrander 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-1: McNary 500/230 kV Xfmr	OPEN Transformer MCNARY_500.0 (40723) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary S2-McNary S3 230 kV	OPEN Line MCNRY S2_230.0 (41352) TO MCNRY S3_230.0 (41353) CKT 1
N-1: McNary-Board T1 230 kV	OPEN Line BOARD T1_230.0 (40121) TO MCNRY S1_230.0 (41351) CKT 1
N-1: McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-1: McNary-Longhorn 500 kV	OPEN Line LONGHORN_500.0 (40724) TO MCNARY_500.0 (40723) CKT 1
N-1: McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-1: McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-1: McNary-Roundup 230 kV	OPEN Line MCNRY S1_230.0 (41351) TO ROUNDUP_230.0 (40905) CKT 1
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJWA T_500.0 (40917)
N-1: McNary-Sac Tap-Low Mon 500 kV	OPEN Bus SACJAWEA_500.0 (40913)
N-1: McNary-Sac Tap-Low Mon 500 kV	CLOSE Gen ICE H1-2_ 13.8 (40559) #1
N-1: Midpoint-Hemingway 500 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	SET SWITCHED SHUNT AT BUS PTRSNFLT_230.0 (62030) TO 63.4 MVR
N-1: Midpoint-Humboldt 345 kV	OPEN Bus IDAHO-NV_345.0 (64061)
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS HIL TOP_230.0 (40537) TO 52.2 MVR
N-1: Midpoint-Humboldt 345 kV	SET SWITCHED SHUNT AT BUS ALTURAS_ 69.0 (45005) TO 10.8 MVR
N-1: Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Line OLYMPIA_500.0 (40797) TO PAUL_500.0 (40821) CKT 1
N-1: Olympia-Paul 500 kV	OPEN Shunt OLY E_230.0 (40794) #s
N-1: Ontario-Caldwell 230 kV	OPEN MultiSectionLine CALDWELL_230.0 (60110) TO LANGLEY_230.0 (60266) CKT 1

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-1: Ostrander-Knight 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-1: Ostrander-Pearl 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-1: Ostrander-Troutdale 500 kV	OPEN Line OSTRNDER_500.0 (40809) TO TROUTDAL_500.0 (41095) CKT 1
N-1: Oxbow-Brownlee #2 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 2
N-1: Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-1: Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-1: Paul-Satsop 500 kV	OPEN Line PAUL_500.0 (40821) TO SATSOP_500.0 (40949) CKT 1
N-1: Pearl-Keeler 500 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-1: Pearl-Keeler 500 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-1: Pinto-Four Corner 345 kV	OPEN Bus PINTO PS_345.0 (66235)
N-1: Ponderosa A 500/230 kV Xfmr	OPEN Transformer PONDROSA_500.0 (40837) TO PONDROSS_230.0 (40838) CKT 1
N-1: Ponderosa B 500/230 kV Xfmr	OPEN Transformer PONDROSB_500.0 (40834) TO PONDROSN_230.0 (40836) CKT 1
N-1: Raver-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-1: Raver-Tacoma 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus H ALLEN_345.0 (18001)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus HA PS_345.0 (18002)
N-1: Red Butte-Harry Allen 345 kV	OPEN Bus UTAH-NEV_345.0 (67657)
N-1: Robinson-Harry Allen 500 kV	OPEN Line ROBINSON_500.0 (64895) TO H ALLEN_500.0 (18450) CKT 1
N-1: Rock Ck-Wautoma 500 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Round Mtn-Table Mtn 500 kV	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-1: Roundup-Lagrande 230 kV	OPEN Line LAGRANDE_230.0 (40621) TO ROUNDUP_230.0 (40905) CKT 1
N-1: Schultz-Sickler 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-1: Schultz-Vantage 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-1: Schultz-Wautoma 500 kV	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-1: Sigurd-Glen Canyon 230 kV	OPEN Bus SIGURDPS_230.0 (66355)
N-1: Slatt 500/230 kV Xfmr	OPEN Transformer SLATT_500.0 (40989) TO SLATT_230.0 (40986) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-1: Slatt-Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-1: Snok Tap-Snoking 500 kV	OPEN Line SNOK TAP_500.0 (41001) TO SNOKING_500.0 (41007) CKT 1
N-1: Table Mtn-Tesla 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-1: Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO VACA-DIX_500.0 (30030) CKT 1
N-1: Vantage 500/230 kV Xfmr #1	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 1
N-1: Vantage 500/230 kV Xfmr #2	OPEN Transformer VANTAGE_500.0 (41113) TO VANTAGE_230.0 (41111) CKT 2
N-1: Walla Walla-Talbot 230 kV	OPEN Line TALBOT_230.0 (44912) TO WALAWALA_230.0 (45327) CKT 1
N-1: Walla Walla-Wallula 230 kV	OPEN Line WALAWALA_230.0 (45327) TO WALLULA_230.0 (45331) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Ashe-Slatt 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Buckley-Marion 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Buckley 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN MultiSectionLine ASHE R1_500.0 (40062) TO MARION_500.0 (40699) CKT 2
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Marion & Slatt-John Day 500 kV	OPEN Bus ASHE R1_500.0 (40062)
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & McNary-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Line ASHE_500.0 (40061) TO SLATT_500.0 (40989) CKT 1
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	OPEN Bus COYOTETP_500.0 (40725)
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	OPEN InjectionGroup RAS Libby Gen Drop
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Line BETHEL_230.0 (43039) TO ROUNDB N_230.0 (43483) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Round Butte 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN MultiSectionLine BETHEL_230.0 (43039) TO SANTIAM_230.0 (40939) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Series Cap BETHEL5_500.0 (43041) TO BETHCRS1_500.0 (43491) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Line BETHCRS1_500.0 (43491) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Bethel-Cedar Spring 500 kV & Bethel-Santiam 230 kV	OPEN Series Cap CDR SPRG_500.0 (43950) TO CDRSBET1_500.0 (43951) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	OPEN MultiSectionLine BIGEDDY2_230.0 (41342) TO CHEMAWA_230.0 (40213) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	OPEN Bus PARKDALE_230.0 (40813)
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 2
N-2: Boise Bench-Brownlee #1 & #2 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO31_230.0 (61996) CKT 3 TO 50 % of present
N-2: Boise Bench-Brownlee #1 & #2 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIHOR41_230.0 (61995) CKT 4 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO BROWNLEE_230.0 (60095) CKT 3
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	OPEN MultiSectionLine BOISEBCH_230.0 (60045) TO HORSEFLT_230.0 (60102) CKT 4
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO11_230.0 (61998) CKT 1 TO 50 % of present
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	SET SERIES CAP REACTANCE AT BOISEBCH_230.0 (60045) TO BOIBRO21_230.0 (61997) CKT 2 TO 50 % of present
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 1
N-2: Bridger-Populus #1 & #2 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine POPULUS_345.0 (67790) TO BRIDGER_345.0 (60085) CKT 2
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	OPEN MultiSectionLine BRIDGER_345.0 (60085) TO 3MIKNOLL_345.0 (60084) CKT 1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	CLOSE Shunt KINPORT_345.0 (60190) #1
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	SET SWITCHED SHUNT AT BUS DILLON S_ 69.0 (62345) TO 27.9 MVR
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Series Cap GAR1EAST_500.0 (40451) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line GAR1EAST_500.0 (40451) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN1_500.0 (62013) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Series Cap GAR2EAST_500.0 (40453) TO GARRISON_500.0 (40459) CKT 1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line GAR2EAST_500.0 (40453) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Line BROADVU_500.0 (62046) TO TOWN2_500.0 (62012) CKT 2
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 4_ 26.0 (62047) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Gen COLSTP 2_ 22.0 (62049) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt PTRSNFLT_230.0 (62030) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt OREBASIN_230.0 (66145) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt FRANNIE2_ 34.5 (67145) #1
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	SET SWITCHED SHUNT AT BUS ROSEBUD_230.0 (63012) TO -10 MVR
N-2: Broadview-Garrisont #1 & #2 500 kV + RAS	OPEN Shunt GARLAND1_ 34.5 (67147) #1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN MultiSectionLine OXBOW_230.0 (60275) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Line LOLO_230.0 (48197) TO IMNAHA_230.0 (60278) CKT 1
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line OXBOW_230.0 (60275) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Line HELLSCYN_230.0 (60150) TO BROWNLEE_230.0 (60095) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Transformer HELLSCYN_230.0 (60150) TO HELSCYN1_ 14.4 (60151) CKT 1
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	OPEN Gen HELSCYN1_ 14.4 (60151) #1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: Buckley-Marion & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	OPEN Line MONROE_230.0 (40747) TO NOVELTY_230.0 (42304) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO SICKLER_500.0 (40973) CKT 1
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus CHIEF J3_345.0 (40223)
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	OPEN Bus SNOHOMS3_345.0 (40993)
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Line CHIEF JO_500.0 (40233) TO COULEE_500.0 (40287) CKT 1
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus CHIEF J4_345.0 (40225)

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	OPEN Bus SNOHOMS4_345.0 (40994)
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO HANFORD_500.0 (40499) CKT 1
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	OPEN Line HANFORD_500.0 (40499) TO VANTAGE_500.0 (41113) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Coulee-Schultz #1 & #2 500 kV	OPEN MultiSectionLine COULEE_500.0 (40287) TO SCHULTZ_500.0 (40957) CKT 2
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN Line ING 500_500.0 (50194) TO CUSTER W_500.0 (40323) CKT 1
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA1_ 13.8 (42111) #1
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen FREDONA2_ 13.8 (42112) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN2_ 13.8 (42042) #2
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Gen WHITHRN3_ 13.8 (42043) #3
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS BCH-NW Gen Drop Units BY 'BCH-NW_gen_drop_value1' MW in generator merit order by opening
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO1_ 13.8 (41214) #I
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO3_ 13.8 (41216) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO4_ 13.8 (41217) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO5_ 13.8 (41218) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO6_ 13.8 (41219) #F
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	OPEN Load INTALCO7_ 13.8 (41220) #F
N-2: DC-BIPOLE	OPEN Shunt MALIN_500.0 (40687) #s
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: DC-BIPOLE	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: DC-BIPOLE	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: DC-BIPOLE	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: DC-BIPOLE	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: DC-BIPOLE	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: DC-BIPOLE	CHANGE INJECTION GROUP RAS PDCI Gen Drop Units BY 'PDCI_gen_drop_value_less300' MW in generator merit order by opening
N-2: DC-BIPOLE	OPEN Bus SYLMAR1_230.0 (26097)
N-2: DC-BIPOLE	OPEN Bus SYLMAR2_230.0 (26099)
N-2: DC-BIPOLE	OPEN Shunt SYLMAR S_230.0 (24147) #b
N-2: DC-BIPOLE	OPEN Shunt SYLMARLA_230.0 (26094) #b
N-2: DC-BIPOLE	OPEN Shunt BIGEDDY2_230.0 (41342) #s
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #b
N-2: DC-BIPOLE	CLOSE Shunt ANTELOPE_230.0 (24401) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS ANTELOPE_230.0 (24401) TO 158.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt BARRE_230.0 (24016) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS BARRE_230.0 (24016) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt CHINO_230.0 (24025) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS CHINO_230.0 (24025) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt DEVERS_230.0 (24804) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS DEVERS_230.0 (24804) TO 316.8 MVR
N-2: DC-BIPOLE	CLOSE Shunt EL NIDO_230.0 (24040) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS EL NIDO_230.0 (24040) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt GOULD_230.0 (24059) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS GOULD_230.0 (24059) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LCIENEGA_230.0 (24082) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LCIENEGA_230.0 (24082) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt LAGUBELL_230.0 (24076) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS LAGUBELL_230.0 (24076) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOMW_230.0 (24093) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOMW_230.0 (24093) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRALOME_230.0 (25656) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRALOME_230.0 (25656) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MIRAGE_230.0 (24806) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MIRAGE_230.0 (24806) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt MOORPARK_230.0 (24099) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS MOORPARK_230.0 (24099) TO 158.4 MVR

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: DC-BIPOLE	CLOSE Shunt OLINDA_230.0 (24100) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS OLINDA_230.0 (24100) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt PADUA_230.0 (24112) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PADUA_230.0 (24112) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt PARDEE_230.0 (24114) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS PARDEE_230.0 (24114) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt RIOHONDO_230.0 (24126) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS RIOHONDO_230.0 (24126) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt SANBRDNO_230.0 (24132) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS SANBRDNO_230.0 (24132) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt S.CLARA_230.0 (24128) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS S.CLARA_230.0 (24128) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #b
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #2
N-2: DC-BIPOLE	CLOSE Shunt VALLEYSC_115.0 (24160) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VALLEYSC_115.0 (24160) TO 187.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt VILLA PK_230.0 (24154) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VILLA PK_230.0 (24154) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VINCENT_230.0 (24155) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VINCENT_230.0 (24155) TO 158.4 MVR
N-2: DC-BIPOLE	CLOSE Shunt VSTA_230.0 (24901) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS VSTA_230.0 (24901) TO 79.2 MVR
N-2: DC-BIPOLE	CLOSE Shunt WALNUT_230.0 (24158) #ei
N-2: DC-BIPOLE	SET SWITCHED SHUNT AT BUS WALNUT_230.0 (24158) TO 79.2 MVR
N-2: DC-BIPOLE	OPEN Bus CELILO4_230.0 (41314)
N-2: DC-BIPOLE	OPEN Bus CELILO3_230.0 (41313)
N-2: DC-BIPOLE	OPEN Bus CELILO2_500.0 (41312)
N-2: DC-BIPOLE	OPEN Bus CELILO1_500.0 (41311)
N-2: Double Palo Verde	OPEN Shunt CAPTJACK_500.0 (45035) #s
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c1
N-2: Double Palo Verde	CLOSE Shunt CAPTJACK_500.0 (45035) #c2
N-2: Double Palo Verde	OPEN Shunt MALIN_500.0 (40687) #s
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c1
N-2: Double Palo Verde	CLOSE Shunt MALIN_500.0 (40687) #c2
N-2: Double Palo Verde	CLOSE Shunt OLINDA_500.0 (30020) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c1
N-2: Double Palo Verde	CLOSE Shunt TABLE MT_500.0 (30015) #c2
N-2: Double Palo Verde	INSERVICE SeriesCap GRIMAL23_500.0 (90070) TO GRIMAL24_500.0 (90071) CKT 2
N-2: Double Palo Verde	INSERVICE SeriesCap PONSUM13_500.0 (90101) TO PONSUM14_500.0 (90102) CKT 1
N-2: Double Palo Verde	INSERVICE SeriesCap CAPPON13_500.0 (90139) TO CAPPON14_500.0 (90140) CKT 1
N-2: Double Palo Verde	OPEN Gen PALOVRD2_ 24.0 (14932) #1
N-2: Double Palo Verde	OPEN Gen PALOVRD1_ 24.0 (14931) #1
N-2: Double Palo Verde	CHANGE LOAD AT BUS AGUAFAPS_ 69.0 (14400) BY -120 MW (cnst pf)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	OPEN Line COVINGTN_230.0 (40303) TO MAPLEV12_230.0 (40692) CKT 2
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_345.0 (40691)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus ROCKY RH_345.0 (40891)
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	OPEN Bus MAPLE VL_500.0 (40693)
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 2
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Garrison-Taft #1 & #2 500 kV + RAS	OPEN Gen COLSTP 3_ 26.0 (62048) #1
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	OPEN Line CDR SPRG_500.0 (43950) TO GRASSLND_500.0 (43049) CKT 1
N-2: Grassland-Cedar Spring & Slatt - Buckley 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO SLATT_500.0 (40989) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line GRASSLND_500.0 (43049) TO COYOTE_500.0 (43123) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line SLATT_500.0 (40989) TO COYOTETP_500.0 (40725) CKT 1
N-2: Grassland-Coyote & Slatt - Longhorn 500 kV	OPEN Line COYOTETP_500.0 (40725) TO LONGHORN_500.0 (40724) CKT 1
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	OPEN Bus PONDROSB_500.0 (40834)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus PONDROSA_500.0 (40837)
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order by opening
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	OPEN Bus GRIZZ R3_500.0 (40488)
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO MALIN_500.0 (40687) CKT 2
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CHANGE INJECTION GROUP RAS Coulee and Chief Jo gen drop BY -2700 MW in generator merit order
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	OPEN MultiSectionLine MALIN_500.0 (40687) TO SUMMER L_500.0 (41043) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line ASHE_500.0 (40061) TO HANFORD_500.0 (40499) CKT 1
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	OPEN Line HANFORD_500.0 (40499) TO LOW MON_500.0 (40683) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Hanford-Wautoma #1 & #2 500 kV	OPEN Line HANFORD_500.0 (40499) TO WAUTOMA_500.0 (41138) CKT 2
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy #1 & #2 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Big Eddy & John Day-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 1
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine GRIZZLY_500.0 (40489) TO JOHN DAY_500.0 (40585) CKT 2
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO GRIZZLY_500.0 (40489) CKT 1
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Buckley-Marion 500 kV	OPEN MultiSectionLine BUCKLEY_500.0 (40155) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN MultiSectionLine JOHN DAY_500.0 (40585) TO MARION_500.0 (40699) CKT 1
N-2: John Day-Marion & Marion-Pearl 500 kV	OPEN Line MARION_500.0 (40699) TO PEARL_500.0 (40827) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus CASCADTP_230.0 (40185)
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	OPEN Bus WINDSHAR_230.0 (41155)
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	OPEN Line BIG EDDY_500.0 (40111) TO OSTRNDER_500.0 (40809) CKT 1
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus ALFALFA_230.0 (40039)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN Bus OUTLOOK_230.0 (45229)
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	OPEN MultiSectionLine OSTRNDER_500.0 (40809) TO KNIGHT_500.0 (41450) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 1
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	OPEN Line CEN FERY_500.0 (40666) TO LOW GRAN_500.0 (40679) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN MultiSectionLine MALIN_500.0 (40687) TO ROUND MT_500.0 (30005) CKT 2
N-2: Malin-Round Mtn #1 & #2 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS1_ 13.2 (38775) #6
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen BUENAVS2_ 13.2 (38780) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG1_ 13.2 (38750) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DOS AMG2_ 13.2 (38755) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD1_ 13.2 (38785) #5
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #2

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #3
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WHLR RD2_ 13.2 (38790) #4
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP1_ 13.2 (38795) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP2_ 13.2 (38800) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #1
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP3_ 13.2 (38805) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen WINDGAP4_ 13.2 (38810) #2
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #10
N-2: Malin-Round Mtn #1 & #2 500 kV	OPEN Gen DELTA E_ 13.2 (38760) #11
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line JOHN DAY_500.0 (40585) TO ROCK CK_500.0 (41401) CKT 1
N-2: McNary-John Day & Rock Creek-John Day 500 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN MultiSectionLine MCNARY_345.0 (40721) TO ROSS_345.0 (40901) CKT 1
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	OPEN Line MCNARY_500.0 (40723) TO JOHN DAY_500.0 (40585) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Line HORSE HV_230.0 (40549) TO MCNRY S1_230.0 (41351) CKT 1
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus MCNARY_345.0 (40721)
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	OPEN Bus ROSS_345.0 (40901)
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN MultiSectionLine MIDPOINT_500.0 (60240) TO HEMINWAY_500.0 (60155) CKT 1
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	OPEN Line KING_230.0 (60177) TO MIDPOINT_230.0 (60232) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CUSTER W_500.0 (40323) TO MONROE_500.0 (40749) CKT 1
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	OPEN MultiSectionLine CHIEF JO_500.0 (40233) TO MONROE_500.0 (40749) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO NAPAVINE_500.0 (40774) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line ALLSTON_500.0 (40045) TO PAUL_500.0 (40821) CKT 2
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	CHANGE INJECTION GROUP RAS P-A/N-A Gen Drop Units BY 'Paul-Allston_gen_drop_value_less300' MW in generator merit order by opening
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line HOLCOMB_115.0 (40539) TO VALLEY T_115.0 (41272) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 1
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	OPEN Line CHEHALIS_230.0 (40207) TO LONGVW T_230.0 (40673) CKT 2
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Paul-Raver & Raver-Covingt4 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line KEELER_500.0 (40601) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	OPEN Line PEARL #_230.0 (43773) TO SHERWOOD_230.0 (43527) CKT 1
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	CHANGE INJECTION GROUP RAS South of Allston Gen Drop BY 'Keeler-Pearl_gen_drop_value_less300' MW in generator merit order by opening
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	OPEN MultiSectionLine BIGEDDY3_230.0 (41343) TO MCLOUGLN_230.0 (43313) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Line OSTRNDER_500.0 (40809) TO PEARL_500.0 (40827) CKT 1
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	OPEN Bus OSTRNDER_230.0 (40810)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT4_500.0 (40302)
N-2: Raver-Covington #1 & #2 500 kV	OPEN Bus COVINGT5_500.0 (40306)
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line ECHOLAKE_500.0 (40381) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul & Napavine-Paul 500 kV	OPEN Line NAPAVINE_500.0 (40774) TO PAUL_500.0 (40821) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus COULEE_300.0 (40285)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	OPEN Bus OLYMPIA_300.0 (40795)
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Line PAUL_500.0 (40821) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	OPEN Bus CENTR SS_230.0 (47748)

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	CHANGE INJECTION GROUP RAS Raver-Paul Gen Drop Units BY 'RAVER-PAUL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Schultz #1 & #2 500 kV	OPEN MultiSectionLine ECHOLAKE_500.0 (40381) TO SCHULTZ_500.0 (40957) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN Line COVINGT4_500.0 (40302) TO RAVER_500.0 (40869) CKT 1
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO TACOMA_500.0 (41051) CKT 1
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	OPEN Bus CHRISTOP_230.0 (42505)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 1
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN MultiSectionLine ROUND MT_500.0 (30005) TO TABLE MT_500.0 (30015) CKT 2
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP3_ 13.2 (38805)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OPEN Transformer ROUND MT_500.0 (30005) TO RD MT 1M_500.0 (30065) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_DLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO SICKLER_500.0 (40973) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	OPEN Line SCHULTZ_500.0 (40957) TO VANTAGE_500.0 (41113) CKT 1
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	CHANGE INJECTION GROUP RAS NOH Gen Drop Units BY 'NOH_SLL_gen_drop_value_less300' MW in generator merit order by opening
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN MultiSectionLine TABLE MT_500.0 (30015) TO TESLA_500.0 (30040) CKT 1
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	CHANGE INJECTION GROUP RAS High Gen Drop Units BY 'High_gen_drop_value_less300' MW in generator merit order by opening
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 1_ 12.5 (38825)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 2_ 12.5 (38830)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 3_ 12.5 (38835)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 4_ 12.5 (38840)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HYATT 5_ 12.5 (38845)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT1_ 13.8 (38700)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT2_ 13.8 (38705)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT3_ 13.8 (38710)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus THERMLT4_ 13.8 (38715)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 4-5_ 13.8 (31782)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMCP_ 13.8 (25619)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMDP_ 13.8 (25620)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA A_ 13.2 (38820)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA B_ 13.2 (38815)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA D_ 13.2 (38765)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA E_ 13.2 (38760)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DELTA C_ 13.2 (38770)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS1_ 13.2 (38775)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus BUENAVS2_ 13.2 (38780)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP2_ 13.2 (38800)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP3_ 13.2 (38805)

Appendix L - 16hs2a_2250idnw_N_nvmod Studied Contingencies & Associated Actions

Contingency Studied	Actions Taken in the Contingency
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP4_ 13.2 (38810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WINDGAP1_ 13.2 (38795)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD2_ 13.2 (38790)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus WHLR RD1_ 13.2 (38785)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG2_ 13.2 (38755)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus DOS AMG1_ 13.2 (38750)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMBP_ 13.2 (25618)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus PEARBMAP_ 13.2 (25617)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBOU2-3_ 11.5 (31808)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus CRBU 1_ 11.5 (31810)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 1_ 18.0 (34600)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 2_ 18.0 (34602)
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OPEN Bus HELMS 3_ 18.0 (34604)
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus ADDY N_230.0 (40021)
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL S3_230.0 (40090) TO LANCASTR_230.0 (40624) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Line BELL BPA_115.0 (40087) TO BIGELOW_115.0 (40113) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine LANCASTR_230.0 (40624) TO NOXONBPA_230.0 (40787) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN MultiSectionLine BELL SC_500.0 (40096) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	OPEN Bus BELL SC_500.0 (40096)
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine DWORSHAK_500.0 (40369) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN MultiSectionLine GARRISON_500.0 (40459) TO TAFT_500.0 (41057) CKT 1
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	OPEN Shunt GARRISON_500.0 (40459) #r
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Bus MABTON_230.0 (40685)
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	OPEN Line ROCK CK_500.0 (41401) TO WAUTOMA_500.0 (41138) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN MultiSectionLine RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 1
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 3
N-3: Schultz-Raver #1 & #2 & #3 500 kV	OPEN Line RAVER_500.0 (40869) TO SCHULTZ_500.0 (40957) CKT 4

Appendix M

16hs2a_2250idnw_ms_swips Base Case (MSTI & SWIP, SWIP South – 1770 MW)

Appendix M - 16hs2a_2250idnw_ms_swips Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 11L12 Meridian-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11L22 Capt Jack-Klam Falls 500 kV+KFGEN2+ST	No Violations							
BF 11R1 Meridian-Klam Falls 500 kV & Meridian 500/230 kV Xfmr	MERIDINP (45197) -> MERIDINP (45195) CKT 2 at MERIDINP	Branch MVA	362.2	670.8	650.0	103.2%	1286.0	52.2%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	636.6	1188.8	979.0	121.4%	1287.7	92.3%
BF 11R6 Meridian-Dixonville 500 kV & Meridian 500/230 kV Xfmr	GLENDL (45113) -> GRANT PS (45123) CKT 1 at GLENDL	Branch Amp	302.0	759.7	722.9	105.1%	1265.2	60.0%
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4028 Taft-Dworshak & Taft Reactor 500kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1583.0	1550.0	102.1%	1782.5	88.8%
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1573.4	1550.0	101.5%	1782.5	88.3%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1650.5	2833.4	2442.0	116.0%	3235.5	87.6%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1650.5	2833.4	2199.9	128.8%	3235.5	87.6%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1648.1	2825.4	2666.9	105.9%	3999.9	70.6%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1642.7	2817.7	2667.0	105.7%	4000.0	70.4%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1604.5	2736.1	2699.7	101.3%	3999.9	68.4%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at ROUND MT	Branch Amp	1600.8	2724.1	2699.7	100.9%	4000.0	68.1%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4111 Hot Springs-Taft & Taft-Dworshak 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1593.8	1550.0	102.8%	1782.5	89.4%
BF 4114 Garrison-Taft #1 +Taft Reactor 500kV	No Violations							
BF 4119 Garrison-Taft #1 & Taft-Bell 500 kV	No Violations							
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations							
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1556.6	1550.0	100.4%	1782.5	87.3%
BF 4148 Hot Springs-Taft & Garrison-Taft #2 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1650.5	2866.5	2442.0	117.4%	3235.5	88.6%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1650.5	2866.5	2199.9	130.3%	3235.5	88.6%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1648.1	2858.2	2666.9	107.2%	3999.9	71.5%
BF 4186 (or 4582) Malin-Round Mtn 500 kV & Malin 500/230 Xfmr	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at ROUND MT	Branch Amp	1642.7	2850.7	2667.0	106.9%	4000.0	71.3%
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1560.9	1550.0	100.7%	1782.5	87.6%
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4234 McNary-Longhorn & McNary-Hermcalp 500 kV	No Violations							
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1568.5	1550.0	101.2%	1782.5	88.0%
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4268 Monroe-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4276 Ing500-CusterW 500 kV & CusterW 500/230 Xfmr	No Violations							
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.4	327.7	320.0	102.4%	370.0	88.6%
BF 4280 Keeler-Pearl & Pearl-Marion 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	678.3	1040.8	950.0	109.6%	1286.0	80.9%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.4	334.4	320.0	104.5%	370.0	90.4%
BF 4280 Keeler-Pearl & Pearl-Ostrander 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	678.3	1052.4	950.0	110.8%	1286.0	81.8%
BF 4287 Pearl-Ostrander 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4293 Schultz-Raver & Raver Covington5 500 kV	No Violations							
BF 4336 Chief Jo-Sickler 500 kV & Sickler 500/230 Xfmr	No Violations							
BF 4336 Sickler-Schultz 500 kV & Sickler 500/230 Xfmr	No Violations							

Appendix M - 16hs2a_2250idnw_ms_swips Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	920.4	1050.0	1009.1	104.0%	1285.2	81.7%
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4432 Ostrander-Troutdale & Split Ostrander 500 kV	No Violations							
BF 4439 Big Eddy-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4442 Big Eddy-Ostrander 500 kV & Ostrander-McLoughlin 230 kV	No Violations							
BF 4448 Knight-Ostrander & Ostrander-Troutdale 500 kV	No Violations							
BF 4450 Knight-Ostrander & Ostrander-Pearl 500 kV	No Violations							
BF 4502 Paul-Allston & Allston-Keeler 500 kV + RAS	No Violations							
BF 4510 Pearl-Marion 500 kV & Pearl 500/230 Xfmr & Pearl Caps	No Violations							
BF 4526 CusterW-Monroe & Monroe-Echo Lake 500 kV + RAS	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV	No Violations							
BF 4530 Raver-Paul & Paul-Satsop 500 kV + RAS	No Violations							
BF 4540 Paul-Napavine & Paul-Satsop 500 kV	No Violations							
BF 4542 Paul-Allston 500 kV & Center G2	No Violations							
BF 4542 Paul-Napavine 500 kV & Center G1	No Violations							
BF 4550 Olympia-Paul & Paul-Allston 500 kV	No Violations							
BF 4554 Olympia-Paul 500 kV & Tono 500/115 Xfmr	No Violations							
BF 4572 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1573.0	1550.0	101.5%	1782.5	88.2%
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4652 Taft-Dworshak & Taft-Hatwai 500 kV + RAS	No Violations							
BF 4672 Monroe-Chief Jo 500 kV & Monroe Caps	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4690 Paul-Allston 500 kV & Allston 500/230 Xfmr	No Violations							
BF 4700 Hatwai 500kV & 230 kV + RAS	No Violations							
BF 4708 Hatwai 500 kV Bus	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1629.3	1550.0	105.1%	1782.5	91.4%
BF 4728 Coulee-Chief Jo 500 kV & Cheif Jo 500/230 Xfmr	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1609.3	1550.0	103.8%	1782.5	90.3%
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1561.4	1550.0	100.7%	1782.5	87.6%
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations							
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1570.1	1550.0	101.3%	1782.5	88.1%
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1567.7	1550.0	101.1%	1782.5	88.0%
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1550.8	1550.0	100.1%	1782.5	87.0%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1571.5	1550.0	101.4%	1782.5	88.2%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1581.0	1550.0	102.0%	1782.5	88.7%
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Buckley & Slatt-Boardman 500 kV	No Violations							
BF 5006 Slatt-Longhorn & Slatt-Grassland 500 kV	No Violations							
BF 5015 Ashe-Slatt & Slatt-Buckley 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1576.1	1550.0	101.7%	1782.5	88.4%
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1562.3	1550.0	100.8%	1782.5	87.6%
BF 5021 Slatt-John Day & Slatt-Longhorn 500 kV	No Violations							
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1600.5	1550.0	103.3%	1782.5	89.8%
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1554.3	1550.0	100.3%	1782.5	87.2%
BF 5114 Echo Lake-Raver & Echo Lake- Snok Tap 500 kV	No Violations							
BF 5117 Echo Lake-Maple Valley & Echo Lake-Raver 500 kV	No Violations							

Appendix M - 16hs2a_2250idnw_ms_swips Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5187 McNary-Longhorn & Longhorn-Slatt 500 kV	No Violations							
BF 5193 Grassland-Coyote & Coyote-Longhorn 500 kV	No Violations							
BF 5211 Low Mon-McNary 500 kV & McNary 500/230 kV Xfmr	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1573.0	1550.0	101.5%	1782.5	88.2%
BF 5214 Low Mon-McNary & Calpine PH 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1571.7	1550.0	101.4%	1782.5	88.2%
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1557.4	1550.0	100.5%	1782.5	87.4%
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1563.6	1550.0	100.9%	1782.5	87.7%
BF 5266 Slatt-Buckly 500 kV	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1714.9	1550.0	110.6%	1782.5	96.2%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1099.7	1317.4	1237.0	106.5%	1396.0	94.4%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	754.4	945.5	920.0	102.8%	1046.8	90.3%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	No Violations							
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1590.9	1550.0	102.6%	1782.5	89.3%
BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2142.9	2509.4	2477.9	101.3%	3999.9	62.7%
BF Lolo 230kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1559.0	1550.0	100.6%	1782.5	87.5%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1725.3	1550.0	111.3%	1782.5	96.8%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1099.7	1317.2	1237.0	106.5%	1396.0	94.4%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	754.4	943.0	920.0	102.5%	1046.8	90.1%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	920.4	1022.0	1009.1	101.3%	1285.2	79.5%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1723.2	1550.0	111.2%	1782.5	96.7%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1099.7	1314.2	1237.0	106.2%	1396.0	94.1%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	754.4	939.5	920.0	102.1%	1046.8	89.7%
BF PGE Grassland-Cedar Sp 500kV & Grassland-Hem 500kV+PTSN	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	920.4	1021.4	1009.1	101.2%	1285.2	79.5%
BF PGE Grassland-Coyote Sp 500kV & Carty Gas Plant	No Violations							
BF PGE Grassland-Slatt 500kV & Boardman Plant	No Violations							
Bus: Alvey 500 kV + RAS	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	920.4	1031.0	1009.1	102.2%	1285.2	80.2%
Bus: Bell BPA 500 kV	No Violations							
Bus: Buckley 500 kV	No Violations							
Bus: Dixonville 500 kV	No Violations							
Bus: Hot Springs 500 kV	No Violations							
Bus: Keeler 500 kV + RAS	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	80.1	94.0	94.0	100.0%	139.0	67.6%
Bus: Rock Creek 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1563.4	1550.0	100.9%	1782.5	87.7%
Bus: Sickler 500 kV	No Violations							
Bus: Summer Lake 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1575.7	1550.0	101.7%	1782.5	88.4%
N-1: Allston-Keeler 500 kV + RAS	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	80.1	94.0	94.0	100.0%	139.0	67.6%
N-1: Allston-Napavine 500 kV	No Violations							
N-1: Allston-Paul #2 500 kV	No Violations							
N-1: Alvery-Dixonville 500 kV	No Violations							
N-1: Alvey-Marion 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	920.4	1092.4	1009.1	108.3%	1285.2	85.0%
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1568.1	1550.0	101.2%	1782.5	88.0%
N-1: Bell-Coulee 500 kV	No Violations							
N-1: Bell-Taft 500 kV	No Violations							
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV	No Violations							
N-1: Broadview-Garrison #1 500 kV	No Violations							
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 1 at COTWDWAP	Branch Amp	299.0	866.4	785.7	110.3%	926.3	93.5%
N-1: Captain Jack-Olinda 500 kV	COTWDWAP (37545) -> OLINDAW (37565) CKT 2 at COTWDWAP	Branch Amp	299.0	866.4	785.7	110.3%	926.3	93.5%
N-1: Captain Jack-Olinda 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1650.5	2495.4	2442.0	102.2%	3235.5	77.1%
N-1: Captain Jack-Olinda 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1650.5	2495.4	2199.9	113.4%	3235.5	77.1%
N-1: Captain Jack-Olinda 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1809.2	2407.0	2199.9	109.4%	3280.5	73.4%
N-1: Captain Jack-Olinda 500 kV	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1793.9	2386.7	2199.9	108.5%	3280.5	72.8%
N-1: Captain Jack-Olinda 500 kV	TABLE MT (30015) -> TABVAC11 (30031) CKT 1 at TABVAC11	Branch Amp	2142.9	2770.4	2667.0	103.9%	3999.9	69.3%
N-1: Captain Jack-Olinda 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2142.9	2770.4	2477.9	111.8%	3999.9	69.3%
N-1: Captain Jack-Olinda 500 kV	TABVAC12 (30032) -> VACA-DIX (30030) CKT 1 at TABVAC12	Branch Amp	2118.3	2733.8	2667.0	102.5%	4000.0	68.3%
N-1: CaptJack-Kfalls 500 kV	No Violations							
N-1: Cascade Crossing 500 kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	920.4	1033.8	1009.1	102.4%	1285.2	80.4%
N-1: Cedar Hill-Robinson 500 kV (SWIP)	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2142.9	2490.7	2477.9	100.5%	3999.9	62.3%
N-1: Chief Jo-Coulee 500 kV	No Violations							
N-1: Chief Jo-Monroe 500 kV	No Violations							
N-1: Chief Jo-Sickler 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Covington4-Raver 500 kV	No Violations							
N-1: Covington5-Raver 500 kV	No Violations							
N-1: Coyote-Longhorn 500 kV	No Violations							
N-1: CusterW-Monroe 500 kV	No Violations							
N-1: Dixonville-Meridian 500 kV	DIXNV230 (44900) -> DIXONVLE (45093) CKT 1 at DIXONVLE	Branch Amp	636.6	1146.3	979.0	117.1%	1287.7	89.0%
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV + RAS	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1636.9	1550.0	105.6%	1782.5	91.8%
N-1: Dworshak-Taft 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1583.0	1550.0	102.1%	1782.5	88.8%
N-1: Echo Lake-Maple Valley 500 kV	No Violations							
N-1: Echo Lake-Raver 500 kV	No Violations							
N-1: Echo Lake-Schultz 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Echo Lake-Snok Tap 500 kV	No Violations							
N-1: Garrison-Taft #2 500 kV	No Violations							
N-1: Goldhill-Placer 115 kV	No Violations							
N-1: Grassland-Coyote 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	No Violations							
N-1: Grizzly-John Day #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1553.1	1550.0	100.2%	1782.5	87.1%
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1583.9	1550.0	102.2%	1782.5	88.9%
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Hatwai 500/230 kV Xfmr + RAS	No Violations							
N-1: Hatwai-Lolo 230 kV	No Violations							
N-1: Hatwai-Low Gran 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1561.2	1550.0	100.7%	1782.5	87.6%
N-1: Hatwai-N Lewiston 230 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1554.1	1550.0	100.3%	1782.5	87.2%
N-1: Hells Canyon-Brownlee 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	754.4	948.4	920.0	103.1%	1046.8	90.6%
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Grassland 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1707.2	1550.0	110.1%	1782.5	95.8%
N-1: Hemingway-Grassland 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1099.7	1302.7	1237.0	105.3%	1396.0	93.3%
N-1: Hemingway-Grassland 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	754.4	931.8	920.0	101.3%	1046.8	89.0%
N-1: Hemingway-Grassland 500 kV + FACRI	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1609.5	1550.0	103.8%	1782.5	90.3%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM14	Branch Amp	1700.7	2768.2	2400.0	115.3%	3199.9	86.5%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1708.4	2787.7	2400.0	116.2%	3800.0	73.4%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1713.7	1550.0	110.6%	1782.5	96.1%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1099.7	1297.2	1237.0	104.9%	1396.0	92.9%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	754.4	926.4	920.0	100.7%	1046.8	88.5%
N-1: Hemingway-Summer Lake 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1551.8	1550.0	100.1%	1782.5	87.1%
N-1: Hill Top 345/230 Xfmr	No Violations							
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: Hot Springs-Taft 500 kV	No Violations							
N-1: Humboldt-Coyote Ck 345 kV	No Violations							
N-1: Huntington-Pinto-Four Corners 345 kV	No Violations							
N-1: Ing500-CusterW 500 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1562.6	1550.0	100.8%	1782.5	87.7%
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Kfalls-Meridian 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1555.7	1550.0	100.4%	1782.5	87.3%
N-1: LaGrande-North Powder 230 kV	No Violations							
N-1: Lanes-Marion 500 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-Sac Tap 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1562.8	1550.0	100.8%	1782.5	87.7%
N-1: Malin 500/230 Xfmr	No Violations							
N-1: Malin-Hilltop 230 kV	No Violations							
N-1: Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1650.5	2835.1	2442.0	116.1%	3235.5	87.6%
N-1: Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1650.5	2835.1	2199.9	128.9%	3235.5	87.6%
N-1: Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALROU21	Branch Amp	1648.1	2826.8	2666.9	106.0%	3999.9	70.7%
N-1: Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1642.7	2819.6	2667.0	105.7%	4000.0	70.5%
N-1: Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1604.5	2806.5	2699.7	104.0%	3999.9	70.2%
N-1: Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1600.8	2796.8	2699.7	103.6%	4000.0	69.9%
N-1: Malin-Summer Lake 500 kV	No Violations							
N-1: Maple Vly-Rocky RH 345 kV	No Violations							
N-1: Marion-Pearl 500 kV	No Violations							
N-1: Marion-Santiam 500 kV	No Violations							
N-1: McLouglin-Ostrander 230 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary S2-McNary S3 230 kV	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Longhorn 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	No Violations							
N-1: McNary-Sac Tap-Low Mon 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1564.6	1550.0	100.9%	1782.5	87.8%
N-1: Midpoint-Hemingway 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1581.8	1550.0	102.1%	1782.5	88.7%
N-1: Midpoint-Humboldt 345 kV	No Violations							
N-1: Midpoint-Townsend 500 kV (MISTI)	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	754.4	1001.0	920.0	108.8%	1046.8	95.6%
N-1: Midpoint-Townsend 500 kV (MISTI)	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1099.7	1270.0	1237.0	102.7%	1396.0	91.0%
N-1: Midpoint-Townsend 500 kV (MISTI)	MIDHEM11 (61988) -> MIDPOINT (60240) CKT 1 at MIDPOINT	Branch Amp	1048.1	1802.7	1732.1	104.1%	2338.3	77.1%
N-1: Midpoint-Townsend 500 kV (MISTI)	PTRSNFUR (62386)	% Δ Volts	1.019	0.956				6.18%
N-1: Midpoint-Townsend 500 kV (MISTI)	PTRSNFLT (62030)	% Δ Volts	1.001	0.941				5.99%
N-1: Midpoint-Townsend 500 kV (MISTI)	AMPS (65025)	% Δ Volts	1.007	0.951				5.56%
N-1: Midpoint-Townsend 500 kV (MISTI)+PTSN Shunt	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	754.4	998.9	920.0	108.6%	1046.8	95.4%
N-1: Midpoint-Townsend 500 kV (MISTI)+PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1099.7	1268.5	1237.0	102.5%	1396.0	90.9%
N-1: Midpoint-Townsend 500 kV (MISTI)+PTSN Shunt	MIDHEM11 (61988) -> MIDPOINT (60240) CKT 1 at MIDPOINT	Branch Amp	1048.1	1797.3	1732.1	103.8%	2338.3	76.9%
N-1: Napavine-Paul 500 kV	No Violations							
N-1: Olympia-Paul 500 kV	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1558.6	1550.0	100.6%	1782.5	87.4%
N-1: Paul-Satsop 500 kV	No Violations							
N-1: Pearl-Keeler 500 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.4	350.2	320.0	109.4%	370.0	94.7%
N-1: Pearl-Keeler 500 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	678.3	1176.7	950.0	123.9%	1286.0	91.5%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Pearl-Keeler 500 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.4	326.3	320.0	102.0%	370.0	88.2%
N-1: Pearl-Keeler 500 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	678.3	1036.3	950.0	109.1%	1286.0	80.6%
N-1: Pinto-Four Corner 345 kV	No Violations							
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Raver-Paul 500 kV	No Violations							
N-1: Raver-Tacoma 500 kV	No Violations							
N-1: Red Butte-Harry Allen 345 kV	No Violations							
N-1: Robinson-Harry Allen 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	89.0	172.5	150.0	115.0%	180.0	95.9%
N-1: Robinson-Harry Allen 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	300.2	462.5	415.7	111.3%	483.5	95.7%
N-1: Robinson-Harry Allen 500 kV	CHCGO PK (32224) -> HIGGINS (32232) CKT 1 at CHCGO PK	Branch Amp	537.5	694.2	652.7	106.4%	893.6	77.7%
N-1: Robinson-Harry Allen 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1809.2	2216.6	2199.9	100.8%	3280.5	67.6%
N-1: Robinson-Harry Allen 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2142.9	2574.1	2477.9	103.9%	3999.9	64.4%
N-1: Rock Ck-Wautoma 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1562.5	1550.0	100.8%	1782.5	87.7%
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1809.2	3241.2	2199.9	147.3%	3280.5	98.8%
N-1: Round Mtn-Table Mtn 500 kV	ROUND MT (30005) -> ROUTAB21 (30018) CKT 2 at ROUTAB21	Branch Amp	1809.2	3241.2	2667.0	121.5%	4000.0	81.0%
N-1: Round Mtn-Table Mtn 500 kV	ROUTAB22 (30019) -> TABLE MT (30015) CKT 2 at ROUTAB22	Branch Amp	1802.1	3230.1	2667.0	121.1%	4000.0	80.8%
N-1: Roundup-Lagrande 230 kV	No Violations							
N-1: Schultz-Sickler 500 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Sigurd-Glen Canyon 230 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Slatt-Longhorn 500 kV	No Violations							
N-1: Snok Tap-Snoking 500 kV	No Violations							
N-1: Table Mtn-Tesla 500 kV	TABLE MT (30015) -> TABVAC11 (30031) CKT 1 at TABVAC11	Branch Amp	2142.9	3176.9	2667.0	119.1%	3999.9	79.4%
N-1: Table Mtn-Tesla 500 kV	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2142.9	3176.9	2477.9	128.2%	3999.9	79.4%
N-1: Table Mtn-Tesla 500 kV	TABVAC12 (30032) -> VACA-DIX (30030) CKT 1 at VACA-DIX	Branch Amp	2118.3	3158.0	2667.0	118.4%	4000.0	79.0%
N-1: Table Mtn-Tesla 500 kV	VACTES11 (30044) -> TESLA (30040) CKT 1 at VACTES11	Branch Amp	1399.1	2355.5	2230.0	105.6%	3555.9	66.2%
N-1: Table Mtn-Vaca Dixon 500 kV	DELEVN (30114) -> CORTINA (30450) CKT 1 at CORTINA	Branch Amp	717.6	832.0	830.9	100.1%	926.3	89.8%
N-1: Table Mtn-Vaca Dixon 500 kV	FRUTLDJT (31120) -> FTSWRDJT (31122) CKT 1 at FRUTLDJT	Branch Amp	285.4	304.2	303.1	100.4%	339.7	89.6%
N-1: Table Mtn-Vaca Dixon 500 kV	BRDGVLLE (31110) -> FRUTLDJT (31120) CKT 1 at BRDGVLLE	Branch Amp	311.5	331.0	328.1	100.9%	371.4	89.1%
N-1: Table Mtn-Vaca Dixon 500 kV	E.NICOLS (32212) -> RIO OSO (32214) CKT 1 at E.NICOLS	Branch Amp	277.2	343.4	326.3	105.2%	416.7	82.4%
N-1: Table Mtn-Vaca Dixon 500 kV	TABLE MT (30015) -> TABTES11 (30041) CKT 1 at TABTES11	Branch Amp	1598.3	2848.7	2667.0	106.8%	3555.9	80.1%
N-1: Table Mtn-Vaca Dixon 500 kV	TABTES11 (30041) -> TABTES12 (30043) CKT 1 at TABTES11	Branch Amp	1598.3	2848.7	2230.0	127.7%	3999.9	71.2%
N-1: Table Mtn-Vaca Dixon 500 kV	TABTES12 (30043) -> TESLA (30040) CKT 1 at TESLA	Branch Amp	1569.4	2814.9	2667.0	105.5%	4000.0	70.4%
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1612.7	1550.0	104.0%	1782.5	90.5%
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Buckley 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1568.9	1550.0	101.2%	1782.5	88.0%
N-2: Ashe-Marion & Slatt-Coyote Tap-Longhorn 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations							

Appendix M - 16hs2a_2250idnw_ms_swips Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Ashe-Slatt & McNary-John Day 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1577.8	1550.0	101.8%	1782.5	88.5%
N-2: Ashe-Slatt & Slatt-Coyote Tap-Longhorn 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1574.7	1550.0	101.6%	1782.5	88.3%
N-2: Bell-Taft & Taft-Dworskak 500 kV + RAS	No Violations							
N-2: Bethel-Cedar Sp 500kV & Bethel-Round Butte 230 kV	No Violations							
N-2: Bethel-Cedar Sp 500kV & Bethel-Santiam 230kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	920.4	1045.9	1009.1	103.7%	1285.2	81.4%
N-2: Bethel-Cedar Sp 500kV & Santiam-Mikkalo 500kV	ALBANY (40025) -> HAZELWOD (45131) CKT 1 at HAZELWOD	Branch Amp	920.4	1033.5	1009.1	102.4%	1285.2	80.4%
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Bridger-Populus #1 & #2 345 kV	No Violations							
N-2: Bridger-Populus #2 & Bridger-3MileKnoll 345 kV	No Violations							
N-2: Broadview-Townsend #1 & #2 500 kV + RAS	No Violations							
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1613.0	1550.0	104.1%	1782.5	90.5%
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1555.8	1550.0	100.4%	1782.5	87.3%
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at LOLO	Branch Amp	754.4	920.4	920.0	100.0%	1046.8	87.9%
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Chief Jo-Monroe & Chief Jo-Sickler 500 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Chief Jo-Snohoms4 345 kV	No Violations							
N-2: Chief Jo-Monroe 500 kV & Monroe-Sammamsh 230 kV	No Violations							
N-2: Chief Jo-Sickler 500 kV & Chief J3-Snohoms3 345 kV	No Violations							
N-2: Coulee-Chief Jo 500 kV & Chief J4-Snohoms4 345 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1576.1	1550.0	101.7%	1782.5	88.4%
N-2: Coulee-Schultz #1 & #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1568.2	1550.0	101.2%	1782.5	88.0%
N-2: CusterW-Ing500 & CusterW-Monroe 500 kV	No Violations							
N-2: CusterW-Monroe #1 & #2 500 kV + RAS	No Violations							
N-2: DC-BIPOLE	SCATERGD (26066) -> OLYMPC (26087) CKT 2 at OLYMPC	Branch Amp	807.2	908.4	876.1	103.7%	1001.6	90.7%
N-2: DC-BIPOLE	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1700.7	2861.2	2400.0	119.2%	3199.9	89.4%
N-2: DC-BIPOLE	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1708.4	2875.8	2400.0	119.8%	3800.0	75.7%
N-2: DC-BIPOLE	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1809.2	2363.7	2199.9	107.4%	3280.5	72.1%
N-2: DC-BIPOLE	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1793.9	2343.7	2199.9	106.5%	3280.5	71.4%
N-2: DC-BIPOLE	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1650.5	2256.4	2199.9	102.6%	3235.5	69.7%
N-2: DC-BIPOLE	TABLE MT (30015) -> TABVAC11 (30031) CKT 1 at TABVAC11	Branch Amp	2142.9	2683.5	2667.0	100.6%	3999.9	67.1%
N-2: DC-BIPOLE	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2142.9	2683.5	2477.9	108.3%	3999.9	67.1%
N-2: DC-BIPOLE	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1557.8	2176.7	2134.0	102.0%	3499.9	62.2%
N-2: DC-BIPOLE	MIDWAY (30060) -> MIDVIN11 (30061) CKT 1 at MIDWAY	Branch Amp	1540.6	2153.0	2134.0	100.9%	3499.9	61.5%
N-2: DC-BIPOLE	ROBINSON (64895)	% Δ Volts	1.095	1.031				5.84%
N-2: DC-BIPOLE	ROBINSON (64885)	% Δ Volts	1.042	0.987				5.28%
N-2: Double Palo Verde	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1625.1	1550.0	104.8%	1782.5	91.2%
N-2: Double Palo Verde	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1700.7	2696.0	2400.0	112.3%	3199.9	84.3%
N-2: Double Palo Verde	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1708.4	2713.0	2400.0	113.0%	3800.0	71.4%
N-2: Double Palo Verde	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1809.2	2230.1	2199.9	101.4%	3280.5	68.0%
N-2: Double Palo Verde	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1793.9	2211.3	2199.9	100.5%	3280.5	67.4%
N-2: Double Palo Verde	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	2142.9	2553.1	2477.9	103.0%	3999.9	63.8%
N-2: Double Palo Verde	YORKCANY (12091)	% Δ Volts	1.005	0.924				8.06%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Double Palo Verde	SPRINGER (12077)	% Δ Volts	1.006	0.929				7.65%
N-2: Double Palo Verde	CIMARRON (12148)	% Δ Volts	1.007	0.93				7.65%
N-2: Double Palo Verde	RAINVL_T (12130)	% Δ Volts	1.008	0.931				7.64%
N-2: Double Palo Verde	RAINVL1 (12129)	% Δ Volts	1.009	0.932				7.63%
N-2: Double Palo Verde	ROBINSON (64895)	% Δ Volts	1.095	1.015				7.31%
N-2: Double Palo Verde	MONTROSE (79049)	% Δ Volts	0.996	0.928				6.83%
N-2: Double Palo Verde	ROBINSON (64885)	% Δ Volts	1.042	0.973				6.62%
N-2: Double Palo Verde	PTRSNFUR (62386)	% Δ Volts	1.019	0.952				6.58%
N-2: Double Palo Verde	LOSTCANY (79045)	% Δ Volts	0.974	0.911				6.47%
N-2: Double Palo Verde	PTRSNFLT (62030)	% Δ Volts	1.001	0.937				6.39%
N-2: Double Palo Verde	STORRIE (12079)	% Δ Volts	1.019	0.954				6.38%
N-2: Double Palo Verde	GALLINAT (10484)	% Δ Volts	1.02	0.955				6.37%
N-2: Double Palo Verde	ARRIBA (10016)	% Δ Volts	1.019	0.955				6.28%
N-2: Double Palo Verde	GRANDJCT (79036)	% Δ Volts	1.009	0.947				6.14%
N-2: Double Palo Verde	VALENCIA (10356)	% Δ Volts	0.999	0.938				6.11%
N-2: Double Palo Verde	BACA (10026)	% Δ Volts	0.997	0.937				6.02%
N-2: Double Palo Verde	BULLOCK (79079)	% Δ Volts	0.986	0.927				5.98%
N-2: Double Palo Verde	HAPPYCAN (79082)	% Δ Volts	0.987	0.928				5.98%
N-2: Double Palo Verde	CEDARHIL (60159)	% Δ Volts	1.088	1.023				5.97%
N-2: Double Palo Verde	NORTHMSA (79085)	% Δ Volts	0.988	0.929				5.97%
N-2: Double Palo Verde	SPRCKTAP (79115)	% Δ Volts	0.988	0.929				5.97%
N-2: Double Palo Verde	VALENCIA (10357)	% Δ Volts	1.023	0.962				5.96%
N-2: Double Palo Verde	MONTROSE (79048)	% Δ Volts	0.991	0.932				5.95%
N-2: Double Palo Verde	BLUEDOOR (79073)	% Δ Volts	0.983	0.925				5.90%
N-2: Double Palo Verde	E.CORTEZ (79074)	% Δ Volts	0.983	0.925				5.90%
N-2: Double Palo Verde	LOSTCANY (79044)	% Δ Volts	0.984	0.926				5.89%
N-2: Double Palo Verde	PEACHVLY (72801)	% Δ Volts	0.988	0.93				5.87%
N-2: Double Palo Verde	CORTEZ (79012)	% Δ Volts	0.983	0.926				5.80%
N-2: Double Palo Verde	GRANDJCT (70205)	% Δ Volts	1.003	0.945				5.78%
N-2: Double Palo Verde	EMPIRETS (79075)	% Δ Volts	0.986	0.929				5.78%
N-2: Double Palo Verde	DOUGHSPN (79182)	% Δ Volts	0.987	0.93				5.78%
N-2: Double Palo Verde	GRCUT TP (79180)	% Δ Volts	0.987	0.93				5.78%
N-2: Double Palo Verde	GRT CUT (79179)	% Δ Volts	0.987	0.93				5.78%
N-2: Double Palo Verde	GARNET M (79103)	% Δ Volts	0.988	0.931				5.77%
N-2: Double Palo Verde	STRNELSN (79183)	% Δ Volts	0.989	0.932				5.76%
N-2: Double Palo Verde	CLIFTON (70113)	% Δ Volts	1.007	0.949				5.76%
N-2: Double Palo Verde	TOWAOC (79122)	% Δ Volts	0.985	0.929				5.69%
N-2: Double Palo Verde	GUNVAL (79184)	% Δ Volts	0.987	0.931				5.67%
N-2: Double Palo Verde	GRT CUT (79178)	% Δ Volts	0.989	0.933				5.66%
N-2: Double Palo Verde	AMPS (65025)	% Δ Volts	1.007	0.95				5.66%
N-2: Double Palo Verde	GARNETAP (79104)	% Δ Volts	0.991	0.935				5.65%
N-2: Double Palo Verde	GOODMNPT (72780)	% Δ Volts	0.986	0.931				5.58%
N-2: Double Palo Verde	MAIN CO (79110)	% Δ Volts	0.986	0.931				5.58%
N-2: Double Palo Verde	SANDCANY (79121)	% Δ Volts	0.986	0.931				5.58%
N-2: Double Palo Verde	HOVENWEP (79108)	% Δ Volts	0.987	0.932				5.57%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Double Palo Verde	Y.JACK W (79118)	% Δ Volts	0.987	0.932				5.57%
N-2: Double Palo Verde	MCPHEE (79177)	% Δ Volts	1.006	0.95				5.57%
N-2: Double Palo Verde	GRANDJCT (70214)	% Δ Volts	1.009	0.953				5.55%
N-2: Double Palo Verde	MANCOSTP (79111)	% Δ Volts	0.994	0.939				5.53%
N-2: Double Palo Verde	HORIZON (70233)	% Δ Volts	1.018	0.962				5.50%
N-2: Double Palo Verde	MIDPOINT (60240)	% Δ Volts	1.092	1.032				5.49%
N-2: Double Palo Verde	Y.JACK 2 (79117)	% Δ Volts	0.988	0.934				5.47%
N-2: Double Palo Verde	PLESNTVW (72782)	% Δ Volts	0.99	0.936				5.45%
N-2: Double Palo Verde	ADOBE (70268)	% Δ Volts	1.025	0.97				5.37%
N-2: Double Palo Verde	GRANDJCT (79034)	% Δ Volts	0.99	0.937				5.35%
N-2: Double Palo Verde	CAHONE (79011)	% Δ Volts	0.992	0.939				5.34%
N-2: Double Palo Verde	DOECANYN (72781)	% Δ Volts	0.992	0.939				5.34%
N-2: Double Palo Verde	VINELAND (70454)	% Δ Volts	1.014	0.96				5.33%
N-2: Double Palo Verde	WBK 25 (50742)	% Δ Volts	1.016	0.962				5.31%
N-2: Double Palo Verde	HOTCHKIS (79042)	% Δ Volts	1.001	0.948				5.29%
N-2: Double Palo Verde	MCKENZIX (79193)	% Δ Volts	0.991	0.939				5.25%
N-2: Double Palo Verde	SOCANAL (79192)	% Δ Volts	0.992	0.94				5.24%
N-2: Double Palo Verde	UINTAH (70438)	% Δ Volts	1.032	0.978				5.23%
N-2: Double Palo Verde	UINTAH (70437)	% Δ Volts	1.018	0.965				5.21%
N-2: Double Palo Verde	CAMEO (70076)	% Δ Volts	1.019	0.966				5.20%
N-2: Double Palo Verde	HRD 25 (51210)	% Δ Volts	1.022	0.969				5.19%
N-2: Double Palo Verde	GRANDJCT (79035)	% Δ Volts	0.987	0.936				5.17%
N-2: Double Palo Verde	GLADSTON (12101)	% Δ Volts	1.01	0.958				5.15%
N-2: Double Palo Verde	DEBEQUE (70140)	% Δ Volts	0.994	0.943				5.13%
N-2: Double Palo Verde	JUANITA (79083)	% Δ Volts	0.994	0.943				5.13%
N-2: Double Palo Verde	BLACKLAK (12011)	% Δ Volts	1.018	0.966				5.11%
N-2: Double Palo Verde	DILLON S (62084)	% Δ Volts	1.006	0.955				5.07%
N-2: Double Palo Verde	CAMEO (70078)	% Δ Volts	1.017	0.966				5.01%
N-2: Echolake-Maple Vly 500 kV & Covington-Maple Vly 230 kV	No Violations							
N-2: Echolake-Maple Vly 500 kV & Rocky RH-Maple Vly 345 kV	No Violations							
N-2: Garrison-Taft #1 & #2 500 kV + RAS	No Violations							
N-2: Grassland-Cedar Sp 500kV & Slatt-Buckley 500kV	No Violations							
N-2: Grassland-Coyote 500kV & Slatt-Longhorn 500kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1582.7	1550.0	102.1%	1782.5	88.8%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1708.4	3310.8	2400.0	137.9%	3800.0	87.1%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM11	Branch Amp	1379.2	3165.0	2700.0	117.2%	4000.0	79.1%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	1597.3	3136.2	2400.0	130.7%	3800.0	82.5%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1583.2	3122.8	2400.0	130.1%	3800.0	82.2%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	1597.3	3103.0	2400.0	129.3%	3800.0	81.7%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1583.2	3092.8	2400.0	128.9%	3800.0	81.4%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations							
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1567.8	1550.0	101.2%	1782.5	88.0%
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at SLATT	Branch Amp	1835.8	3129.1	2900.0	107.9%	4350.0	71.9%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH11	Branch Amp	1840.0	3488.1	3000.0	116.3%	4050.0	86.1%
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1562.4	1550.0	100.8%	1782.5	87.7%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.4	346.7	320.0	108.4%	370.0	93.7%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	678.3	1176.9	950.0	123.9%	1286.0	91.5%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	CLATSOP (40243) -> LWSCLARK (45314) CKT 1 at CLATSOP	Branch MVA	80.1	96.8	94.0	103.0%	139.0	69.6%
N-2: Keeler-Pearl 500 & Sherwood-Carlton 230 kV	CARLTON (40181)	% Δ Volts	1.026	0.972				5.26%
N-2: Knight-Ostrander & Ostrander-Big Eddy 500 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1609.3	1550.0	103.8%	1782.5	90.3%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	89.0	160.2	150.0	106.8%	180.0	89.0%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1833.8	3694.7	2667.4	138.5%	4099.2	90.1%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI11	Branch Amp	1798.2	3587.0	2667.4	134.5%	4099.2	87.5%
N-2: Malin-Round Mtn #1 & #2 500 kV	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPTJACK	Branch Amp	1798.2	3587.0	2667.4	134.5%	4099.2	87.5%
N-2: Malin-Round Mtn #1 & #2 500 kV	DRUM (32218) -> DTCH FL1 (32220) CKT 1 at DRUM	Branch Amp	300.2	417.7	415.7	100.5%	483.5	86.4%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	2048.6	3247.2	2993.0	108.5%	4514.9	71.9%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	2048.6	3247.2	2993.0	108.5%	4514.9	71.9%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	2021.6	3217.4	2993.0	107.5%	4514.9	71.3%
N-2: Malin-Round Mtn #1 & #2 500 kV	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at MAXWELL	Branch Amp	2021.6	3217.4	2993.0	107.5%	4514.9	71.3%
N-2: Malin-Round Mtn #1 & #2 500 kV	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	2000.7	3181.4	2993.0	106.3%	4514.9	70.5%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1579.0	1550.0	101.9%	1782.5	88.6%
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1582.7	1550.0	102.1%	1782.5	88.8%
N-2: Monroe-CusterW & Chief Jo-Monroe 500 kV	No Violations							
N-2: Napavine-Allston & Paul-Allston #2 500 kV + RAS	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1554.2	1550.0	100.3%	1782.5	87.2%
N-2: Paul-Napavine & Paul-Allston #2 500 kV + RAS	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1554.4	1550.0	100.3%	1782.5	87.2%
N-2: Paul-Raver & Raver-Covingt4 500 kV	No Violations							
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	HORIZN (43740) -> SUNSETPG (43739) CKT 1 at SUNSETPG	Branch MVA	270.4	328.2	320.0	102.6%	370.0	88.7%
N-2: Pearl-Keeler 500 kV & Pearl-Sherwood 230 kV + RAS	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	678.3	1041.7	950.0	109.6%	1286.0	81.0%
N-2: Pearl-Ostrander 500 kV & Big Eddy-McLougln 230 kV	No Violations							
N-2: Pearl-Ostrander 500 kV & Ostrander-McLougln 230 kV	No Violations							
N-2: Raver-Covington #1 & #2 500 kV	No Violations							
N-2: Raver-Echo Lake & Raver-Schultz 500 kV	No Violations							
N-2: Raver-Paul & Napavine-Paul 500 kV	No Violations							
N-2: Raver-Paul 500 kV & Coulee-Olympia 300 kV	No Violations							
N-2: Raver-Paul 500 kV & Tacoma A-Chehalis 230 kV	No Violations							
N-2: Raver-Schultz #1 & #2 500 kV	No Violations							
N-2: Raver-Tacoma & Raver-Covingt4 500 kV	No Violations							
N-2: Raver-Tacoma 500 kV & Tacoma-Christop-Covington 230 kV	No Violations							
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAL SUB (64025) -> CAL S PS (64023) CKT 1 at CAL S PS	Branch MVA	89.0	167.5	150.0	111.7%	180.0	93.1%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	DELEVN (30114) -> CORTINA (30450) CKT 1 at CORTINA	Branch Amp	717.6	933.5	830.9	112.3%	926.3	100.8%

Appendix M - 16hs2a_2250idnw_ms_swips Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	FRUTLDJT (31120) -> FTSWRDJT (31122) CKT 1 at FRUTLDJT	Branch Amp	285.4	322.6	303.1	106.4%	339.7	95.0%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	BRDGVLLE (31110) -> FRUTLDJT (31120) CKT 1 at BRDGVLLE	Branch Amp	311.5	349.9	328.1	106.6%	371.4	94.2%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	FTSWRDJT (31122) -> GRBRVLLE (31116) CKT 1 at FTSWRDJT	Branch Amp	279.4	316.5	303.1	104.4%	339.7	93.2%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1833.8	3416.9	2667.4	128.1%	4099.2	83.4%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI12	Branch Amp	1798.2	3327.6	2667.4	124.8%	4099.2	81.2%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPTJACK	Branch Amp	1798.2	3311.2	2667.4	124.1%	4099.2	80.8%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	2048.6	3532.6	2993.0	118.0%	4514.9	78.2%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	2048.6	3532.6	2993.0	118.0%	4514.9	78.2%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	2021.6	3516.1	2993.0	117.5%	4514.9	77.9%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at MAXWELL	Branch Amp	2021.6	3516.1	2993.0	117.5%	4514.9	77.9%
N-2: Round Mtn-Table Mtn #1 & #2 500 kV + RAS	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	2000.7	3484.5	2993.0	116.4%	4514.9	77.2%
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	No Violations							
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	No Violations							
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	DELEVN (30114) -> CORTINA (30450) CKT 1 at CORTINA	Branch Amp	717.6	949.2	830.9	114.2%	926.3	102.5%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	FRUTLDJT (31120) -> FTSWRDJT (31122) CKT 1 at FRUTLDJT	Branch Amp	285.4	324.8	303.1	107.2%	339.7	95.6%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	BRDGVLLE (31110) -> FRUTLDJT (31120) CKT 1 at BRDGVLLE	Branch Amp	311.5	352.1	328.1	107.3%	371.4	94.8%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	FTSWRDJT (31122) -> GRBRVLLE (31116) CKT 1 at FTSWRDJT	Branch Amp	279.4	318.7	303.1	105.1%	339.7	93.8%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	PEASE (32200) -> E.MRY J1 (32288) CKT 1 at PEASE	Branch Amp	391.1	459.4	441.8	104.0%	507.1	90.6%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	ROUND MT (30245) -> COTWD_E (30105) CKT 3 at COTWD_E	Branch Amp	292.7	663.7	635.1	104.5%	745.5	89.0%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	E.NICOLS (32212) -> RIO OSO (32214) CKT 1 at E.NICOLS	Branch Amp	277.2	364.1	326.3	111.6%	416.7	87.4%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OLIMAX11 (30026) -> OLIMAX12 (30027) CKT 1 at OLIMAX11	Branch Amp	2048.6	3282.8	2993.0	109.7%	4514.9	72.7%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OLINDA (30020) -> OLIMAX11 (30026) CKT 1 at OLIMAX11	Branch Amp	2048.6	3282.8	2993.0	109.7%	4514.9	72.7%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	MAXWELL (30025) -> MAXTRA11 (30036) CKT 1 at MAXWELL	Branch Amp	2021.6	3263.6	2993.0	109.0%	4514.9	72.3%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	OLIMAX12 (30027) -> MAXWELL (30025) CKT 1 at MAXWELL	Branch Amp	2021.6	3263.6	2993.0	109.0%	4514.9	72.3%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	CAPOLI12 (90134) -> OLINDA (30020) CKT 1 at OLINDA	Branch Amp	1833.8	2954.3	2667.4	110.8%	4099.2	72.1%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	MAXTRA11 (30036) -> TRACY (30035) CKT 1 at TRACY	Branch Amp	2000.7	3233.0	2993.0	108.0%	4514.9	71.6%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	CAPOLI11 (90133) -> CAPOLI12 (90134) CKT 1 at CAPOLI12	Branch Amp	1798.2	2870.5	2667.4	107.6%	4099.2	70.0%
N-2: Table Mtn-Tesla & Table Mtn-Vaca Dixon 500 kV	CAPTJACK (45035) -> CAPOLI11 (90133) CKT 1 at CAPOLI11	Branch Amp	1798.2	2868.7	2667.4	107.5%	4099.2	70.0%
N-2: Taft-Bell 500 kV & Bell-Lancaster 230 kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Boundary #3 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Lancaster 230kV	No Violations							
N-2: Taft-Bell 500kV & Bell-Trentwood #2 115kV	No Violations							
N-2: Taft-Bell 500kV & Lancaster-Noxon 230kV	No Violations							
N-2: Taft-Dworshak & Garrison-Taft #1 500kV	No Violations							
N-2: Townsend-Garrison #1 & #2 500 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1569.9	1550.0	101.3%	1782.5	88.1%
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	TOWNSEND (62500) -> TWNSNDPS (62503) CKT 1 at TOWNSEND	Branch MVA	1517.7	1569.9	1550.0	101.3%	1782.5	88.1%
N-3: Schultz-Raver #1 & #2 & #3 500 kV	No Violations							

Appendix N

Idaho-Northwest v West of McNary & West of Slatt Studies

N1.0 Simultaneous Interaction Study: Idaho-Northwest (W-E) v West of McNary, Grassland Terminus

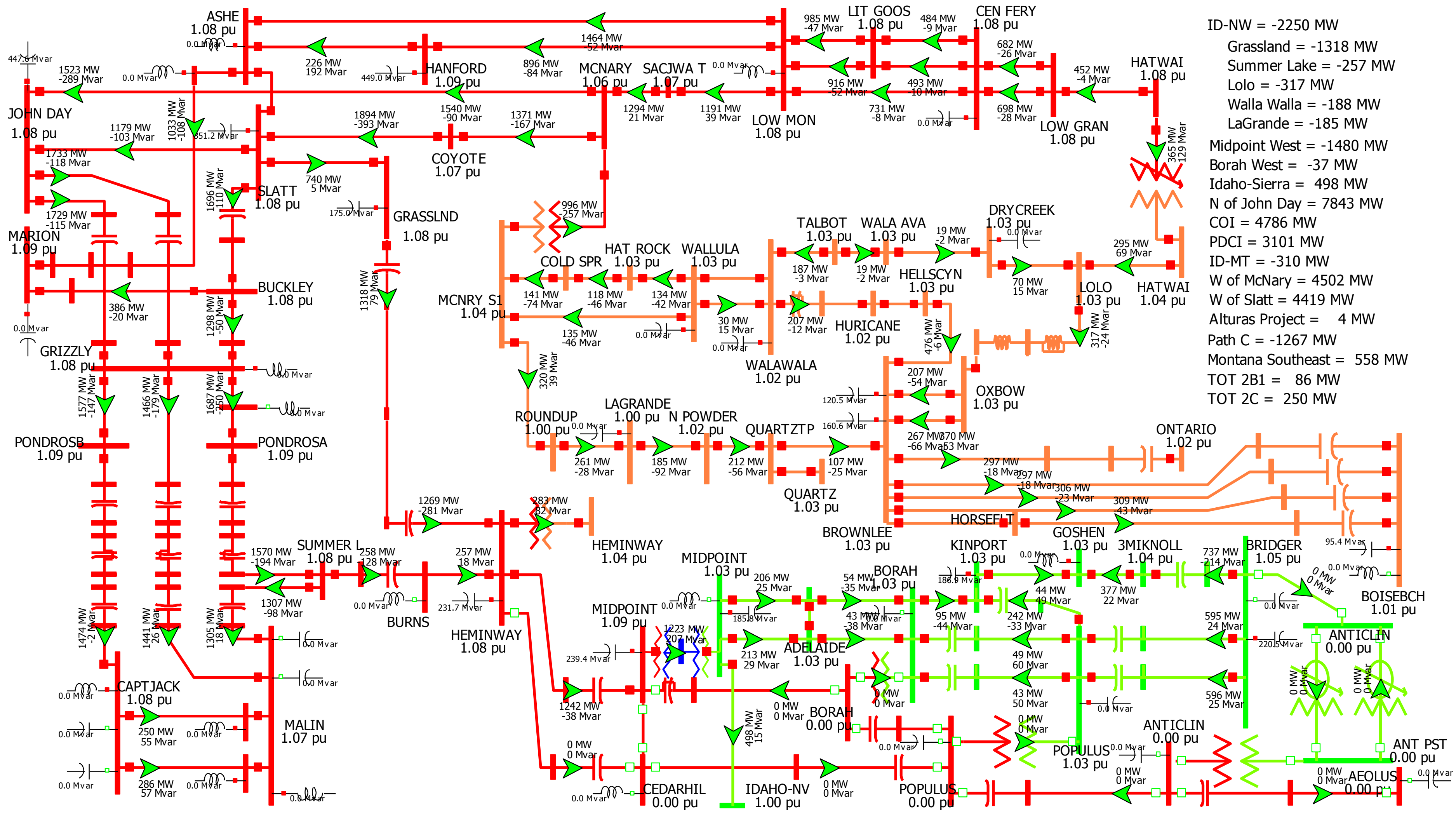

Figure N1: Idaho-Northwest 2250 MW west-to-east, West of McNary 4500 MW, Grassland Terminus

N1.1 Background & Need for Simultaneous Interaction Study

The Hemingway-Boardman Phase II study review group requested that the impacts of the Hemingway to Boardman project be evaluated with the West of McNary path at its 4500 MW east-to-west rating simultaneous with Idaho-Northwest at 2250 MW west-to-east. The study group also requested that the study be performed leaving out other planned projects such as Stage One of Gateway West, and the Cascade Crossings Transmission Project.

The West of McNary path is made up of the following lines: (1) Coyote-Slatt 500 kV, (2) McNary-John Day 500 kV, (3) McNary-Ross 345 kV, (4) Jones Canyon-Tumble Creek 230 kV and (5) Harvalum-Big Eddy 230 kV.

N1.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is 16hs2a_2250idnw_4500wom.

Step-by-step development of the 16hs2a_2250idnw_4500wom base case:

Step 1: Begin with the 16hs2a_2250idnw_solo base case.

> Utilize the base case developed in Section 4.10.2 Steady State Case Stressing. This case does not include Stage One of Gateway West or the Cascade Crossings Transmission Project.

Step 2: Stress the West of McNary path.

> Generation east of McNary was increased to stress the West of McNary path to 4,500 MW. The path flows were increased by modifying generation in the Pacific Northwest, mostly in Southeast Washington, and the Lower Columbia Basin. The generation increase east of McNary cooresponds with a reduction in generation west of McNary at places such as John Day, The Dalles, and Bonneville.

Step 3: Re-stress Idaho-Northwest

> The Idaho-Northwest path was re-stressed to 2250 MW in the west-to-east direction by reducing PacifiCorp East (PACE) and Idaho Power generation and replacing the generation with a schedule from the Northwest. No other paths were significantly altered.

N1.3 Post Transient Results

Post-transient contingency results for the 16hs2a_2250idnw_4500wom case can be found at the end of this section. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF IPC Hemingway-Grassland 500 kV & Hem 500/230 Xfmr

This is the limiting contingency for the Idaho-Northwest path in the west-to-east direction. This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 110% of its 1237 Amp nominal rating (97.3% of its 1396 Amp emergency rating). Since the overload is less than the Brownlee-Hells Canyon 230 kV line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table N1.1: Post-transient results – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	110% (1237 Amp Rating)	97.3% (1396 Amp Rating)
Oxbow – Lolo 230 kV	112% (920 Amp SOL)	98.7% (1047 Amp Rating)

A breaker failure at Hemingway significantly stresses the Brownlee-Hells Canyon and Oxbow-Lolo 230 kV lines. Section 2.4 considers different Hemingway 500 kV substation configurations to avoid severe breaker failures, however, at this time this breaker failure is considered to be credible.

In reality, with high north-to-south loading on the COI, loss of Hemingway-Boardman 500 kV depresses the voltage at Malin to a value less than 1.05 pu, resulting in FACRI insertion of the Fort Rock series capacitors. The results above do not include the operation of the FACRI, as a conservative planning assumption. The Fort Rock series capacitors are located in the 500 kV lines south of Grizzly.

Severe Post-Transient Contingency #2 – Hemingway-Grassland 500 kV + PTSN Shunt

This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 109% of its 1237 Amp nominal rating (96.1% of its 1396 Amp emergency rating). Since the overload is less than the Brownlee-Hells Canyon 230 kV line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table N1.2: Post-transient results – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	109% (1237 Amp Rating)	97.3% (1396 Amp Rating)
Oxbow – Lolo 230 kV	112% (920 Amp SOL)	98.7% (1047 Amp Rating)

In reality, with high north-to-south loading on the COI, loss of Hemingway-Boardman 500 kV depresses the voltage at Malin to a value less than 1.05 pu, resulting in FACRI insertion of the Fort Rock series capacitors. The results above do not include the operation of the FACRI, as a conservative planning assumption. The Fort Rock series capacitors are located in the 500 kV lines south of Grizzly.

Conclusion

Two of the notable post transient contingencies resulting in more severe system stressing were noted above. These contingencies, as well as all other post-transient contingencies, result in acceptable performance. Ultimately, the results indicate that Idaho-Northwest can achieve a 2250 MW west-to-east rating simultaneous with West of McNary at 4500 MW.

Appendix N1 - 16hs2a_2250idnw_4500wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	No Violations							
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1690.3	2924.8	2199.7	133.0%	3235.5	90.4%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1690.3	2924.8	2199.7	133.0%	3235.5	90.4%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1688.3	2917.0	2666.9	109.4%	3999.9	72.9%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1681.6	2907.9	2667.0	109.0%	4000.0	72.7%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU11 (90079) -> MALROU12 (90080) CKT 1 at MALROU11	Branch Amp	1643.6	2815.5	2229.7	126.3%	3514.0	80.1%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1643.6	2815.5	2699.7	104.3%	3999.9	70.4%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1638.4	2806.8	2699.7	104.0%	4000.0	70.2%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations							
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1238.2	1237.0	100.1%	1396.0	88.7%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	KINGEN (47332)	% Δ Volts	1.017	0.966				-5.01%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	KINGEN T (40608)	% Δ Volts	1.016	0.965				-5.02%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	LAGRAND2 (40620)	% Δ Volts	1.008	0.957				-5.06%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	LAGRANDE (40621)	% Δ Volts	1.004	0.953				-5.08%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	BOARD T2 (40123)	% Δ Volts	1.035	0.981				-5.22%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	ROUNDUP (40905)	% Δ Volts	1.001	0.945				-5.59%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	LAGRANDE (40619)	% Δ Volts	0.952	0.898				-5.67%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	DR W TP (45162)	% Δ Volts	1.030	0.970				-5.83%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	DR E TP (45160)	% Δ Volts	1.030	0.970				-5.83%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	DALREED (45075)	% Δ Volts	1.030	0.970				-5.83%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	ROUNDUP2 (41253)	% Δ Volts	0.984	0.925				-6.00%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	JONESCYN (47814)	% Δ Volts	1.032	0.969				-6.10%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	MCKAY (45322)	% Δ Volts	0.979	0.919				-6.13%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	ROUNDUP (40903)	% Δ Volts	0.984	0.923				-6.20%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	PENDLT T (41248)	% Δ Volts	0.974	0.913				-6.26%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	PENDLBPA (41247)	% Δ Volts	0.974	0.913				-6.26%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	BUCKAROO (45027)	% Δ Volts	0.972	0.911				-6.28%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	PENDLTON (45235)	% Δ Volts	0.971	0.910				-6.28%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	MISSIONT (47191)	% Δ Volts	0.970	0.908				-6.39%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	ATHENA (45015)	% Δ Volts	0.960	0.898				-6.46%
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	PILOT RK (45413)	% Δ Volts	0.960	0.897				-6.56%
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	No Violations							
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	No Violations							
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	No Violations							
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations							
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	No Violations							
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	No Violations							
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1259.5	1237.0	101.8%	1396.0	90.2%
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	812.1	924.5	920.0	100.5%	1046.8	88.3%
BF 5006 Slatt-Grassland 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1254.1	1237.0	101.4%	1396.0	89.8%
BF 5015 Ashe-Slatt 500 kV & Slatt 500 kV Caps	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations							
BF 5021 Slatt-John Day 500 kV	No Violations							
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1240.5	1237.0	100.3%	1396.0	88.9%
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5043 Coyote-Slatt & Slatt 500 kV Caps	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1238.6	1237.0	100.1%	1396.0	88.7%
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5211 Low Mon-McNary & McNary-John Day 500 kV	No Violations							
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV & Slatt 500 kV Caps	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	812.1	1033.1	920.0	112.3%	1046.8	98.7%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1358.8	1237.0	109.8%	1396.0	97.3%
BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr	IMNAHA (60278)	% Δ Volts	0.982	0.926				-5.70%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1242.4	1237.0	100.4%	1396.0	89.0%
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1252.5	1237.0	101.2%	1396.0	89.7%
BF McNary 230 kV SECT 1	No Violations							
BF McNary 230 kV SECT 2	No Violations							
BF McNary 230 kV SECT 3	No Violations							
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	812.1	986.4	920.0	107.2%	1046.8	94.2%
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1307.2	1237.0	105.7%	1396.0	93.6%
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	HEMBOA11 (61953)	% Δ Volts	1.102	1.021				-7.35%
Bus: Buckley 500 kV	No Violations							
Bus: Summer Lake 500 kV	No Violations							
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV	No Violations							
N-1: Brownlee-Ontario 230 kV	QUARTZ (60305) -> NELSN TP (61055) CKT 1 at QUARTZ	Branch Amp	227.8	409.7	400.0	102.4%	491.2	83.4%
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Coyote-Slatt 500 kV	No Violations							
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV + RAS	No Violations							
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1254.1	1237.0	101.4%	1396.0	89.8%
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	812.1	997.0	920.0	108.4%	1046.8	95.2%
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1689.9	2890.4	2400.0	120.4%	3199.9	90.3%
N-1: Hemingway-Grassland 500 kV + FACRI	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1253.9	1237.0	101.4%	1396.0	89.8%
N-1: Hemingway-Grassland 500 kV + FACRI	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	1698.2	2908.6	2400.0	121.2%	3800.0	76.5%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	812.1	1006.1	920.0	109.4%	1046.8	96.1%
N-1: Hemingway-Grassland 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1332.5	1237.0	107.7%	1396.0	95.5%
N-1: Hemingway-Summer Lake 500 kV	No Violations							
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Low Mon-McNary 500 kV	No Violations							
N-1: Malin-Summer Lake 500 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	JONESCYN (47814)	% Δ Volts	1.032	0.978				-5.23%
N-1: McNary S2-McNary S3 230 kV	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-Calpine PH	No Violations							
N-1: McNary-Coyote 500 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1266.1	1237.0	102.4%	1396.0	90.7%
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1252.7	1237.0	101.3%	1396.0	89.7%
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1270.1	1237.0	102.7%	1396.0	91.0%
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Roundup-Lagrande 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1248.5	1237.0	100.9%	1396.0	89.4%
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	812.1	948.5	920.0	103.1%	1046.8	90.6%
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Coyote-Slatt 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1256.4	1237.0	101.6%	1396.0	90.0%
N-2: Ashe-Marion & Coyote-Slatt 500 kV	JONTMB11 (90164)	% Δ Volts	1.003	0.948				-5.48%
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & Coyote-Slatt 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1307.0	1237.0	105.7%	1396.0	93.6%
N-2: Ashe-Slatt & Coyote-Slatt 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	812.1	977.3	920.0	106.2%	1046.8	93.4%
N-2: Ashe-Slatt & Coyote-Slatt 500 kV	PTRSNFUR (62386)	% Δ Volts	1.021	0.970				-5.00%
N-2: Ashe-Slatt & Coyote-Slatt 500 kV	ASHMAR22 (90007)	% Δ Volts	1.089	1.034				-5.05%
N-2: Ashe-Slatt & Coyote-Slatt 500 kV	JONTMB11 (90164)	% Δ Volts	1.003	0.943				-5.98%
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	No Violations							

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	812.1	972.4	920.0	105.7%	1046.8	92.9%
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							
N-2: DC-BIPOLE	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1689.9	2661.8	2400.0	110.9%	3199.9	83.2%
N-2: DC-BIPOLE	E.NICOLS (32212) -> RIO OSO (32214) CKT 1 at E.NICOLS	Branch Amp	295.5	331.5	326.3	101.6%	416.7	79.5%
N-2: DC-BIPOLE	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1807.8	2362.4	2199.9	107.4%	3280.5	72.0%
N-2: DC-BIPOLE	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1792.5	2342.4	2199.9	106.5%	3280.5	71.4%
N-2: DC-BIPOLE	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1690.3	2292.1	2199.7	104.2%	3235.5	70.8%
N-2: DC-BIPOLE	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1690.3	2292.1	2199.7	104.2%	3235.5	70.8%
N-2: DC-BIPOLE	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	1698.2	2677.7	2400.0	111.6%	3800.0	70.5%
N-2: DC-BIPOLE	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1616.8	2303.3	2134.0	107.9%	3499.9	65.8%
N-2: DC-BIPOLE	MIDWAY (30060) -> MIDVIN11 (30061) CKT 1 at MIDVIN11	Branch Amp	1595.1	2269.5	2134.0	106.3%	3499.9	64.8%
N-2: DC-BIPOLE	MIDVIN12 (30062) -> VINCENT (24156) CKT 1 at VINCENT	Branch Amp	1573.4	2240.8	2134.0	105.0%	3499.9	64.0%
N-2: DC-BIPOLE	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1936.3	2494.7	2477.9	100.7%	3999.9	62.4%
N-2: DC-BIPOLE	YORKCANY (12091)	% Δ Volts	1.0	1.0				-5.2%
N-2: Double Palo Verde	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM14	Branch Amp	1689.9	2438.8	2400.0	101.6%	3199.9	76.2%
N-2: Double Palo Verde	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1698.2	2460.2	2400.0	102.5%	3800.0	64.7%
N-2: Double Palo Verde	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1616.8	2158.8	2134.0	101.2%	3499.9	61.7%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1698.2	3107.2	2400.0	129.5%	3800.0	81.8%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM11	Branch Amp	1393.2	2987.2	2700.0	110.6%	4000.0	74.7%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON16	Branch Amp	1597.0	2942.7	2400.0	122.6%	3800.0	77.4%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1581.9	2927.3	2400.0	122.0%	3800.0	77.0%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON16	Branch Amp	1597.0	2966.2	2400.0	123.6%	3800.0	78.1%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1581.9	2955.2	2400.0	123.1%	3800.0	77.8%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations							
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	1813.7	3038.7	2900.0	104.8%	4350.0	69.9%
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	No Violations							
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH11	Branch Amp	1840.8	3366.1	3000.0	112.2%	4050.0	83.1%
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 + RAS	No Violations							
N-2: McNary-John Day & Rock Creek-John Day 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1241.2	1237.0	100.3%	1396.0	88.9%
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	MCNRY S1 (41351) -> MCNARY (40723) CKT 1 at MCNARY	Branch MVA	1052.5	1480.4	1368.0	108.2%	1644.0	90.0%
N-2: Midpoint-Hemingway 500 kV & Midpoint-King 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1159.7	1258.0	1237.0	101.7%	1396.0	90.1%
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	No Violations							
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							

N2.0 Simultaneous Interaction Study: Idaho-Northwest (W-E) v West of McNary, Longhorn Terminus, Longhorn Generation

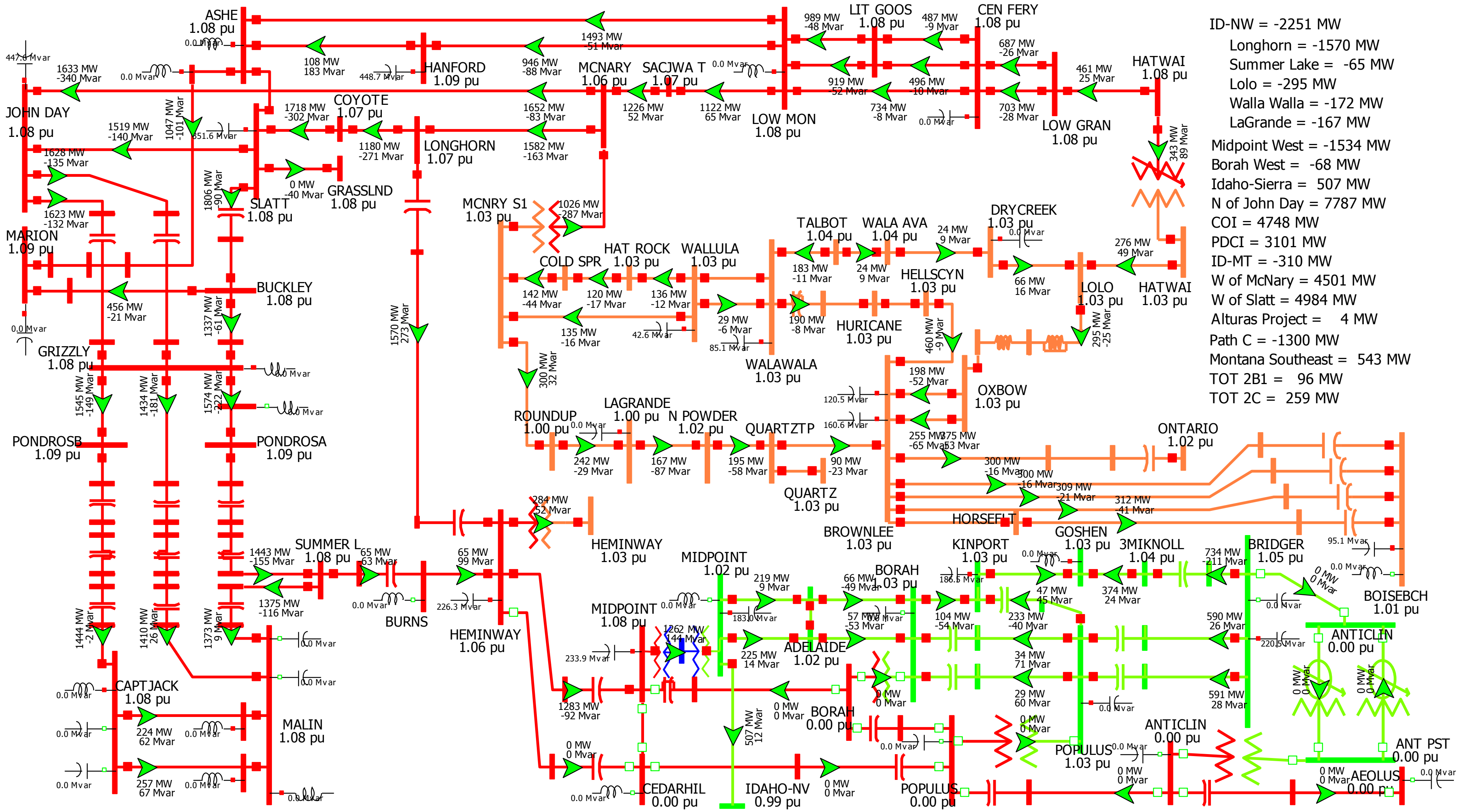

Figure N2: Idaho-Northwest 2250 MW west-to-east, West of McNary 4500 MW, Longhorn Terminus, High Longhorn Gen

N2.1 Background & Need for Simultaneous Interaction Study

The Hemingway-Boardman Phase II study review group requested that the impacts of the Hemingway to Boardman project be evaluated with the West of McNary path at its 4500 MW east-to-west rating simultaneous with Idaho-Northwest at 2250 MW west-to-east. The study group also requested that the study be performed leaving out other planned projects such as Stage One of Gateway West, and the Cascade Crossings Transmission Project. Given the uncertainty of the northwest terminus of the Hemingway-Boardman project, this section looks at a Longhorn terminus option.

Due to the location of Longhorn, just east of the West of McNary cut plane, generation east of the cutplane had to increase substantially compared to the Grassland terminus alternative studied in Section N1. This section models Longhorn generation is at its maximum in order to restress the West of McNary path. The following section, Section N3, models Stanfield (McNary 500 kV) generation at its maximum.

Terminating the Hemingway-Boardman 500 kV transmission project at Longhorn is assumed not to affect the definition of the West of McNary path. This may change in the future. The West of McNary path is made up of the following lines: (1) Coyote-Slatt 500 kV, (2) McNary-John Day 500 kV, (3) McNary-Ross 345 kV, (4) Jones Canyon-Tumble Creek 230 kV and (5) Harvalum-Big Eddy 230 kV.

N2.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is 16hs2a_lh_2250idnw_4500wom.

<u>Step-by-step development of the 16hs2a_lh_2250idnw_4500wom base case:</u>

Step 1: Begin with the 16hs2a_2250idnw_4500wom base case.

> Utilize the base case developed in Section N1.2 Steady State Case Stressing. Shift the terminus of the Hemingway-Boardman transmission project from Grassland to Longhorn.

Step 2: Stress the West of McNary path.

> Over 1500 MW of generation drops off at Longhorn, toward Hemingway, in this configuration, and does not reach the West of McNary cutplane. In the Grassland terminus option, this flow would have crossed the West of McNary cutplane before sinking toward Hemingway. To make up for this reduction in flow across West of McNary, wind generation at Longhorn was stressed

to maximum levels (1214 MW), and generation at Stanfield (McNary 500 kV) was also ramped up to 362 MW. Combining Longhorn & Stanfield, this is 1576 MW of additional generation east of the cutplane when compared to the Section N1 base case. The generation increase at Longhorn & Stanfield cooresponds with a reduction in generation west of McNary at places such as John Day, The Dalles, Bonneville and Boardman. Perhaps in the future, West of McNary would be redefined if the Hemingway-Boardman transmission project terminates at Longhorn.

Step 3: Re-stress Idaho-Northwest

The Idaho-Northwest path was re-stressed to 2250 MW in the west-to-east direction by reducing PacifiCorp East (PACE) and Idaho Power generation and replacing the generation with a schedule from the Northwest. No other paths were significantly altered.

N2.3 Post Transient Results

Post-transient contingency results for the 16hs2a_lh_2250idnw_4500wom case can be found at the end of this section. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF IPC Hemingway-Longhorn 500 kV & Hem 500/230 Xfmr

This is the limiting contingency for the Idaho-Northwest path in the west-to-east direction. This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 111% of its 1237 Amp nominal rating (98.4% of its 1396 Amp emergency rating). Since the overload is less than the Brownlee-Hells Canyon 230 kV line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table N2.1: Post-transient results – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	111% (1237 Amp Rating)	98.4% (1396 Amp Rating)
Oxbow – Lolo 230 kV	111% (920 Amp SOL)	97.3% (1047 Amp Rating)

A breaker failure at Hemingway significantly stresses the Brownlee-Hells Canyon and Oxbow-Lolo 230 kV lines. Section 2.4 considers different Hemingway 500 kV substation configurations to avoid severe breaker failures, however, at this time this breaker failure is considered to be credible.

In reality, with high north-to-south loading on the COI, loss of Hemingway-Boardman 500 kV depresses the voltage at Malin to a value less than 1.05 pu, resulting in FACRI insertion of the Fort Rock series capacitors. The results above do not include the operation of the FACRI, as a conservative planning assumption. The Fort Rock series capacitors are located in the 500 kV lines south of Grizzly.

Severe Post-Transient Contingency #2 – Hemingway-Longhorn 500 kV + PTSN Shunt

This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 110% of its 1237 Amp nominal rating (97.1% of its 1396 Amp emergency rating). Since the overload is less than the Brownlee-

Hells Canyon 230 kV line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table N2.2: Post-transient results – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	110% (1237 Amp Rating)	97.1% (1396 Amp Rating)
Oxbow – Lolo 230 kV	109% (920 Amp SOL)	95.6% (1047 Amp Rating)

In reality, with high north-to-south loading on the COI, loss of Hemingway-Boardman 500 kV depresses the voltage at Malin to a value less than 1.05 pu, resulting in FACRI insertion of the Fort Rock series capacitors. The results above do not include the operation of the FACRI, as a conservative planning assumption. The Fort Rock series capacitors are located in the 500 kV lines south of Grizzly.

Severe Post-Transient Contingency #3 – BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV

This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 107% of its 1237 Amp nominal rating (95.0% of its 1396 Amp emergency rating). Since the overload is less than the Brownlee-Hells Canyon 230 kV line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table N2.3: Post-transient results – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	107% (1237 Amp Rating)	95.0% (1396 Amp Rating)
Oxbow – Lolo 230 kV	106% (920 Amp SOL)	93.5% (1047 Amp Rating)

In reality, with high north-to-south loading on the COI, loss of Hemingway-Boardman 500 kV depresses the voltage at Malin to a value less than 1.05 pu, resulting in FACRI insertion of the Fort Rock series capacitors. The results above do not include the operation of the FACRI, as a conservative planning assumption. The Fort Rock series capacitors are located in the 500 kV lines south of Grizzly.

Conclusion

Three of the notable post transient contingencies resulting in more severe system stressing were noted above. These contingencies, as well as all other post-transient contingencies, result in acceptable performance. Ultimately, the results indicate that Idaho-Northwest can achieve a 2250 MW west-to-east rating simultaneous with West of McNary at 4500 MW even if the Hemingway-Boardman 500 kV transmission project has a Longhorn northwest terminus.

Appendix N2 - 16hs2a_lh_2250idnw_4500wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	No Violations							
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1676.0	2901.0	2199.7	131.9%	3235.5	89.7%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1676.0	2901.0	2199.7	131.9%	3235.5	89.7%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALIN	Branch Amp	1674.0	2893.4	2666.9	108.5%	3999.9	72.3%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1667.4	2884.1	2667.0	108.1%	4000.0	72.1%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU11 (90079) -> MALROU12 (90080) CKT 1 at MALROU11	Branch Amp	1629.7	2793.5	2229.7	125.3%	3514.0	79.5%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1629.7	2793.5	2699.7	103.5%	3999.9	69.8%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1624.6	2784.7	2699.7	103.1%	4000.0	69.6%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations							
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	RATSN C1 (47891)	% Δ Volts	1.030	0.978				-5.05%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	WHT F C1 (47896)	% Δ Volts	1.030	0.978				-5.05%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	LJ2 C1 (47807)	% Δ Volts	1.034	0.980				-5.22%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	LEANJ C1 (44886)	% Δ Volts	1.036	0.978				-5.60%
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	LJ2 C2 (47811)	% Δ Volts	1.043	0.977				-6.33%
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	MCNRY S1 (41351) -> MCNARY (40723) CKT 1 at MCNARY	Branch MVA	1093.0	1376.1	1368.0	100.6%	1644.0	83.7%
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	No Violations							
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	No Violations							
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	No Violations							
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations							
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	No Violations							
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	No Violations							
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	No Violations							
BF 5006 Slatt-Grassland 500 kV	No Violations							
BF 5015 Ashe-Slatt 500 kV & Slatt 500 kV Caps	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations							
BF 5021 Slatt-John Day 500 kV	No Violations							
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	LONGHORN (40724) -> HEMLON12 (61955) CKT 1 at HEMLON12	Branch Amp	1702.8	2033.0	2000.1	101.6%	3000.0	67.8%

Appendix N2 - 16hs2a_lh_2250idnw_4500wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	HEMLON11 (61956) -> HEMINWAY (60155) CKT 1 at HEMINWAY	Branch Amp	1675.9	2026.8	2000.1	101.3%	3000.0	67.6%
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5043 Coyote-Slatt & Slatt 500 kV Caps	LONGHORN (40724) -> HEMLON12 (61955) CKT 1 at HEMLON12	Branch Amp	1702.8	2038.3	2000.1	101.9%	3000.0	67.9%
BF 5043 Coyote-Slatt & Slatt 500 kV Caps	HEMLON11 (61956) -> HEMINWAY (60155) CKT 1 at HEMINWAY	Branch Amp	1675.9	2022.6	2000.1	101.1%	3000.0	67.4%
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5211 Low Mon-McNary & McNary-John Day 500 kV	No Violations							
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV & Slatt 500 kV Caps	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1120.9	1373.6	1237.0	111.0%	1396.0	98.4%
BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	750.9	1018.9	920.0	110.8%	1046.8	97.3%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	No Violations							
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	No Violations							
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1120.9	1288.6	1237.0	104.2%	1396.0	92.3%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	750.9	947.3	920.0	103.0%	1046.8	90.5%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1120.9	1333.0	1237.0	107.8%	1396.0	95.5%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	750.9	965.4	920.0	104.9%	1046.8	92.2%
BF LH Longhorn-Coyote 500 kV & Longhorn Gen	No Violations							
BF LH McNary-Longhorn & Hemingway-Longhorn 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1120.9	1326.7	1237.0	107.2%	1396.0	95.0%
BF LH McNary-Longhorn & Hemingway-Longhorn 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	750.9	978.5	920.0	106.4%	1046.8	93.5%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	No Violations							
BF LH McNary-Longhorn 500 kV & Longhorn Gen	No Violations							
BF McNary 230 kV SECT 1	No Violations							
BF McNary 230 kV SECT 2	No Violations							
BF McNary 230 kV SECT 3	No Violations							
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	No Violations							
Bus: Buckley 500 kV	No Violations							
Bus: Summer Lake 500 kV	No Violations							
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV	No Violations							
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							

Appendix N2 - 16hs2a_lh_2250idnw_4500wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Coyote-Slatt 500 kV	LONGHORN (40724) -> HEMLON12 (61955) CKT 1 at LONGHORN	Branch Amp	1702.8	2023.6	2000.1	101.2%	3000.0	67.5%
N-1: Coyote-Slatt 500 kV	HEMLON11 (61956) -> HEMINWAY (60155) CKT 1 at HEMINWAY	Branch Amp	1675.9	2006.7	2000.1	100.3%	3000.0	66.9%
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV + RAS	No Violations							
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	No Violations							
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	750.9	928.6	920.0	100.9%	1046.8	88.7%
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Longhorn 500 kV + FACRI	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1120.9	1268.7	1237.0	102.6%	1396.0	90.9%
N-1: Hemingway-Longhorn 500 kV + FACRI	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1550.1	2847.2	2400.0	118.6%	3199.9	89.0%
N-1: Hemingway-Longhorn 500 kV + FACRI	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	1557.7	2867.0	2400.0	119.5%	3800.0	75.4%
N-1: Hemingway-Longhorn 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1120.9	1354.9	1237.0	109.5%	1396.0	97.1%
N-1: Hemingway-Longhorn 500 kV + PTSN Shunt	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	750.9	1001.0	920.0	108.8%	1046.8	95.6%
N-1: Hemingway-Summer Lake 500 kV	No Violations							
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Longhorn-Coyote 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-McNary 500 kV	MCNRY S1 (41351) -> MCNARY (40723) CKT 1 at MCNARY	Branch MVA	1093.0	1371.3	1368.0	100.2%	1644.0	83.4%
N-1: Malin-Summer Lake 500 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary S2-McNary S3 230 kV	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-Calpine PH	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Longhorn 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							

Appendix N2 - 16hs2a_lh_2250idnw_4500wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: McNary-Roundup 230 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	No Violations							
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Roundup-Lagrande 230 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations							
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Coyote-Slatt 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at SLATT	Branch Amp	1928.7	2920.4	2900.0	100.7%	4350.0	67.1%
N-2: Ashe-Slatt & Coyote-Slatt 500 kV	LONGHORN (40724) -> HEMLON12 (61955) CKT 1 at HEMLON12	Branch Amp	1702.8	2019.3	2000.1	101.0%	3000.0	67.3%
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	No Violations							
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	No Violations							
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							
N-2: DC-BIPOLE	MIDPOINT (60240) -> MPSNT501 (60237) CKT 1 at MIDPOINT	Branch MVA	1270.2	1500.2	1500.0	100.0%	1650.0	90.9%
N-2: DC-BIPOLE	E.NICOLS (32212) -> RIO OSO (32214) CKT 1 at E.NICOLS	Branch Amp	294.9	330.5	326.3	101.3%	416.7	79.3%
N-2: DC-BIPOLE	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1550.1	2424.6	2400.0	101.0%	3199.9	75.8%
N-2: DC-BIPOLE	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1794.7	2343.9	2199.9	106.5%	3280.5	71.5%
N-2: DC-BIPOLE	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1779.5	2324.1	2199.9	105.6%	3280.5	70.8%
N-2: DC-BIPOLE	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1676.0	2270.6	2199.7	103.2%	3235.5	70.2%
N-2: DC-BIPOLE	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1676.0	2270.6	2199.7	103.2%	3235.5	70.2%
N-2: DC-BIPOLE	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1599.6	2289.0	2134.0	107.3%	3499.9	65.4%
N-2: DC-BIPOLE	MIDWAY (30060) -> MIDVIN11 (30061) CKT 1 at MIDWAY	Branch Amp	1578.2	2255.4	2134.0	105.7%	3499.9	64.4%
N-2: DC-BIPOLE	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1557.7	2438.0	2400.0	101.6%	3800.0	64.2%

Appendix N2 - 16hs2a_lh_2250idnw_4500wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: DC-BIPOLE	MIDVIN12 (30062) -> VINCENT (24156) CKT 1 at MIDVIN12	Branch Amp	1556.7	2227.0	2134.0	104.4%	3499.9	63.6%
N-2: DC-BIPOLE	TABVAC11 (30031) -> TABVAC12 (30032) CKT 1 at TABVAC11	Branch Amp	1923.2	2478.0	2477.9	100.0%	3999.9	62.0%
N-2: DC-BIPOLE	YORKCANY (12091)	% Δ Volts	1.001	0.949				-5.19%
N-2: Double Palo Verde	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1599.6	2140.1	2134.0	100.3%	3499.9	61.1%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	1557.7	2929.0	2400.0	122.0%	3800.0	77.1%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM11	Branch Amp	1467.3	3012.6	2700.0	111.6%	4000.0	75.3%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	1563.1	2812.6	2400.0	117.2%	3800.0	74.0%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1548.0	2797.6	2400.0	116.6%	3800.0	73.6%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON16	Branch Amp	1563.1	2953.6	2400.0	123.1%	3800.0	77.7%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1548.0	2942.3	2400.0	122.6%	3800.0	77.4%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations							
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at SLATT	Branch Amp	1928.7	3059.8	2900.0	105.5%	4350.0	70.3%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH11	Branch Amp	1728.9	3213.5	3000.0	107.1%	4050.0	79.3%
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	No Violations							
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							

N3.0 Simultaneous Interaction Study: Idaho-Northwest (W-E) v West of McNary, Longhorn Terminus, Stanfield Generation

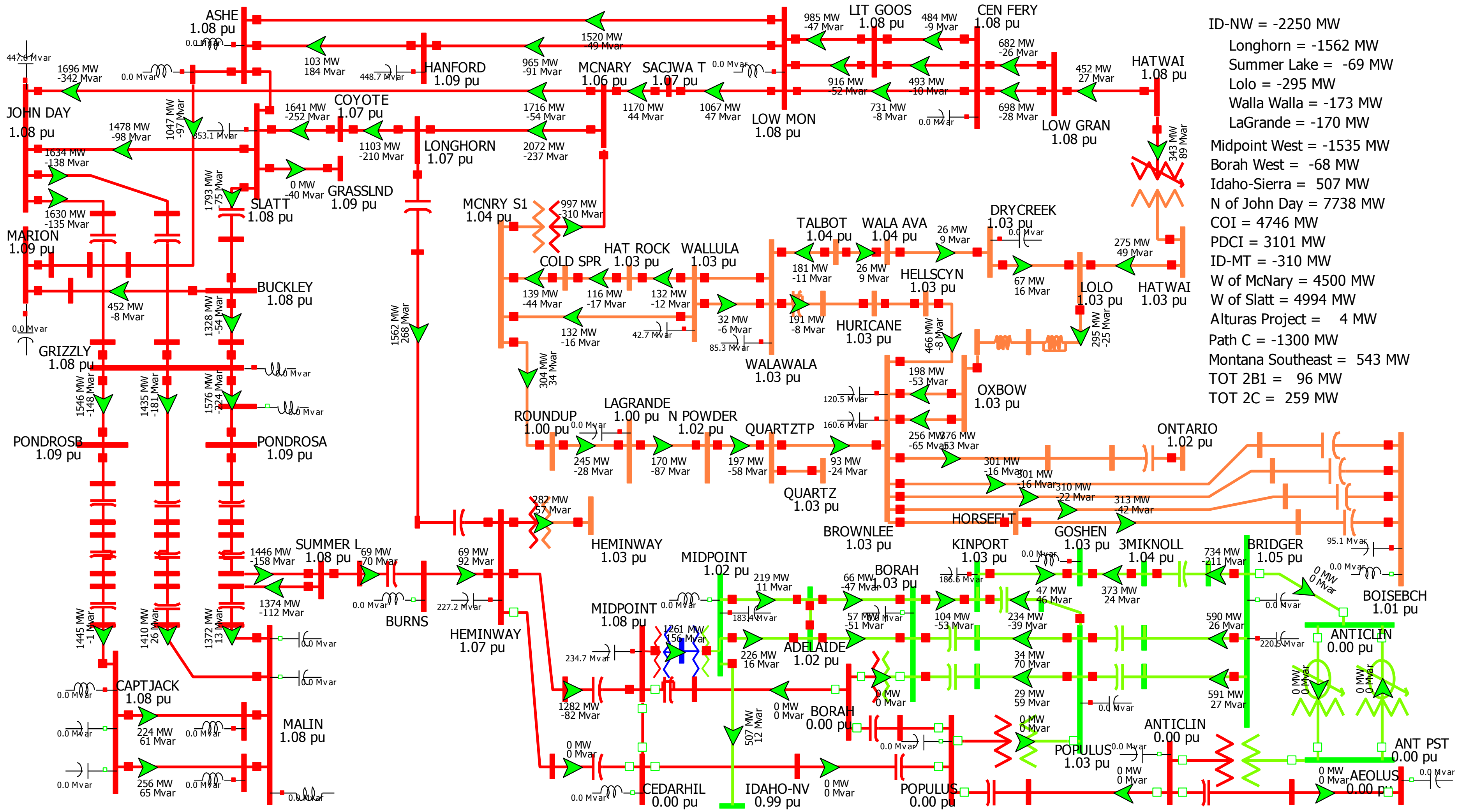

Figure N3: Idaho-Northwest 2250 MW west-to-east, West of McNary 4500 MW, Longhorn Terminus, High Stanfield Gen

N3.1 Background & Need for Simultaneous Interaction Study

This section is the same as Section N2 except Stanfield generation (located at McNary 500 kV) is modeled at its maximum, rather than Longhorn generation at its maximum. This section will determine whether there is an issue if the generation that stresses West of McNary were to be located at McNary rather than at Longhorn. Idaho-Northwest is stressed to 2250 MW west-to-east simultaneous with West of McNary at 4500 MW east-to-west.

N3.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is 16hs2a_lh_stanfield_2250idnw_4500wom.

Step-by-step development of the 16hs2a_lh_stanfield_2250idnw_4500wom base case:

Step 1: Begin with the 16hs2a_lh_2250idnw_4500wom base case.

Utilize the base case developed in Section N2.2 Steady State Case Stressing.

Step 2: Stress the West of McNary path.

This base case is intended to model Stanfield generation at its 1000 MW maximum capability. Utilizing the case from Section N2, Stanfield generation was increased from 362 MW to 1000 MW. Increases in Stanfield generation resulted in a corresponding decrease in Longhorn generation, from 1214 MW in the Section N2 base case to 620 MW in this base case. Total generation between Longhorn & Stanfield is 1620 MW, compared to the 1576 MW in the Section N2 base case, and 0 MW in the Section N1 base case.

Step 3: Re-stress Idaho-Northwest

The Idaho-Northwest path was re-stressed to 2250 MW in the west-to-east direction by reducing PacifiCorp East (PACE) and Idaho Power generation and replacing the generation with a schedule from the Northwest. No other paths were significantly altered.

N3.3 Post Transient Results

Post-transient contingency results for the 16hs2a_lh_stanfield_2250idnw_4500wom case can be found at the end of this section. Details for the severe/notable contingencies can be found below.

Severe Post-Transient Contingency #1 – BF IPC Hemingway-Longhorn 500 kV & Hem 500/230 Xfmr

This is the limiting contingency for the Idaho-Northwest path in the west-to-east direction. This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 112% of its 1237 Amp nominal rating (99.3% of its 1396 Amp emergency rating). Since the overload is less than the Brownlee-Hells Canyon 230 kV line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table N2.4: Post-transient results – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	112% (1237 Amp Rating)	99.3% (1396 Amp Rating)
Oxbow – Lolo 230 kV	111% (920 Amp SOL)	97.2% (1047 Amp Rating)

A breaker failure at Hemingway significantly stresses the Brownlee-Hells Canyon and Oxbow-Lolo 230 kV lines. Section 2.4 considers different Hemingway 500 kV substation configurations to avoid severe breaker failures, however, at this time this breaker failure is considered to be credible.

In reality, with high north-to-south loading on the COI, loss of Hemingway-Boardman 500 kV depresses the voltage at Malin to a value less than 1.05 pu, resulting in FACRI insertion of the Fort Rock series capacitors. The results above do not include the operation of the FACRI, as a conservative planning assumption. The Fort Rock series capacitors are located in the 500 kV lines south of Grizzly.

Severe Post-Transient Contingency #2 – Hemingway-Longhorn 500 kV + PTSN Shunt

This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 110% of its 1237 Amp nominal rating (97.9% of its 1396 Amp emergency rating). Since the overload is less than the Brownlee-Hells Canyon 230 kV line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table N2.5: Post-transient results – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	110% (1237 Amp Rating)	97.9% (1396 Amp Rating)
Oxbow – Lolo 230 kV	108% (920 Amp SOL)	95.3% (1047 Amp Rating)

In reality, with high north-to-south loading on the COI, loss of Hemingway-Boardman 500 kV depresses the voltage at Malin to a value less than 1.05 pu, resulting in FACRI insertion of the Fort Rock series capacitors. The results above do not include the operation of the FACRI, as a conservative planning assumption. The Fort Rock series capacitors are located in the 500 kV lines south of Grizzly.

Severe Post-Transient Contingency #3 – BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV

This contingency results in overloading the Brownlee-Hells Canyon 230 kV line to 107% of its 1237 Amp nominal rating (94.5% of its 1396 Amp emergency rating). Since the overload is less than the Brownlee-

Hells Canyon 230 kV line's emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Table N2.6: Post-transient results – BF IPC Midpoint-Hemingway 500 kV & Hem 500/230 Xfmr

Element	Nominal % Loading	Emergency % Loading
Brownlee-Hells Canyon 230 kV	107% (1237 Amp Rating)	94.5% (1396 Amp Rating)
Oxbow – Lolo 230 kV	104% (920 Amp SOL)	91.5% (1047 Amp Rating)

In reality, with high north-to-south loading on the COI, loss of Hemingway-Boardman 500 kV depresses the voltage at Malin to a value less than 1.05 pu, resulting in FACRI insertion of the Fort Rock series capacitors. The results above do not include the operation of the FACRI, as a conservative planning assumption. The Fort Rock series capacitors are located in the 500 kV lines south of Grizzly.

Conclusion

Three of the notable post transient contingencies resulting in more severe system stressing were noted above. These contingencies, as well as all other post-transient contingencies, result in acceptable performance. Ultimately, the results indicate that Idaho-Northwest can achieve a 2250 MW west-to-east rating simultaneous with West of McNary at 4500 MW even if the Hemingway-Boardman 500 kV transmission project has a Longhorn northwest terminus and generation is high at Stanfield rather than Longhorn.

Appendix N3 - 16hs2a_lh_stanfield_2250idnw_4500wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	No Violations							
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1675.0	2898.9	2199.7	131.8%	3235.5	89.6%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1675.0	2898.9	2199.7	131.8%	3235.5	89.6%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALIN (40687) -> MALROU21 (40696) CKT 2 at MALROU21	Branch Amp	1673.0	2891.2	2666.9	108.4%	3999.9	72.3%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU23 (40698) -> ROUND MT (30005) CKT 2 at MALROU23	Branch Amp	1666.5	2882.1	2667.0	108.1%	4000.0	72.1%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU11 (90079) -> MALROU12 (90080) CKT 1 at MALROU11	Branch Amp	1628.7	2791.1	2229.7	125.2%	3514.0	79.4%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALIN (40687) -> MALROU11 (90079) CKT 1 at MALIN	Branch Amp	1628.7	2791.1	2699.7	103.4%	3999.9	69.8%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	MALROU12 (90080) -> ROUND MT (30005) CKT 1 at MALROU12	Branch Amp	1623.8	2782.5	2699.7	103.1%	4000.0	69.6%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	No Violations							
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	LJ2 C1 (47807)	% Δ Volts	1.033	0.981		-5.03%		
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	LJ2 C2 (47811)	% Δ Volts	1.043	0.979		-6.14%		
BF 4231 McNary-Longhorn 500 kV & McNary 500/230 kV Xfmr	LEANJ C1 (44886)	% Δ Volts	1.036	0.980		-5.41%		
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV + RAS	No Violations							
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV + RAS	No Violations							
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	No Violations							
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations							
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	No Violations							
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	No Violations							
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	No Violations							
BF 5006 Slatt-Grassland 500 kV	No Violations							
BF 5015 Ashe-Slatt 500 kV & Slatt 500 kV Caps	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	No Violations							
BF 5021 Slatt-John Day 500 kV	No Violations							
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	LONGHORN (40724) -> HEMLON12 (61955) CKT 1 at HEMLON12	Branch Amp	1684.4	2014.0	2000.1	100.7%	3000.0	67.1%
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	HEMLON11 (61956) -> HEMINWAY (60155) CKT 1 at HEMINWAY	Branch Amp	1660.2	2009.9	2000.1	100.5%	3000.0	67.0%
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							

Appendix N3 - 16hs2a_lh_stanfield_2250idnw_4500wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5043 Coyote-Slatt & Slatt 500 kV Caps	LONGHORN (40724) -> HEMLON12 (61955) CKT 1 at HEMLON12	Branch Amp	1684.4	2002.4	2000.1	100.1%	3000.0	66.7%
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5211 Low Mon-McNary & McNary-John Day 500 kV	No Violations							
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV & Slatt 500 kV Caps	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1135.0	1386.0	1237.0	112.0%	1396.0	99.3%
BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	751.7	1016.9	920.0	110.5%	1046.8	97.2%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	No Violations							
BF IPC Midpoint-Hem 500 kV & Adel-Midpoint 345 kV + PTSN	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1135.0	1246.3	1237.0	100.7%	1396.0	89.3%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1135.0	1337.8	1237.0	108.1%	1396.0	95.8%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	751.7	975.8	920.0	106.1%	1046.8	93.2%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1135.0	1318.9	1237.0	106.6%	1396.0	94.5%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	751.7	958.1	920.0	104.1%	1046.8	91.5%
BF LH Longhorn-Coyote 500 kV & Longhorn Gen	No Violations							
BF LH McNary-Longhorn & Hemingway-Longhorn 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1135.0	1296.3	1237.0	104.8%	1396.0	92.9%
BF LH McNary-Longhorn & Hemingway-Longhorn 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	751.7	946.0	920.0	102.8%	1046.8	90.4%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	No Violations							
BF LH McNary-Longhorn 500 kV & Longhorn Gen	No Violations							
BF McNary 230 kV SECT 1	No Violations							
BF McNary 230 kV SECT 2	No Violations							
BF McNary 230 kV SECT 3	No Violations							
BF PGE Slatt-Grassland 500 kV & Boardman Coal Gen	No Violations							
Bus: Buckley 500 kV	No Violations							
Bus: Summer Lake 500 kV	No Violations							
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV	No Violations							
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Coyote-Slatt 500 kV	No Violations							

Appendix N3 - 16hs2a_lh_stanfield_2250idnw_4500wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV + RAS	No Violations							
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	No Violations							
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	751.7	931.2	920.0	101.2%	1046.8	89.0%
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Longhorn 500 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1135.0	1366.1	1237.0	110.4%	1396.0	97.9%
N-1: Hemingway-Longhorn 500 kV	LOLO (48197) -> IMNAHA (60278) CKT 1 at IMNAHA	Branch Amp	751.7	997.5	920.0	108.4%	1046.8	95.3%
N-1: Hemingway-Longhorn 500 kV + FACRI	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1552.7	2843.3	2400.0	118.5%	3199.9	88.9%
N-1: Hemingway-Longhorn 500 kV + FACRI	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1560.4	2863.0	2400.0	119.3%	3800.0	75.3%
N-1: Hemingway-Longhorn 500 kV + FACRI	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1135.0	1281.3	1237.0	103.6%	1396.0	91.8%
N-1: Hemingway-Summer Lake 500 kV	No Violations							
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Longhorn-Coyote 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-McNary 500 kV	No Violations							
N-1: Malin-Summer Lake 500 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary S2-McNary S3 230 kV	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-Calpine PH	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Longhorn 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV + PTSN Shunt	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1135.0	1237.8	1237.0	100.1%	1396.0	88.7%
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							

Appendix N3 - 16hs2a_lh_stanfield_2250idnw_4500wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	HELLSCYN (60150) -> BROWNLEE (60095) CKT 1 at HELLSCYN	Branch Amp	1135.0	1239.6	1237.0	100.2%	1396.0	88.8%
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Roundup-Lagrande 230 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations							
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Coyote-Slatt 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & Coyote-Slatt 500 kV	No Violations							
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	No Violations							
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	No Violations							
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							
N-2: DC-BIPOLE	YORKCANY (12091)	% Δ Volts	1.001	0.949		-5.19%		
N-2: DC-BIPOLE	MIDPOINT (60240) -> MPSNT501 (60237) CKT 1 at MIDPOINT	Branch MVA	1270.6	1500.5	1500.0	100.0%	1650.0	90.9%
N-2: DC-BIPOLE	E.NICOLS (32212) -> RIO OSO (32214) CKT 1 at E.NICOLS	Branch Amp	294.8	330.4	326.3	101.2%	416.7	79.3%
N-2: DC-BIPOLE	PONSUM13 (90101) -> PONSUM14 (90102) CKT 1 at PONSUM13	Branch Amp	1552.7	2427.9	2400.0	101.2%	3199.9	75.9%
N-2: DC-BIPOLE	ROUTAB21 (30018) -> ROUTAB22 (30019) CKT 2 at ROUTAB21	Branch Amp	1793.8	2342.8	2199.9	106.5%	3280.5	71.4%
N-2: DC-BIPOLE	ROUTAB11 (30016) -> ROUTAB12 (30017) CKT 1 at ROUTAB11	Branch Amp	1778.6	2322.9	2199.9	105.6%	3280.5	70.8%
N-2: DC-BIPOLE	MALROU21 (40696) -> MALROU22 (40697) CKT 2 at MALROU22	Branch Amp	1675.0	2269.3	2199.7	103.2%	3235.5	70.1%
N-2: DC-BIPOLE	MALROU22 (40697) -> MALROU23 (40698) CKT 2 at MALROU22	Branch Amp	1675.0	2269.3	2199.7	103.2%	3235.5	70.1%
N-2: DC-BIPOLE	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1599.8	2289.1	2134.0	107.3%	3499.9	65.4%
N-2: DC-BIPOLE	MIDWAY (30060) -> MIDVIN11 (30061) CKT 1 at MIDWAY	Branch Amp	1578.5	2255.4	2134.0	105.7%	3499.9	64.4%
N-2: DC-BIPOLE	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM11	Branch Amp	1560.4	2441.5	2400.0	101.7%	3800.0	64.3%
N-2: DC-BIPOLE	MIDVIN12 (30062) -> VINCENT (24156) CKT 1 at MIDVIN12	Branch Amp	1556.9	2227.1	2134.0	104.4%	3499.9	63.6%
N-2: Double Palo Verde	MIDVIN22 (30064) -> VINCENT (24156) CKT 2 at MIDVIN22	Branch Amp	1599.8	2140.6	2134.0	100.3%	3499.9	61.2%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	PONSUM11 (90099) -> PONSUM12 (90100) CKT 1 at PONSUM12	Branch Amp	1560.4	2931.8	2400.0	122.2%	3800.0	77.2%

Appendix N3 - 16hs2a_lh_stanfield_2250idnw_4500wom Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV + RAS	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM11	Branch Amp	1465.3	3011.0	2700.0	111.5%	4000.0	75.3%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	1563.3	2813.9	2400.0	117.2%	3800.0	74.0%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1548.3	2798.9	2400.0	116.6%	3800.0	73.7%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON16	Branch Amp	1563.3	2953.2	2400.0	123.0%	3800.0	77.7%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV + RAS	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1548.3	2942.0	2400.0	122.6%	3800.0	77.4%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations							
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV + RAS	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	1910.3	3048.4	2900.0	105.1%	4350.0	70.1%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV + RAS	GRIJOH12 (90065) -> GRIJOH11 (90064) CKT 1 at GRIJOH12	Branch Amp	1735.7	3218.4	3000.0	107.3%	4050.0	79.5%
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV + RAS	No Violations							
N-2: Sickler-Schultz & Schultz-Vantage 500 kV + RAS	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							

N4.0 Simultaneous Interaction Study: Idaho-Northwest (E-W) v West of Slatt, Grassland Terminus

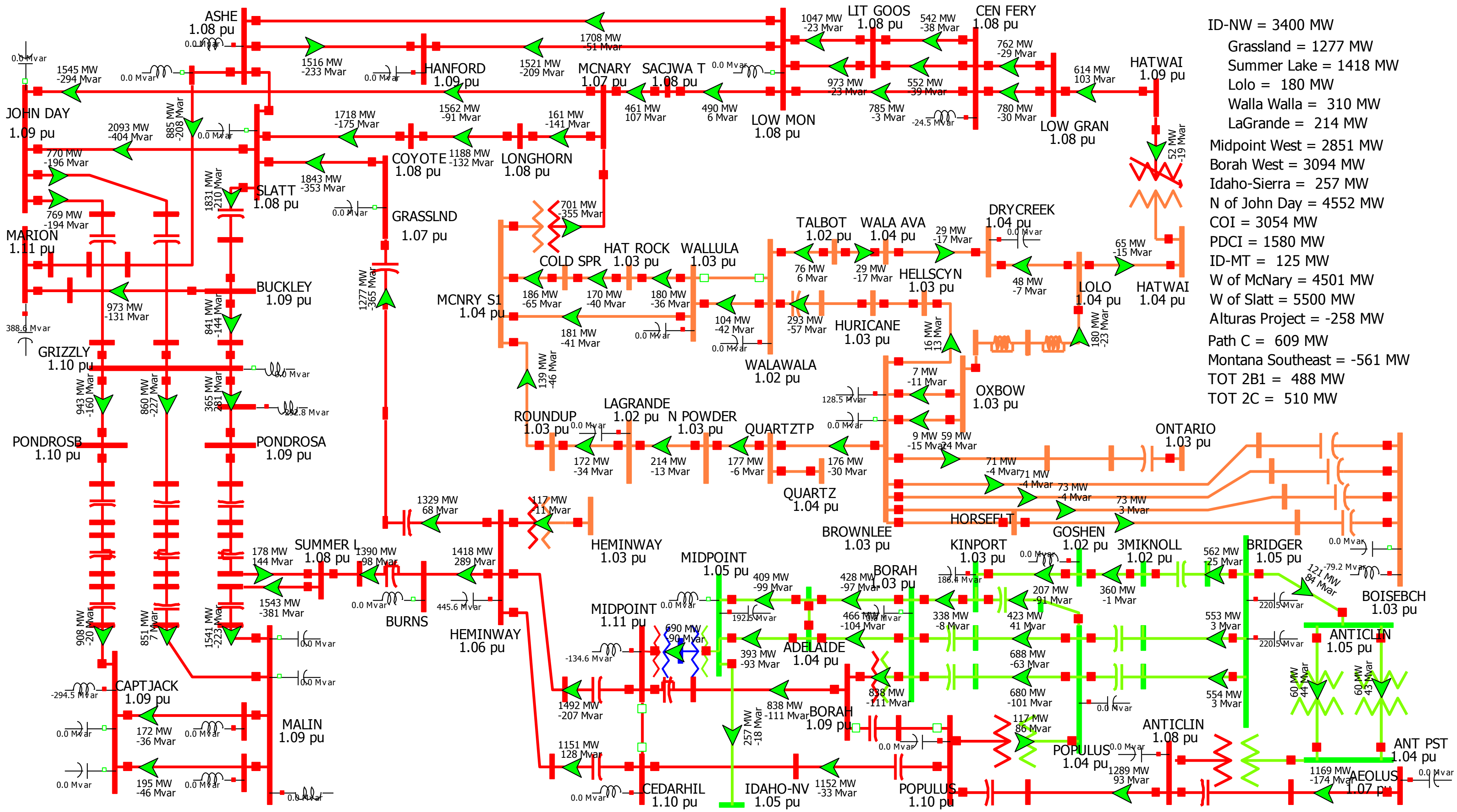

Figure N4: Idaho-Northwest 3400 MW east-to-west, West of Slatt 5500 MW, Grassland Terminus

N4.1 Background & Need for Simultaneous Interaction Study

The Hemingway-Boardman Phase II study review group requested that the impacts of the Hemingway to Boardman project be evaluated with the West of Slatt path at its 5500 MW rating simultaneous with Idaho-Northwest at 3400 MW east-to-west. The study group also requested that the study be performed leaving out the Cascade Crossings Transmission Project.

The West of Slatt path is made up of the following lines: (1) McNary-John Day 500 kV, (2) Slatt-John Day 500 kV and (3) Slatt-Buckley 500 kV.

N4.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is 16la1sa_3400idnw_5500wos.

<u>Step-by-step development of the 16la1sa_3400idnw_5500wos base case:</u>

Step 1: Begin with the 16la1sa_3400idnw_N base case.

> Utilize the base case developed in Section 5.1.2 Steady State Case Stressing. Remove the Cascade Crossing Transmission Project from the case.

Step 2: Stress the West of Slatt path.

> Generation east of Slatt was increased to stress the West of Slatt path to 5,500 MW. The path flows were increased by modifying generation in the Pacific Northwest, mostly in Southeast Washington, and the Lower Columbia Basin, including ~1000 MW of Longhorn wind generation modeled as connecting to Longhorn 500 kV. The generation increase east of Slatt cooresponds with a reduction in generation west of Slatt at places such as Western Oregon/Washington, Centrailia, John Day, The Dalles, and Bonneville. Generation was also scheduled from the Northwest to California.

Step 3: Re-stress Idaho-Northwest

> The Idaho-Northwest path was re-stressed to 3400 MW in the east-to-west direction by adjusting schedules between PacifiCorp East (PACE), Idaho Power, and the Northwest. In order to achieve 3400 MW on Idaho-Northwest in this configuration, the Hines 138/115 kV transformer had to be opened, and the Burns 500 kV series capacitor was completely bypassed.

N4.3 Post Transient Results

Post-transient contingency results for the 16la1sa_3400idnw_5500wos case can be found at the end of this section. Details for the severe/notable contingencies can be found below.

Post-Transient Contingency #1 – BF IPC Hemingway-Grassland 500 kV & Hemingway 500/230 Xfmr

This is the limiting contingency for the Idaho-Northwest path in the east-to-west direction. In previous east-to-west study cases in Section 5, this contingency resulted in overloading the Burns series capacitor to its emergency rating. In this case, the Burns series capacitor is bypassed pre-contingency, due to the pre-contingency loading of the Hemingway-Summer Lake 500 kV line. In real life, during peak Idaho-Northwest east-to-west flow conditions, the COI is generally flowing at a value less than 2000 MW north-to-south. In order to stress West of Slatt, COI is stressed to 3000+ MW in this case, putting pressure on the Hemingway-Summer Lake 500 kV line. The end result is the need to bypass the Burns series capacitor, which will generally be avoided, if possible.

Post-Transient Contingency #2 – N-1: Hemingway-Grassland 500 kV

Removal of the Burns series capacitor results in less robust voltage performance across Idaho-Northwest busses for Idaho-Northwest line outages. To make up for this poor voltage performance, the LaGrande series capacitor is modeled as switching in, post-disturbence, otherwise post-transient voltage deviation at LaGrande would have exceeded 5% for this N-1 contingency. In real life, the LaGrande shunt capacitor switches in when the LaGrange 230 kV bus voltage falls below 1.0 pu for a certain number of seconds. This action is not controlled via RAS.

Post-Transient Contingency #3 – BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr + RAS

This contingency results in overloading the Midpoint 500 kV series capacitor to 134% of its 1732 Amp nominal rating (99.5% of its 2338 Amp emergency rating). Since the overload is less than the Midpoint 500 kV series capacitors emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Conclusion

Three of the notable post transient contingencies resulting in more severe system stressing were noted above. These contingencies, as well as all other post-transient contingencies, result in acceptable performance. Ultimately, the results indicate that Idaho-Northwest can achieve a 3400 MW east-to-west rating simultaneous with West of Slatt at 5500 MW.

Appendix N4 - 16la1sa_3400idnw_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	No Violations							
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	No Violations							
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	No Violations							
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	1973.9	2905.3	2900.0	100.2%	4350.0	66.8%
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	No Violations							
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	BELL SC (40096) -> BELL BPA (40091) CKT 1 at BELL BPA	Branch Amp	1916.9	2871.3	2200.1	130.5%	3000.0	95.7%
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1660.0	1768.7	1732.1	102.1%	2338.3	75.6%
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	BELL SC (40096) -> BELL BPA (40091) CKT 1 at BELL BPA	Branch Amp	1916.9	2282.5	2200.1	103.7%	3000.0	76.1%
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1660.0	1759.4	1732.1	101.6%	2338.3	75.2%
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	265.8	314.7	300.0	104.9%	370.0	85.0%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	259.3	307.8	300.0	102.6%	370.0	83.2%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	251.5	302.9	300.0	101.0%	370.0	81.9%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	251.5	302.9	300.0	101.0%	370.0	81.9%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1449.2	2210.0	2000.1	110.5%	3000.0	73.7%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1470.1	2174.7	2000.1	108.7%	3000.0	72.5%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	265.8	314.8	300.0	104.9%	370.0	85.1%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	259.3	308.1	300.0	102.7%	370.0	83.3%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	251.5	301.0	300.0	100.3%	370.0	81.4%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	251.5	301.0	300.0	100.3%	370.0	81.4%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1449.2	2206.2	2000.1	110.3%	3000.0	73.5%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1470.1	2166.8	2000.1	108.3%	3000.0	72.2%
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	265.8	319.8	300.0	106.6%	370.0	86.4%
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	259.3	312.8	300.0	104.3%	370.0	84.6%
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	88.5	123.8	112.0	110.5%	146.7	84.4%
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	751.2	1100.8	1008.1	109.2%	1250.1	88.1%

Appendix N4 - 16la1sa_3400idnw_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	734.8	1079.7	1000.1	108.0%	1250.1	86.4%
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	N POWDER (60312)	% Δ Volts	1.032	0.980				-5.04%
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	LAGRANDE (40621)	% Δ Volts	1.024	0.971				-5.18%
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	N POWDER (60313)	% Δ Volts	1.011	0.957				-5.34%
BF 5015 Ashe-Slatt 500 kV & Slatt 500 kV Caps	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	1973.9	2915.7	2900.0	100.5%	4350.0	67.0%
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	No Violations							
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5043 Slatt-Coyote 500 kV & Slatt 500 kV Caps	No Violations							
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5211 Low Mon-McNary 500 kV & McNary-John Day 500 kV	No Violations							
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV & Slatt 500 kV Caps	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	88.5	124.3	112.0	111.0%	146.7	84.7%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	265.8	308.9	300.0	103.0%	370.0	83.5%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	259.3	302.6	300.0	100.9%	370.0	81.8%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	751.2	1048.9	1008.1	104.0%	1250.1	83.9%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at WALAWALA	Branch Amp	734.8	1028.5	1000.1	102.8%	1250.1	82.3%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	88.5	125.7	112.0	112.2%	146.7	85.7%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	265.8	314.1	300.0	104.7%	370.0	84.9%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	259.3	307.6	300.0	102.5%	370.0	83.1%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	251.5	300.2	300.0	100.1%	370.0	81.1%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	251.5	300.2	300.0	100.1%	370.0	81.1%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	751.2	1079.5	1008.1	107.1%	1250.1	86.4%
BF IPC Hem-Grassland 500 kV & Hem 500/230 Xfmr + RAS	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	734.8	1058.6	1000.1	105.9%	1250.1	84.7%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	265.8	311.5	300.0	103.8%	370.0	84.2%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	259.3	305.2	300.0	101.7%	370.0	82.5%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1449.2	2252.9	2000.1	112.6%	3000.0	75.1%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1470.1	2217.6	2000.1	110.9%	3000.0	73.9%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTNPS	Branch MVA	265.8	310.0	300.0	103.3%	370.0	83.8%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	259.3	304.0	300.0	101.3%	370.0	82.2%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	751.2	1034.9	1008.1	102.7%	1250.1	82.8%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	734.8	1014.6	1000.1	101.5%	1250.1	81.2%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1660.0	2326.7	1732.1	134.3%	2338.3	99.5%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	POPULUS (67790) -> BORPOP11 (61970) CKT 1 at POPULUS	Branch Amp	1120.6	1605.4	1492.7	107.5%	2264.2	70.9%
Bus: Buckley 500 kV	No Violations							
Bus: Summer Lake 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	265.8	315.3	300.0	105.1%	370.0	85.2%
Bus: Summer Lake 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	259.3	308.5	300.0	102.8%	370.0	83.4%
Bus: Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	251.5	303.0	300.0	101.0%	370.0	81.9%
Bus: Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	251.5	303.0	300.0	101.0%	370.0	81.9%

Appendix N4 - 16la1sa_3400idnw_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
Bus: Summer Lake 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1449.2	2208.3	2000.1	110.4%	3000.0	73.6%
Bus: Summer Lake 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1470.1	2173.3	2000.1	108.7%	3000.0	72.4%
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV + RAS	No Violations							
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Coyote-Slatt 500 kV	No Violations							
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							
N-1: Dworshak-Hatwai 500 kV	No Violations							
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	265.8	319.5	300.0	106.5%	370.0	86.3%
N-1: Grassland-Slatt 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	259.3	312.5	300.0	104.2%	370.0	84.5%
N-1: Grassland-Slatt 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	88.5	123.5	112.0	110.3%	146.7	84.2%
N-1: Grassland-Slatt 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	751.2	1094.9	1008.1	108.6%	1250.1	87.6%
N-1: Grassland-Slatt 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	734.8	1073.9	1000.1	107.4%	1250.1	85.9%
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	No Violations							
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Grassland 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	88.5	124.5	112.0	111.1%	146.7	84.9%
N-1: Hemingway-Grassland 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	265.8	308.2	300.0	102.7%	370.0	83.3%
N-1: Hemingway-Grassland 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	259.3	301.9	300.0	100.6%	370.0	81.6%
N-1: Hemingway-Grassland 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	751.2	1067.9	1008.1	105.9%	1250.1	85.4%
N-1: Hemingway-Grassland 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	734.8	1047.2	1000.1	104.7%	1250.1	83.8%
N-1: Hemingway-Summer Lake 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	265.8	311.5	300.0	103.8%	370.0	84.2%

Appendix N4 - 16la1sa_3400idnw_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Hemingway-Summer Lake 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	259.3	305.1	300.0	101.7%	370.0	82.5%
N-1: Hemingway-Summer Lake 500 kV	HEMBOA13 (61951) -> GRASSLND (43049) CKT 1 at GRASSLND	Branch Amp	1449.2	2244.1	2000.1	112.2%	3000.0	74.8%
N-1: Hemingway-Summer Lake 500 kV	HEMINWAY (60155) -> HEMBOA11 (61953) CKT 1 at HEMINWAY	Branch Amp	1470.1	2209.5	2000.1	110.5%	3000.0	73.7%
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-McNary 500 kV	No Violations							
N-1: Malin-Summer Lake 500 kV	No Violations							
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-Coyote 500 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV	No Violations							
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	984.8	1038.1	950.0	109.3%	1286.0	80.7%
N-1: Ostrander-Troutdale 500 kV	TROUTDAL (41095)	% Δ Volts	1.081	1.023				-5.37%
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	No Violations							
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Populus-Cedar Hill-Hemingway 500 kV + RAS	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1660.0	2005.1	1732.1	115.8%	2338.3	85.7%
N-1: Populus-Cedar Hill-Hemingway 500 kV + RAS	POPULUS (67790) -> BORPOP11 (61970) CKT 1 at POPULUS	Branch Amp	1120.6	1607.8	1492.7	107.7%	2264.2	71.0%
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Roundup-Lagrande 230 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations							
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Coyote-Slatt 500 kV	PORT ANG (40841)	% Δ Volts	1.000	0.950				-5.00%
N-2: Ashe-Marion & Coyote-Slatt 500 kV	HOOD RVR (45145)	% Δ Volts	0.970	0.921				-5.05%

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Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Ashe-Marion & Coyote-Slatt 500 kV	POWERDLE (45251)	% Δ Volts	0.969	0.920				-5.06%
N-2: Ashe-Marion & Coyote-Slatt 500 kV	WILRDJON (41163)	% Δ Volts	0.967	0.918				-5.07%
N-2: Ashe-Marion & Coyote-Slatt 500 kV	CONDITPH (45057)	% Δ Volts	0.965	0.916				-5.08%
N-2: Ashe-Marion & Coyote-Slatt 500 kV	BALD MT (41185)	% Δ Volts	0.965	0.916				-5.08%
N-2: Ashe-Marion & Coyote-Slatt 500 kV	ROSS (40901)	% Δ Volts	1.023	0.971				-5.08%
N-2: Ashe-Marion & Coyote-Slatt 500 kV	BINGEN (40115)	% Δ Volts	0.963	0.914				-5.09%
N-2: Ashe-Marion & Coyote-Slatt 500 kV	LJ2 1 (47808)	% Δ Volts	1.013	0.961				-5.13%
N-2: Ashe-Marion & Coyote-Slatt 500 kV	TMBLCR T (41079)	% Δ Volts	1.012	0.960				-5.14%
N-2: Ashe-Marion & Coyote-Slatt 500 kV	LJ2 C1 (47807)	% Δ Volts	1.031	0.977				-5.24%
N-2: Ashe-Marion & Coyote-Slatt 500 kV	SAPPHO (40945)	% Δ Volts	0.971	0.920				-5.25%
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & Coyote-Slatt 500 kV	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1660.0	1733.1	1732.1	100.1%	2338.3	74.1%
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	No Violations							
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	No Violations							
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							
N-2: DC-BIPOLE	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	251.5	302.3	300.0	100.8%	370.0	81.7%
N-2: DC-BIPOLE	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	251.5	302.3	300.0	100.8%	370.0	81.7%
N-2: Double Palo Verde	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	251.5	323.3	300.0	107.8%	370.0	87.4%
N-2: Double Palo Verde	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	251.5	323.3	300.0	107.8%	370.0	87.4%
N-2: Double Palo Verde	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO	Branch MVA	251.9	328.0	315.0	104.1%	394.0	83.2%
N-2: Double Palo Verde	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO	Branch MVA	251.9	326.8	315.0	103.7%	394.0	82.9%
N-2: Double Palo Verde	CHOLLA (14000) -> CHOSAG11 (14014) CKT 1 at CHOSAG11	Branch Amp	971.6	1071.5	1026.0	104.4%	1538.1	69.7%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM12	Branch Amp	1693.8	2814.9	2700.0	104.3%	4000.0	70.4%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	No Violations							
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	975.5	2514.5	2400.0	104.8%	3800.0	66.2%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON12	Branch Amp	957.1	2497.1	2400.0	104.0%	3800.0	65.7%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	BELL SC (40096) -> BELL BPA (40091) CKT 1 at BELL SC	Branch Amp	1916.9	2565.0	2200.1	116.6%	3000.0	85.5%
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	No Violations							
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV	No Violations							
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	No Violations							
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							

Appendix N4 - 16la1sa_3400idnw_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	BELL SC (40096) -> BELL BPA (40091) CKT 1 at BELL BPA	Branch Amp	1916.9	2871.3	2200.1	130.5%	3000.0	95.7%
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1660.0	1768.7	1732.1	102.1%	2338.3	75.6%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	No Violations							
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	DALREED (45075) -> DR W TP (45162) CKT 1 at DALREED	Branch Amp	462.2	810.2	795.7	101.8%	1006.6	80.5%
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1660.0	1800.5	1732.1	104.0%	2338.3	77.0%
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	KEELER (40601) -> KEELER (40599) CKT 1 at KEELER	Branch MVA	984.8	1019.8	950.0	107.3%	1286.0	79.3%
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	DALREED (45075) -> DR W TP (45162) CKT 1 at DALREED	Branch Amp	462.2	801.9	795.7	100.8%	1006.6	79.7%
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1660.0	1792.5	1732.1	103.5%	2338.3	76.7%
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	No Violations							
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	No Violations							
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							

N5.0 Simultaneous Interaction Study: Idaho-Northwest (E-W) v West of McNary & West of Slatt, Longhorn Terminus

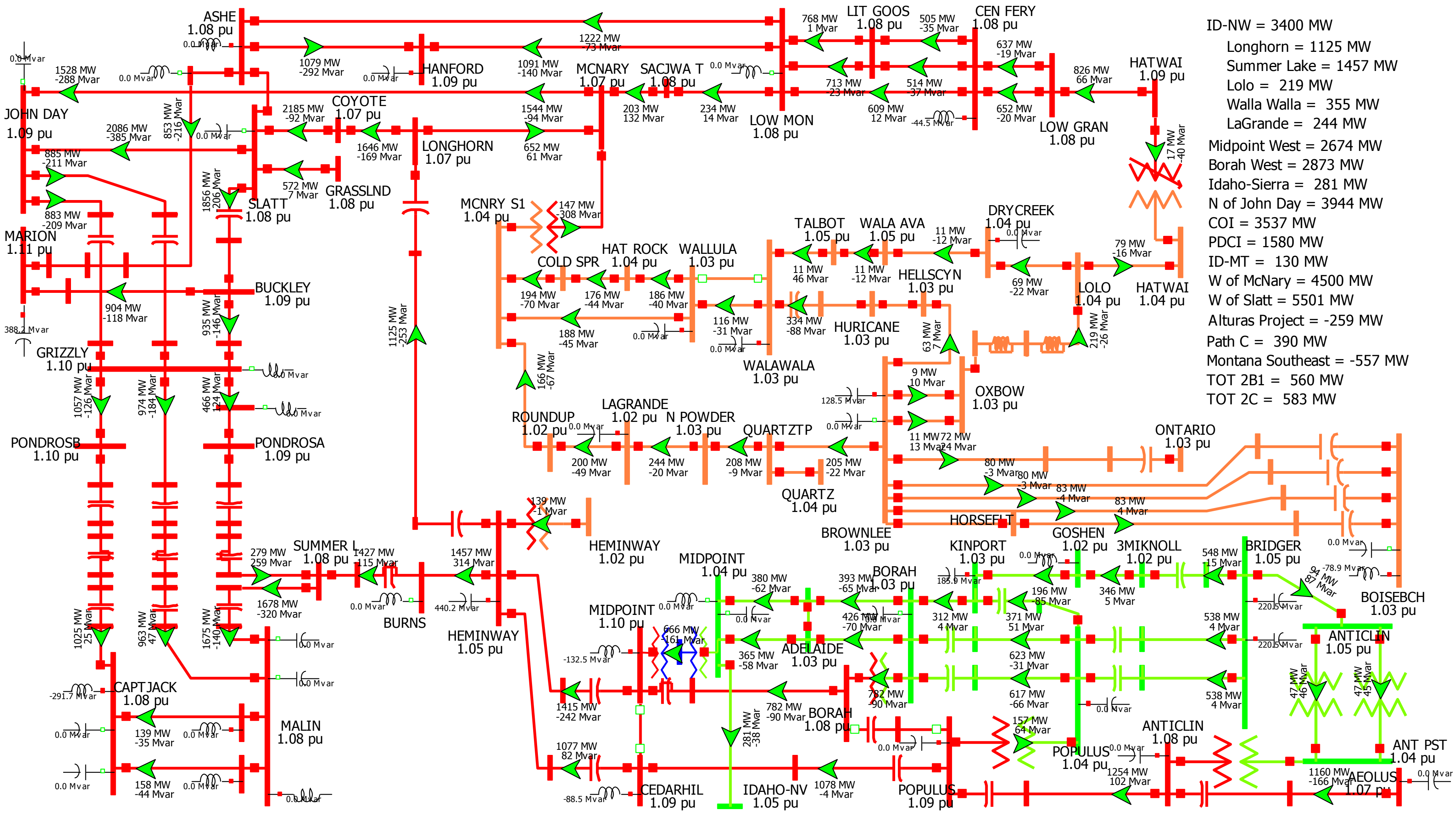

Figure N5: Idaho-Northwest 3400 MW east-to-west, West of McNary 4500 MW, West of Slatt 5500 MW, Longhorn Terminus

N5.1 Background & Need for Simultaneous Interaction Study

The Hemingway-Boardman Phase II study review group requested that the impacts of the Hemingway to Boardman project be evaluated with theWest of McNary path at its 4500 MW rating and West of Slatt path at its 5500 MW rating simultaneous with Idaho-Northwest at 3400 MW east-to-west. The study group also requested that the study be performed leaving out the Cascade Crossings Transmission Project. Given the uncertainty of the northwest terminus of the Hemingway-Boardman project, this section looks at a Longhorn terminus option.

Terminating the Hemingway-Boardman 500 kV transmission project at Longhorn is assumed not to affect the definition of the West of McNary path. This may change in the future. The West of McNary path is made up of the following lines: (1) Coyote-Slatt 500 kV, (2) McNary-John Day 500 kV, (3) McNary-Ross 345 kV, (4) Jones Canyon-Tumble Creek 230 kV and (5) Harvalum-Big Eddy 230 kV. The West of Slatt path is made up of the following lines: (1) McNary-John Day 500 kV, (2) Slatt-John Day 500 kV and (3) Slatt-Buckley 500 kV.

N5.2 Steady State Case Stressing

For the best information about path flows, generation patterns, etc, base cases can be downloaded from the following FTP site for approximately 90 days after this report is submitted to WECC:

https://fileexch.idahopower.com/

User Name: B2HPhase2

Password: Data4Study

The case name for this study is 16la1sa_lh_3400idnw_4500wom_5500wos.

Step-by-step development of the 16la1sa_lh_3400idnw_4500wom_5500wos base case:

Step 1: Begin with the 16la1sa_3400idnw_5500wos base case.

> Utilize the base case developed in Section N4.2 Steady State Case Stressing. Shift the terminus of the Hemingway-Boardman transmission project from Grassland to Longhorn.

Step 2: Stress the West of McNary & West of Slatt paths.

> By moving the terminus of the Hemingway-Boardman transmission project to Longhorn, the case was almost already stressed to 4500 MW on West of McNary and 5500 MW on West of Slatt. Generation at Longhorn was switched in, and schedules between the Northwest, Idaho and Calcifornia were adjusted to complete the case modification.

N5.3 Post Transient Results

Post-transient contingency results for the 16la1sa_lh_3400idnw_4500wom_5500wos case can be found at the end of this section. Details for the severe/notable contingencies can be found below.

Post-Transient Contingency #1 – BF IPC Hemingway-Longhorn 500 kV & Hemingway 500/230 Xfmr

This is the limiting contingency for the Idaho-Northwest path in the east-to-west direction. In previous east-to-west study cases in Section 5, this contingency resulted in overloading the Burns series capacitor to its emergency rating. In this case, the Burns series capacitor is bypassed pre-contingency, due to the pre-contingency loading of the Hemingway-Summer Lake 500 kV line. In real life, during peak Idaho-Northwest east-to-west flow conditions, the COI is generally flowing at a value less than 2000 MW north-to-south. In order to stress West of Slatt, COI is stressed to 3000+ MW in this case, putting pressure on the Hemingway-Summer Lake 500 kV line. The end result is the need to bypass the Burns series capacitor, which will generally be avoided, if possible.

Post-Transient Contingency #2 – N-1: Hemingway-Longhorn 500 kV

Removal of the Burns series capacitor results in less robust voltage performance across Idaho-Northwest busses for Idaho-Northwest line outages. To make up for this poor voltage performance, the LaGrande series capacitor is modeled as switching in, post-disturbence, otherwise post-transient voltage deviation at LaGrande would have exceeded 5% for this N-1 contingency. In real life, the LaGrande shunt capacitor switches in when the LaGrange 230 kV bus voltage falls below 1.0 pu for a certain number of seconds. This action is not controlled via RAS.

Post-Transient Contingency #3 – BF IPC Populus-CHill-Hemingway 500 kV & Hem 500/230 Xfmr + RAS

This contingency results in overloading the Midpoint 500 kV series capacitor to 135% of its 1732 Amp nominal rating (99.8% of its 2338 Amp emergency rating). Since the overload is less than the Midpoint 500 kV series capacitors emergency rating, this contingency results in acceptable performance. Refer to the table below for more information about the overloads caused by this contingency.

Conclusion

Three of the notable post transient contingencies resulting in more severe system stressing were noted above. These contingencies, as well as all other post-transient contingencies, result in acceptable performance. Ultimately, the results indicate that Idaho-Northwest can achieve a 3400 MW east-to-west rating simultaneous with West of Slatt at 5500 MW.

Appendix N5 – 16la1sa_lh_3400idnw_4500wom_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4003 Hanford-Vantage & Hanford Caps	No Violations							
BF 4019 CaptJack-Malin #2 & Malin 500/230 Xfmr	No Violations							
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	303.3	300.0	101.1%	370.0	82.0%
BF 4046 John Day-Grizzly #2 & Grizzly-Malin #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	303.3	300.0	101.1%	370.0	82.0%
BF 4064 CaptJack-Malin & Malin-Round Mtn #1 500 kV	MALROU22 (90083) -> MALROU23 (90084) CKT 2 at MALROU22	Branch Amp	1285.3	2236.7	2199.9	101.7%	3235.5	69.1%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	307.1	300.0	102.4%	370.0	83.0%
BF 4072 Grizzly-Malin #2 & Malin-Round Mtn #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	307.1	300.0	102.4%	370.0	83.0%
BF 4095 Low Mon-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4104 Ashe-Hanford & Hanford-Wautoma 500 kV	No Violations							
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	300.4	300.0	100.1%	370.0	81.2%
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	300.4	300.0	100.1%	370.0	81.2%
BF 4131 Slatt-John Day & John Day-Grizzly #2 500 kV	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	1997.9	2973.1	2900.0	102.5%	4350.0	68.3%
BF 4143 (or 4134) John Day-Grizzly #1 & John Day Caps 500 kV	No Violations							
BF 4170 John Day-Marion & John Day Caps 500 kV	No Violations							
BF 4194 Rock Ck-John Day & Big Eddy-John Day 500 kV	No Violations							
BF 4197 John Day-Big Eddy #1 & John Day Caps 500 kV	No Violations							
BF 4202 John Day-Big Eddy#2 & Big Eddy-Ostrander 500 kV	No Violations							
BF 4231 McNary-Coyote 500 kV & McNary 500/230 kV Xfmr	No Violations							
BF 4247 Lit Goos-Low Mon #2 & Low Mon-McNary 500 kV	No Violations							
BF 4259 Lit Goos-Low Mon #2 & Low Mon-Hanford 500 kV	No Violations							
BF 4377 Ashe-Marion & Marion-Alvey 500 kV	No Violations							
BF 4386 Buckley-Marion & Marion-Santiam 500 kV	No Violations							
BF 4630 Cen Ferry-Lit Goos #1 & Lit Goos-Low Mon #1 500 kV	No Violations							
BF 4676 Lit Goos-Low Mon & Low Mon-Ashe 500 kV	No Violations							
BF 4775 Cen Ferry-Low Gran #1 & #2 500 kV	BELL SC (40096) -> BELL BPA (40091) CKT 1 at BELL SC	Branch Amp	1534.7	2290.2	2200.1	104.1%	3000.0	76.3%
BF 4776 Hatwai-Low Gran & Low Gran-Cen Ferry 500 kV	No Violations							
BF 4870 John Day-Big Eddy 500 kV & Big Eddy 500/230 kV	No Violations							
BF 4888 Ashe-Slatt & CGS 500 kV	No Violations							
BF 4891 Low Mon-Ashe & Ashe-Slatt 500 kV	No Violations							
BF 4901 Low Mon-Ashe & Ashe-Hanford 500 kV	No Violations							
BF 4940 Low Mon-Ashe & Ashe-Marion 500 kV	No Violations							
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	336.7	300.0	112.2%	370.0	91.0%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	336.7	300.0	112.2%	370.0	91.0%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	316.0	300.0	105.3%	370.0	85.4%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	331.3	315.0	105.2%	394.0	84.1%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	330.6	315.0	104.9%	394.0	83.9%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	260.8	309.2	300.0	103.1%	370.0	83.6%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1074.4	999.1	107.5%	1250.1	85.9%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	844.9	1052.7	1000.1	105.3%	1250.1	84.2%
BF 4957 Summer L-Malin & Summer L-Hemingway 500 kV	HEMINWAY (60155) -> HEMLON11 (61956) CKT 1 at HEMINWAY	Branch Amp	1310.8	2036.0	2000.1	101.8%	3464.1	58.8%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	337.2	300.0	112.4%	370.0	91.1%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	337.2	300.0	112.4%	370.0	91.1%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	315.5	300.0	105.2%	370.0	85.3%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	331.7	315.0	105.3%	394.0	84.2%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	331.0	315.0	105.1%	394.0	84.0%

Appendix N5 – 16la1sa_lh_3400idnw_4500wom_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	260.8	308.4	300.0	102.8%	370.0	83.3%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1068.4	999.1	106.9%	1250.1	85.5%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	844.9	1047.0	1000.1	104.7%	1250.1	83.8%
BF 4959 Grizzly-Summer L & Summer L-Malin 500 kV	HEMINWAY (60155) -> HEMLON11 (61956) CKT 1 at HEMINWAY	Branch Amp	1310.8	2018.6	2000.1	100.9%	3464.1	58.3%
BF 4996 CaptJack-Malin #1 & #2 500 kV	No Violations							
BF 5003 Slatt-Boardman 500 kV & Slatt 500 kV Caps	No Violations							
BF 5015 Ashe-Slatt 500 kV & Slatt 500 kV Caps	No Violations							
BF 5018 Ashe-Slatt & Slatt-John Day 500 kV	SLATT (40989) -> BUCSLA11 (90020) CKT 1 at BUCSLA11	Branch Amp	1997.9	2988.2	2900.0	103.0%	4350.0	68.7%
BF 5028 Buckley-Grizzly & Grizzly-Summer Lake 500 kV	No Violations							
BF 5040 Grizzly-John Day & Grizzly-Round Bu 500 kV	No Violations							
BF 5043 Slatt-Coyote 500 kV & Slatt 500 kV Caps	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	305.9	300.0	102.0%	370.0	82.7%
BF 5043 Slatt-Coyote 500 kV & Slatt 500 kV Caps	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	305.9	300.0	102.0%	370.0	82.7%
BF 5148 Coulee-Schultz & Echo Lake-Schultz 500 kV	No Violations							
BF 5170 Wautoma-Schultz & Schultz-Raver 500 kV	No Violations							
BF 5179 Vantage-Schultz & Schultz-Raver #4	No Violations							
BF 5211 Low Mon-McNary 500 kV & McNary-John Day 500 kV	No Violations							
BF 5250 Hanford-Wautoma#1 & Wautoma-Knight 500 kV	No Violations							
BF 5259 Hanford-Wautoma#2 & Wautoma-Rock Ck 500 kV	No Violations							
BF 5266 Slatt-Buckly 500 kV & Slatt 500 kV Caps	No Violations							
BF 5339 Vantage-Schultz 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF 5345 Vantage-Hanford 500 kV & Vantage 500/230 Xfmr #1	No Violations							
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	330.9	300.0	110.3%	370.0	89.4%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	330.9	300.0	110.3%	370.0	89.4%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	313.3	300.0	104.4%	370.0	84.7%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	260.8	307.1	300.0	102.4%	370.0	83.0%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	326.1	315.0	103.5%	394.0	82.8%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	325.4	315.0	103.3%	394.0	82.6%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1082.9	999.1	108.4%	1250.1	86.6%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	844.9	1061.0	1000.1	106.1%	1250.1	84.9%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HEMINWAY (60155) -> HEMLON11 (61956) CKT 1 at HEMINWAY	Branch Amp	1310.8	2076.7	2000.1	103.8%	3464.1	59.9%
BF IPC Hemingway-Summer L 500 kV & Hemingway 500/230 Xfmr	HEMLON12 (61955) -> LONGHORN (40724) CKT 1 at HEMLON12	Branch Amp	1213.3	2019.5	2000.1	101.0%	3464.1	58.3%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	329.6	300.0	109.9%	370.0	89.1%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	329.6	300.0	109.9%	370.0	89.1%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	325.2	315.0	103.2%	394.0	82.5%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	324.5	315.0	103.0%	394.0	82.4%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	304.2	300.0	101.4%	370.0	82.2%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	87.4	120.1	112.0	107.2%	146.7	81.9%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1148.4	999.1	114.9%	1250.1	91.9%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at WALAWALA	Branch Amp	844.9	1124.7	1000.1	112.5%	1250.1	90.0%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	330.7	300.0	110.2%	370.0	89.4%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	330.7	300.0	110.2%	370.0	89.4%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	309.5	300.0	103.2%	370.0	83.6%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr + RAS	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	87.4	121.6	112.0	108.5%	146.7	82.9%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	326.4	315.0	103.6%	394.0	82.8%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	325.7	315.0	103.4%	394.0	82.7%

Appendix N5 – 16la1sa_lh_3400idnw_4500wom_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr + RAS	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	260.8	303.1	300.0	101.0%	370.0	81.9%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr + RAS	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1180.3	999.1	118.1%	1250.1	94.4%
BF IPC Hem-Longhorn 500 kV & Hem 500/230 Xfmr + RAS	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	844.9	1156.2	1000.1	115.6%	1250.1	92.5%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	317.4	300.0	105.8%	370.0	85.8%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	317.4	300.0	105.8%	370.0	85.8%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTNPS	Branch MVA	266.8	308.5	300.0	102.8%	370.0	83.4%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	260.8	302.4	300.0	100.8%	370.0	81.7%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1151.1	999.1	115.2%	1250.1	92.1%
BF IPC Midpoint-Hemingway 500 kV & Hemingway 500/230 Xfmr	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	844.9	1127.3	1000.1	112.7%	1250.1	90.2%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	335.2	300.0	111.7%	370.0	90.6%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	335.2	300.0	111.7%	370.0	90.6%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	329.8	315.0	104.7%	394.0	83.7%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	329.1	315.0	104.5%	394.0	83.5%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTNPS	Branch MVA	266.8	305.5	300.0	101.8%	370.0	82.6%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	87.4	118.8	112.0	106.1%	146.7	81.0%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1086.8	999.1	108.8%	1250.1	86.9%
BF IPC Populus-CHill-Hem 500 kV & Hem 500/230 Xfmr + RAS	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	844.9	1063.6	1000.1	106.3%	1250.1	85.1%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	YELOWTLP (66750) -> YELOWTLP (66755) CKT 1 at YELOWTLP	Branch MVA	77.4	100.1	100.0	100.1%	112.0	89.4%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	328.4	300.0	109.5%	370.0	88.7%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	326.9	300.0	109.0%	370.0	88.4%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	326.9	300.0	109.0%	370.0	88.4%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	260.8	320.7	300.0	106.9%	370.0	86.7%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	87.4	124.4	112.0	111.1%	146.7	84.8%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	319.0	315.0	101.3%	394.0	81.0%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	318.5	315.0	101.1%	394.0	80.8%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1245.0	999.1	124.6%	1250.1	99.6%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at WALAWALA	Branch Amp	844.9	1220.0	1000.1	122.0%	1250.1	97.6%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	HELLSCYN (60150) -> HURICANE (45103) CKT 1 at HELLSCYN	Branch Amp	883.9	1262.7	1199.9	105.2%	1380.1	91.5%
BF LH Hemingway-Longhorn 500 kV & Longhorn Gen	N POWDER (60312) -> LAGRANDE (40621) CKT 1 at N POWDER	Branch Amp	605.3	938.5	910.0	103.1%	1046.5	89.7%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	331.5	300.0	110.5%	370.0	89.6%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	331.5	300.0	110.5%	370.0	89.6%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	326.8	315.0	103.7%	394.0	82.9%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	306.6	300.0	102.2%	370.0	82.9%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	326.1	315.0	103.5%	394.0	82.8%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	260.8	300.2	300.0	100.1%	370.0	81.1%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	87.4	117.1	112.0	104.5%	146.7	79.8%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1129.4	999.1	113.0%	1250.1	90.3%
BF LH Longhorn-Coyote & Hemingway-Longhorn 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	844.9	1106.5	1000.1	110.6%	1250.1	88.5%
BF LH Longhorn-Coyote 500 kV & Longhorn Gen	No Violations							
BF LH McNary-Longhorn & Hemingway-Longhorn 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	328.8	300.0	109.6%	370.0	88.9%
BF LH McNary-Longhorn & Hemingway-Longhorn 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	328.8	300.0	109.6%	370.0	88.9%
BF LH McNary-Longhorn & Hemingway-Longhorn 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	324.4	315.0	103.0%	394.0	82.3%
BF LH McNary-Longhorn & Hemingway-Longhorn 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	323.8	315.0	102.8%	394.0	82.2%
BF LH McNary-Longhorn & Hemingway-Longhorn 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	303.9	300.0	101.3%	370.0	82.1%
BF LH McNary-Longhorn & Hemingway-Longhorn 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	87.4	117.8	112.0	105.2%	146.7	80.3%

Appendix N5 – 16la1sa_lh_3400idnw_4500wom_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
BF LH McNary-Longhorn & Hemingway-Longhorn 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1162.0	999.1	116.3%	1250.1	93.0%
BF LH McNary-Longhorn & Hemingway-Longhorn 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	844.9	1138.3	1000.1	113.8%	1250.1	91.1%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	329.5	300.0	109.8%	370.0	89.1%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	328.0	300.0	109.3%	370.0	88.6%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	328.0	300.0	109.3%	370.0	88.6%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	260.8	321.8	300.0	107.3%	370.0	87.0%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JEFFERSN	Branch MVA	87.4	124.1	112.0	110.8%	146.7	84.6%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	320.0	315.0	101.6%	394.0	81.2%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	319.4	315.0	101.4%	394.0	81.1%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1230.7	999.1	123.2%	1250.1	98.4%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at WALAWALA	Branch Amp	844.9	1206.1	1000.1	120.6%	1250.1	96.5%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	HELLSCYN (60150) -> HURICANE (45103) CKT 1 at HELLSCYN	Branch Amp	883.9	1248.3	1199.9	104.0%	1380.1	90.4%
BF LH McNary-Longhorn & Longhorn-Coyote 500 kV	N POWDER (60312) -> LAGRANDE (40621) CKT 1 at N POWDER	Branch Amp	605.3	917.6	910.0	100.8%	1046.5	87.7%
BF LH McNary-Longhorn 500 kV & Longhorn Gen	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1603.7	1733.2	1732.1	100.1%	2338.3	74.1%
Bus: Buckley 500 kV	No Violations							
Bus: Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	338.6	300.0	112.9%	370.0	91.5%
Bus: Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	338.6	300.0	112.9%	370.0	91.5%
Bus: Summer Lake 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	315.9	300.0	105.3%	370.0	85.4%
Bus: Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	333.0	315.0	105.7%	394.0	84.5%
Bus: Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	332.2	315.0	105.5%	394.0	84.3%
Bus: Summer Lake 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	260.8	308.7	300.0	102.9%	370.0	83.4%
Bus: Summer Lake 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1073.2	999.1	107.4%	1250.1	85.9%
Bus: Summer Lake 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	844.9	1051.8	1000.1	105.2%	1250.1	84.1%
Bus: Summer Lake 500 kV	HEMINWAY (60155) -> HEMLON11 (61956) CKT 1 at HEMINWAY	Branch Amp	1310.8	2026.7	2000.1	101.3%	3464.1	58.5%
N-1: Ashe-Hanford 500 kV	No Violations							
N-1: Ashe-Low Mon 500 kV	No Violations							
N-1: Ashe-Marion 500 kV	No Violations							
N-1: Ashe-Slatt 500 kV	No Violations							
N-1: Big Eddy-Celilo 500 kV	No Violations							
N-1: Big Eddy-John Day 500 kV	No Violations							
N-1: Big Eddy-Knight 500 kV	No Violations							
N-1: Big Eddy-Ostrander 500 kV	No Violations							
N-1: Boise Bench-Brownlee #3 230 kV	No Violations							
N-1: Brady-Antelope 230 kV + RAS	No Violations							
N-1: Brownlee-Ontario 230 kV	No Violations							
N-1: Buckley-Grizzly 500 kV	No Violations							
N-1: Buckley-Marion 500 kV	No Violations							
N-1: Buckley-Slatt 500 kV	No Violations							
N-1: Coulee-Hanford 500 kV	No Violations							
N-1: Coulee-Schultz 500 kV	No Violations							
N-1: Coyote-Slatt 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	305.9	300.0	102.0%	370.0	82.7%
N-1: Coyote-Slatt 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	305.9	300.0	102.0%	370.0	82.7%
N-1: Drycreek-Lolo 230 kV	No Violations							
N-1: Drycreek-N Lewiston 230 kV	No Violations							
N-1: Drycreek-Wala Ava 230 kV	No Violations							

Appendix N5 – 16la1sa_lh_3400idnw_4500wom_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: Dworshak-Hatwai 500 kV	No Violations							
N-1: Dworshak-Taft 500 kV	No Violations							
N-1: Grassland-Slatt 500 kV	No Violations							
N-1: Grizzly-John Day #2 500 kV	No Violations							
N-1: Grizzly-Malin 500 kV	No Violations							
N-1: Grizzly-Ponderosa A-Summer L 500 kV	No Violations							
N-1: Grizzly-Ponderosa B-Capt Jack 500 kV	No Violations							
N-1: Grizzly-Round Bu 500 kV	No Violations							
N-1: Hanford-Low Mon 500 kV	No Violations							
N-1: Hanford-Vantage 500 kV	No Violations							
N-1: Hanford-Wautoma 500 kV	No Violations							
N-1: Hells Canyon-Brownlee 230 kV	No Violations							
N-1: Hells Canyon-Walla Walla 230 kV	No Violations							
N-1: Hemingway-Longhorn 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	328.5	300.0	109.5%	370.0	88.8%
N-1: Hemingway-Longhorn 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	328.5	300.0	109.5%	370.0	88.8%
N-1: Hemingway-Longhorn 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	324.2	315.0	102.9%	394.0	82.3%
N-1: Hemingway-Longhorn 500 kV	JEFFERSN (65850) -> JFRSNPHA (65860) CKT 1 at JFRSNPHA	Branch MVA	87.4	120.5	112.0	107.6%	146.7	82.2%
N-1: Hemingway-Longhorn 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	323.6	315.0	102.7%	394.0	82.1%
N-1: Hemingway-Longhorn 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	303.7	300.0	101.2%	370.0	82.1%
N-1: Hemingway-Longhorn 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1158.2	999.1	115.9%	1250.1	92.7%
N-1: Hemingway-Longhorn 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	844.9	1134.4	1000.1	113.4%	1250.1	90.7%
N-1: Hemingway-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	331.0	300.0	110.3%	370.0	89.5%
N-1: Hemingway-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	331.0	300.0	110.3%	370.0	89.5%
N-1: Hemingway-Summer Lake 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	313.3	300.0	104.4%	370.0	84.7%
N-1: Hemingway-Summer Lake 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	260.8	307.1	300.0	102.4%	370.0	83.0%
N-1: Hemingway-Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	326.1	315.0	103.5%	394.0	82.8%
N-1: Hemingway-Summer Lake 500 kV	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	325.5	315.0	103.3%	394.0	82.6%
N-1: Hemingway-Summer Lake 500 kV	HURICANE (45103) -> HURWAL11 (90145) CKT 1 at HURICANE	Branch Amp	865.2	1085.9	999.1	108.7%	1250.1	86.9%
N-1: Hemingway-Summer Lake 500 kV	HURWAL11 (90145) -> WALAWALA (45327) CKT 1 at HURWAL11	Branch Amp	844.9	1064.0	1000.1	106.4%	1250.1	85.1%
N-1: Hemingway-Summer Lake 500 kV	HEMINWAY (60155) -> HEMLON11 (61956) CKT 1 at HEMINWAY	Branch Amp	1310.8	2074.9	2000.1	103.7%	3464.1	59.9%
N-1: Hemingway-Summer Lake 500 kV	HEMLON12 (61955) -> LONGHORN (40724) CKT 1 at HEMLON12	Branch Amp	1213.3	2016.4	2000.1	100.8%	3464.1	58.2%
N-1: Horse Hv-McNary 230 kV	No Violations							
N-1: John Day-Marion 500 kV	No Violations							
N-1: John Day-Rock Ck 500 kV	No Violations							
N-1: John Day-Slatt 500 kV	No Violations							
N-1: Knight-Wautoma 500 kV	No Violations							
N-1: LaGrande-North Powder 230 kV	No Violations							
N-1: Lit Goose-Central Ferry 500 kV	No Violations							
N-1: Lit Goose-Low Mon 500 kV	No Violations							
N-1: Longhorn-Coyote 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	301.9	300.0	100.6%	370.0	81.6%
N-1: Longhorn-Coyote 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	301.9	300.0	100.6%	370.0	81.6%
N-1: Low Gran-Central Ferry 500 kV	No Violations							
N-1: Low Mon-McNary 500 kV	No Violations							
N-1: Malin-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	305.6	300.0	101.9%	370.0	82.6%
N-1: Malin-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	305.6	300.0	101.9%	370.0	82.6%

Appendix N5 – 16la1sa_lh_3400idnw_4500wom_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-1: McNary 500/230 kV Xfmr	No Violations							
N-1: McNary-Board T1 230 kV	No Violations							
N-1: McNary-John Day 500 kV	No Violations							
N-1: McNary-Longhorn 500 kV	No Violations							
N-1: McNary-Ross 345 kV	No Violations							
N-1: McNary-Roundup 230 kV	No Violations							
N-1: Midpoint-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	311.7	300.0	103.9%	370.0	84.2%
N-1: Midpoint-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	311.7	300.0	103.9%	370.0	84.2%
N-1: Ontario-Caldwell 230 kV	No Violations							
N-1: Ostrander-Knight 500 kV	No Violations							
N-1: Ostrander-Pearl 500 kV	No Violations							
N-1: Ostrander-Troutdale 500 kV	No Violations							
N-1: Oxbow-Brownlee #2 230 kV	No Violations							
N-1: Oxbow-Lolo 230 kV	No Violations							
N-1: Ponderosa A 500/230 kV Xfmr	No Violations							
N-1: Ponderosa B 500/230 kV Xfmr	No Violations							
N-1: Populus-Cedar Hill-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	302.5	300.0	100.8%	370.0	81.7%
N-1: Populus-Cedar Hill-Hemingway 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	302.5	300.0	100.8%	370.0	81.7%
N-1: Populus-Cedar Hill-Hemingway 500 kV	MIDPOINT (60240) -> MIDHEM11 (61988) CKT 1 at MIDHEM11	Branch Amp	1603.7	2372.2	1732.1	137.0%	2338.3	101.4%
N-1: Populus-Cedar Hill-Hemingway 500 kV	POPULUS (67790) -> BORPOP11 (61970) CKT 1 at POPULUS	Branch Amp	1014.8	1551.8	1492.7	104.0%	2264.2	68.5%
N-1: Rock Ck-Wautoma 500 kV	No Violations							
N-1: Roundup-Lagrande 230 kV	No Violations							
N-1: Schultz-Vantage 500 kV	No Violations							
N-1: Schultz-Wautoma 500 kV	No Violations							
N-1: Slatt 500/230 kV Xfmr	No Violations							
N-1: Vantage 500/230 kV Xfmr #1	No Violations							
N-1: Vantage 500/230 kV Xfmr #2	No Violations							
N-1: Walla Walla-Talbot 230 kV	No Violations							
N-1: Walla Walla-Wallula 230 kV	No Violations							
N-2: Ashe-Marion & Ashe-Slatt 500 kV	No Violations							
N-2: Ashe-Marion & Buckley-Marion 500 kV	No Violations							
N-2: Ashe-Marion & Coyote-Slatt 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	311.8	300.0	103.9%	370.0	84.3%
N-2: Ashe-Marion & Coyote-Slatt 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	311.8	300.0	103.9%	370.0	84.3%
N-2: Ashe-Marion & Slatt-Buckley 500 kV	No Violations							
N-2: Ashe-Marion & Slatt-John Day 500 kV	No Violations							
N-2: Ashe-Slatt & Coyote-Slatt 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	310.1	300.0	103.4%	370.0	83.8%
N-2: Ashe-Slatt & Coyote-Slatt 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	310.1	300.0	103.4%	370.0	83.8%
N-2: Ashe-Slatt & McNary-John Day 500 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Chemawa 230 kV	No Violations							
N-2: Big Eddy-Ostrander 500 kV & Big Eddy-Troutdale 230 kV	No Violations							
N-2: Boise Bench-Brownlee #1 & #2 230 kV	No Violations							
N-2: Boise Bench-Brownlee #3 & Boise Bench-Horseflat#4 230 kV	No Violations							
N-2: Brownlee-Hells Canyon & Oxbow-Lolo 230 kV	No Violations							
N-2: Brownlee-Oxbow & Brownlee-Hells Canyon 230 kV	No Violations							
N-2: Buckley-Marion & John Day-Marion 500 kV	No Violations							

Appendix N5 – 16la1sa_lh_3400idnw_4500wom_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: Coulee-Hanford & Hanford-Vantage 500 kV	No Violations							
N-2: Coulee-Schultz #1 & #2 500 kV	No Violations							
N-2: DC-BIPOLE	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	339.9	300.0	113.3%	370.0	91.9%
N-2: DC-BIPOLE	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	339.9	300.0	113.3%	370.0	91.9%
N-2: DC-BIPOLE	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO PS	Branch MVA	290.2	333.1	315.0	105.8%	394.0	84.6%
N-2: DC-BIPOLE	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO PS	Branch MVA	290.2	332.4	315.0	105.5%	394.0	84.4%
N-2: Double Palo Verde	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	358.4	300.0	119.5%	370.0	96.9%
N-2: Double Palo Verde	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	358.4	300.0	119.5%	370.0	96.9%
N-2: Double Palo Verde	PINTO (66225) -> PINTO PS (66235) CKT 2 at PINTO	Branch MVA	290.2	364.5	315.0	115.7%	394.0	92.5%
N-2: Double Palo Verde	PINTO (66225) -> PINTO PS (66235) CKT 1 at PINTO	Branch MVA	290.2	363.1	315.0	115.3%	394.0	92.2%
N-2: Double Palo Verde	H ALLEN (18001) -> H ALLEN (18019) CKT 1 at H ALLEN	Branch MVA	296.7	371.1	357.0	104.0%	415.9	89.2%
N-2: Double Palo Verde	H ALLEN (18001) -> H ALLEN (18019) CKT 2 at H ALLEN	Branch MVA	296.7	371.1	357.0	104.0%	415.9	89.2%
N-2: Double Palo Verde	CHOLLA (14000) -> CHOSAG11 (14014) CKT 1 at CHOSAG11	Branch Amp	978.9	1079.7	1026.0	105.2%	1538.1	70.2%
N-2: Double Palo Verde	ROBINSON (64885)	% Δ Volts	1.026	0.973				-5.17%
N-2: Double Palo Verde	GONDER (64310)	% Δ Volts	1.016	0.963				-5.22%
N-2: Double Palo Verde	HA PS (18002)	% Δ Volts	0.99	0.938				-5.25%
N-2: Double Palo Verde	ROBINSON (64895)	% Δ Volts	1.081	1.024				-5.27%
N-2: Double Palo Verde	GONDER (64056)	% Δ Volts	1.022	0.968				-5.28%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	304.1	300.0	101.4%	370.0	82.2%
N-2: Grizzly-Malin & Grizzly-Captain Jack 500 kV	MALSUM12 (90086) -> MALSUM11 (90085) CKT 1 at MALSUM11	Branch Amp	1823.8	2781.2	2700.0	103.0%	4000.0	69.5%
N-2: Grizzly-Malin & Grizzly-Summer Lake 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	300.4	300.0	100.1%	370.0	81.2%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	BRDRTWN (64018) -> BRDRTNPS (64017) CKT 1 at BRDRTWN	Branch MVA	266.8	317.8	300.0	105.9%	370.0	85.9%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	HIL TOP (64058) -> HIL TOP (40537) CKT 1 at HIL TOP	Branch MVA	260.8	310.3	300.0	103.4%	370.0	83.9%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	306.4	300.0	102.1%	370.0	82.8%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	306.4	300.0	102.1%	370.0	82.8%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	CAPPON16 (90142) -> CAPPON15 (90141) CKT 1 at CAPPON15	Branch Amp	1092.7	2475.2	2400.0	103.1%	3800.0	65.1%
N-2: Grizzly-Malin & Malin-Summer Lake 500 kV	CAPPON12 (90138) -> CAPPON11 (90137) CKT 1 at CAPPON11	Branch Amp	1081.0	2458.4	2400.0	102.4%	3800.0	64.7%
N-2: Hanford-Ashe & Hanford-Low Mon 500 kV	No Violations							
N-2: Hanford-Wautoma #1 & #2 500 kV	No Violations							
N-2: Hells Canyon-Brownlee & Oxbow-Lolo 230 kV	No Violations							
N-2: John Day-Big Eddy #1 & #2 500 kV	No Violations							
N-2: John Day-Big Eddy & John Day-Marion 500 kV	No Violations							
N-2: John Day-Grizzly #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	307.5	300.0	102.5%	370.0	83.1%
N-2: John Day-Grizzly #1 & #2 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	307.5	300.0	102.5%	370.0	83.1%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	303.8	300.0	101.3%	370.0	82.1%
N-2: John Day-Grizzly #2 & Buckley-Grizzly 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	303.8	300.0	101.3%	370.0	82.1%
N-2: John Day-Marion & Buckley-Marion 500 kV	No Violations							
N-2: John Day-Marion & Marion-Pearl 500 kV	No Violations							
N-2: John Day-Rock Creek 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & McNary-Ross 345 kV	No Violations							
N-2: Knight-Ostrander 500 kV & Midway-Bonneville 230 kV	No Violations							
N-2: Lower Granite-Central Ferry #1 & #2 500 kV	BELL SC (40096) -> BELL BPA (40091) CKT 1 at BELL SC	Branch Amp	1534.7	2290.2	2200.1	104.1%	3000.0	76.3%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	301.9	300.0	100.6%	370.0	81.6%
N-2: McNary-John Day & Rock Creek-John Day 500 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	301.9	300.0	100.6%	370.0	81.6%
N-2: McNary-John Day 500 kV & McNary-Horse Heaven 230 kV	No Violations							

Appendix N5 – 16la1sa_lh_3400idnw_4500wom_5500wos Base Case Post-Transient Contingency Results

Contingency Studied	Element Overloaded	Violation Type	Pre Cont. Value	Post Cont. Value	Limit A	% Limit A	Limit B	% Limit B or % Δ Volts
N-2: McNary-John Day 500 kV & McNary-Ross 345 kV	No Violations							
N-2: McNary-Ross 345 kV & McNary-Horse Heaven 230 kV	No Violations							
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 1 at H ALLEN	Branch MVA	291.5	311.8	300.0	103.9%	370.0	84.3%
N-2: Midpoint-Summer Lake 500 kV & Midpoint-King 230 kV	HA PS (18002) -> H ALLEN (18001) CKT 2 at H ALLEN	Branch MVA	291.5	311.8	300.0	103.9%	370.0	84.3%
N-2: Schultz-Wautoma & Vantage-Schultz 500 kV	No Violations							
N-2: Sickler-Schultz & Schultz-Vantage 500 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Midway-Big Eddy 230 kV	No Violations							
N-2: Wautoma-Rock Ck 500 kV & Springcreek-Big Eddy 230 kV	No Violations							

BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON

Docket PCN 5

In the Matter of

IDAHO POWER COMPANY'S
PETITION FOR CERTIFICATE OF PUBLIC CONVENIENCE
AND NECESSITY

Attachment 16

Permit Status Chart

September 30, 2022

Land Use Approvals and Permits Required for the B2H Project

Permit or Approval	Regulatory Authority	Federal /State/ Local	Included in EFSC Site Certificate	Status	Date Issued or Expected
Bureau of Land Management ROW Grant	U.S. Bureau of Land Management	Federal	No	Issued	January 2018
Cultural Resource Use Permit and Site-Specific Authorizations	U.S. Bureau of Land Management	Federal	No	Issued	June 2022
Permit for Archaeological Investigations	U.S. Bureau of Land Management	Federal	No	Issued	Contractor-held[1]
Paleontological Resources Use Permit	U.S. Bureau of Land Management	Federal	No	Issued	Contractor-held
Navy Easement	U.S. Department of Navy	Federal	No	Issued	March 2020
Forest Service Easement	U.S. Forest Service	Federal	No	Issued	May 2019
Special Use Authorization for Archaeological Investigations	U.S. Forest Service	Federal	No	Issued	July 2022
Archaeological Excavation Permit	Oregon State Historic Preservation Office	State	No	Issued	August 2022
Energy Facility Site Certificate	Oregon Energy Facility Siting Council	State	Yes	Approved	September 2022
Fish Passage Plan Approval	Oregon Department of Fish and Wildlife	State	Yes	Pending	October 2022
Removal-Fill Permit	Oregon Department of State Lands	State	Yes	Pending	October 2022
Baker County Land Use Permits	Baker County	Local	Yes	Pending	October 2022
City of Huntington Land Use Permits	City of Huntington	Local	Yes	Pending	October 2022
City of North Powder Land Use Permits	City of North Powder	Local	Yes	Pending	October 2022
Malheur County Land Use Permits	Malheur County	Local	Yes	Pending	October 2022

[1] Contractor-held permits are held by Idaho Power's contractors as part of their ordinary course of business rather than being obtained specifically for B2H.

Permit or Approval	Regulatory Authority	Federal /State/ Local	Included in EFSC Site Certificate	Status	Date Issued or Expected
Morrow County Land Use Permits	Morrow County	Local	Yes	Pending	October 2022
Umatilla County Land Use Permits	Umatilla County	Local	Yes	Pending	October 2022
Union County Land Use Permits	Union County	Local	Yes	Pending	October 2022
Federal Notice of Proposed Construction or Alteration	Federal Aviation Administration	Federal	No	Pending	Prior to Construction
Clean Water Act Section 404, Nationwide Permit 57[2]	U.S. Army Corps of Engineers	Federal	No	Pending	Prior to Construction
Special Use Permit for Logging Activities	U.S. Forest Service	Federal	No	Pending	Prior to Construction
Oregon Notice of Proposed Construction or Alteration	Oregon Department of Aviation	State	No	Pending	Prior to Construction
National Pollutant Discharge Elimination System Permit 1200-C	Oregon Department of Environmental Quality	State	No	Pending	Prior to Construction
National Pollutant Discharge Elimination System Permit 1200-A	Oregon Department of Environmental Quality	State	No	Pending	Prior to Construction
Air Contaminant Discharge Permit	Oregon Department of Environmental Quality	State	No	Pending	Prior to Construction
Permit to Operate Power Driven Machinery	Oregon Department of Forestry	State	No	Pending	Prior to Construction
Burn Permit	Oregon Department of Forestry	State	No	Pending	Prior to Construction
Plan for Alternate Practice	Oregon Department of Forestry	State	No	Pending	Prior to Construction
Permit to Construct a State Highway Approach	Oregon Department of Transportation	State	No	Pending	Prior to Construction

[2] Nationwide Permit 57 was formerly known as Nationwide Permit 12 prior to being renumbered in 2021.

Permit or Approval	Regulatory Authority	Federal /State/ Local	Included in EFSC Site Certificate	Status	Date Issued or Expected
Oversize Load Movement Permit/Load Registration	Oregon Department of Transportation	State	No	Pending	Prior to Construction
Permit to Occupy or Perform Operations Upon a State Highway	Oregon Department of Transportation	State	No	Pending	Prior to Construction
Road Approach Permit	Baker County	Local	No	Pending	Prior to Construction
Work in County Right-of-Way Permit	Baker County	Local	No	Pending	Prior to Construction
Flood Plain Development Permit	Baker County	Local	No	Pending	Prior to Construction
Permit to Occupy or Perform Operations upon Public Roads	Malheur County	Local	No	Pending	Prior to Construction
Flood Plain Development Permit	Malheur County	Local	No	Pending	Prior to Construction
Utility Crossing Permit	Morrow County	Local	No	Pending	Prior to Construction
Access Approach Site Permit	Morrow County	Local	No	Pending	Prior to Construction
Construction Permit to Build on Right-of-Way	Morrow County	Local	No	Pending	Prior to Construction
Flood Plain Development Permit	Morrow County	Local	No	Pending	Prior to Construction
Installation of Utilities on County and Public Roads Permit	Umatilla County	Local	No	Pending	Prior to Construction
Road Approach and Crossing Permit	Umatilla County	Local	No	Pending	Prior to Construction
Flood Plain Development Permit	Umatilla County	Local	No	Pending	Prior to Construction
Road Approach Permit	Union County	Local	No	Pending	Prior to Construction
Work in County Right-of-Way Permit	Union County	Local	No	Pending	Prior to Construction
Flood Plain Development Permit	Union County	Local	No	Pending	Prior to Construction
Conditional Use Permit	Owyhee County (Idaho)	Local	No	Pending	Prior to Construction

CERTIFICATE OF SERVICE

I hereby certify that I served a true and correct copy of the confidential pages of Idaho Power Company's Petition for Certificate of Public Convenience and Necessity on the parties to Docket PCN 5 on the date indicated by email addressed to said person(s) at his or her last-known address(es) indicated below.

PCN 5 Service List

STAFF	
Kim Herb (C) Public Utility Commission of Oregon PO BOX 1088 SALEM OR 97308-1088 kim.herb@puc.oregon.gov	Johanna Riemenschneider (C) Oregon Department of Justice BUSINESS ACTIVITIES SECTION 1162 COURT ST NE SALEM OR 97301-4796 johanna.riemenschneider@doj.state.or.us

STOP B2H	
Jim Kreider (C) 60366 MARVIN RD LA GRANDE OR 97850 jkreider@campblackdog.org	

DATED: September 30, 2022

/s/ Alisha Till
Alisha Till
Paralegal