



Oregon

Kate Brown, Governor

Public Utility Commission

201 High St SE Suite 100

Salem, OR 97301

Mailing Address: PO Box 1088

Salem, OR 97308-1088

Consumer Services

1-800-522-2404

Local: 503-378-6600

Administrative Services

503-373-7394

May 24, 2018

Via Electronic Filing

OREGON PUBLIC UTILITY COMMISSION
ATTENTION: FILING CENTER
PO BOX: 1088
SALEM OR 97308-1088

**RE: Docket No. UE 335 – In the Matter of
PORTLAND GENERAL ELECTRIC COMPANY, Request for a
General Rate Revision.**

Attached are the following exhibits in UE 355 Staff Opening Testimony
for Net Variable Power Costs:

Exhibit 100-101, Gibbens, page 3 of Exhibit 100 is confidential
Exhibit 200-202, Anderson
Exhibit 300-307, Kaufman
Exhibit 300, Confidential pages are: 2, 4-5, 7-15, 17-19 and 21-23
Exhibit 303 is confidential and provided on CD to parties who have
signed Protective Order 18-047.

/s/ Kay Barnes

Kay Barnes
PUC- Utility Program
(503) 378-5763
kay.barnes@state.or.us

UE 335 SERVICE LIST

STEPHANIE S ANDRUS PUC STAFF--DEPARTMENT OF JUSTICE	BUSINESS ACTIVITIES SECTION 1162 COURT ST NE SALEM OR 97301-4096 stephanie.andrus@state.or.us
SOMMER MOSER PUC STAFF - DEPARTMENT OF JUSTICE	1162 COURT ST NE SALEM OR 97301 sommer.moser@doj.state.or.us
ALBERTSONS	
BRIAN BETHKE 11555 DUBLIN CANYON ROAD	250 PARKCENTER BLVD BOISE ID 83706 brian.bethke@albertsons.com
CHRIS ISHIZU ALBERTSONS COMPANIES, INC.	250 PARKCENTER BLVD BOISE ID 83706 chris.ishizu@albertsons.com
GEORGE WAIDELICH ALBERTSONS COMPANIES' INC.	11555 DUBLIN CANYON ROAD PLEASANTON OR 94588 george.waidelich@albertsons.com
AWEC UE 335	
BRADLEY MULLINS (C) MOUNTAIN WEST ANALYTICS	1750 SW HARBOR WAY STE 450 PORTLAND OR 97201 brmullins@mwanalytics.com
TYLER C PEPPE (C) DAVISON VAN CLEVE, PC	1750 SW HARBOR WAY STE 450 PORTLAND OR 97201 tcp@dvclaw.com
ROBERT SWEETIN (C) DAVISON VAN CLEVE, P.C.	185 E. RENO AVE, SUITE B8C LAS VEGAS NV 89119 rds@dvclaw.com
CALPINE SOLUTIONS	
GREGORY M. ADAMS (C) RICHARDSON ADAMS, PLLC	PO BOX 7218 BOISE ID 83702 greg@richardsonadams.com
GREG BASS CALPINE ENERGY SOLUTIONS, LLC	401 WEST A ST, STE 500 SAN DIEGO CA 92101 greg.bass@calpinesolutions.com
KEVIN HIGGINS (C) ENERGY STRATEGIES LLC	215 STATE ST - STE 200 SALT LAKE CITY UT 84111-2322 khiggins@energystrat.com
FRED MEYER	
KURT J BOEHM (C) BOEHM KURTZ & LOWRY	36 E SEVENTH ST - STE 1510 CINCINNATI OH 45202 kboehm@bkllawfirm.com
JODY KYLER COHN (C) BOEHM, KURTZ & LOWRY	36 E SEVENTH ST STE 1510 CINCINNATI OH 45202 jkyler@bkllawfirm.com
NI PPC	
ROBERT D KAHN NORTHWEST & INTERMOUNTAIN POWER PRODUCERS COALITION	PO BOX 504 MERCER ISLAND WA 98040 rkahn@nippc.org
IRION A SANGER (C) SANGER LAW PC	1117 SE 53RD AVE PORTLAND OR 97215 irion@sanger-law.com

SIDNEY VILLANUEVA (C) SANGER LAW, PC	1117 SE 53RD AVE PORTLAND OR 97215 sidney@sanger-law.com
OREGON CITIZENS UTILITY BOARD	
OREGON CITIZENS' UTILITY BOARD	610 SW BROADWAY, STE 400 PORTLAND OR 97205 dockets@oregoncub.org
MICHAEL GOETZ (C) OREGON CITIZENS' UTILITY BOARD	610 SW BROADWAY STE 400 PORTLAND OR 97205 mike@oregoncub.org
ROBERT JENKS (C) OREGON CITIZENS' UTILITY BOARD	610 SW BROADWAY, STE 400 PORTLAND OR 97205 bob@oregoncub.org
PACIFICORP	
PACIFICORP, DBA PACIFIC POWER	825 NE MULTNOMAH ST, STE 2000 PORTLAND OR 97232 oregondockets@pacificorp.com
MATTHEW MCVEE PACIFICORP	825 NE MULTNOMAH PORTLAND OR 97232 matthew.mcvee@pacificorp.com
PORTLAND GENERAL ELECTRIC	
PGE RATES & REGULATORY AFFAIRS	PORTLAND GENERAL ELECTRIC COMPANY 121 SW SALMON STREET, 1WTC0306 PORTLAND OR 97204 pge.opuc.filings@pgn.com
STEFAN BROWN (C) PORTLAND GENERAL ELECTRIC	121 SW SALMON ST, 1WTC0306 PORTLAND OR 97204 stefan.brown@pgn.com; pge.opuc.filings@pgn.com
DOUGLAS C TINGEY (C) PORTLAND GENERAL ELECTRIC	121 SW SALMON 1WTC1301 PORTLAND OR 97204 doug.tingey@pgn.com
SBUA	
JAMES BIRKELUND SMALL BUSINESS UTILITY ADVOCATES	548 MARKET ST STE 11200 SAN FRANCISCO CA 94104 james@utilityadvocates.org
DIANE HENKELS (C) CLEANTECH LAW PARTNERS PC	420 SW WASHINGTON ST STE 400 PORTLAND OR 97204 dhenkels@cleantechlaw.com
STAFF	
MARIANNE GARDNER (C) PUBLIC UTILITY COMMISSION OF OREGON	PO BOX 1088 SALEM OR 97308-1088 marianne.gardner@state.or.us
WALMART	
VICKI M BALDWIN (C) PARSONS BEHLE & LATIMER	201 S MAIN ST STE 1800 SALT LAKE CITY UT 84111 vbaldwin@parsonsbehle.com
STEVE W CHRIS (C) WAL-MART STORES, INC.	2001 SE 10TH ST BENTONVILLE AR 72716-0550 stephen.chriss@wal-mart.com

CERTIFICATE OF SERVICE

UE 335

I certify that I have, this day, served the foregoing document upon all parties of record in this proceeding by delivering a copy in person or by mailing a copy properly addressed with first class postage prepaid, or by electronic mail pursuant to OAR 860-001-0180, to the following parties or attorneys of parties.

Dated this 24th day of May, 2018 at Salem, Oregon



Kay Barnes
Public Utility Commission
201 High Street SE Suite 100
Salem, Oregon 97301-3612
Telephone: (503) 378-5763

CASE: UE 335
WITNESS: SCOTT GIBBENS

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 100

Net Variable Power Costs

Opening Testimony

May 24, 2018

1 **Q. Please state your name, occupation, and business address.**

2 A. My name is Scott Gibbens. I am a senior economist employed in the Energy
3 Rates, Finance and Audit Division of the Public Utility Commission of Oregon
4 (OPUC). My business address is 201 High Street SE., Suite 100, Salem,
5 Oregon 97301.

6 **Q. Please describe your educational background and work experience.**

7 A. My witness qualification statement is found in Exhibit Staff/101.

8 **Q. What is the purpose of your testimony?**

9 A. I provide a summary of Portland General Electric Company (PGE)'s 2019
10 Automatic Update Tariff (AUT) filing, discuss PGE's benefit estimation for its
11 participation in the Western Energy Imbalance Market (EIM), review Staff's
12 analysis of PGE's decision to change the dispatch logic for Power Westward 2,
13 look at the proposed update to the Headwater Benefits Study, and provide
14 feedback on an issue related to the AUT and Power Cost Adjustment
15 Mechanism (PCAM) relationship stemming from Docket No. UE 329.

16 **Q. Did you prepare an exhibit for this docket?**

17 A. Yes. I prepared a witness qualification statement labeled Exhibit Staff/101.

18 **Q. How is your testimony organized?**

19 A. My testimony is organized as follows:

20	Summary of Staff's Review of PGE's 2018 NVPC Filing	2
21	Issue 1. Filing Compliance and Standard Inputs.....	4
22	Issue 2. Western EIM.....	6
23	Issue 3. Port Westward 2 Dynamic Programming.....	12
24	Issue 4. Headwater Benefits Study	14
25	Issue 6. PCAM and AUT Adjustments	15

SUMMARY OF STAFF'S REVIEW OF PGE'S 2018 NVPC FILING**Q. Please explain PGE's 2018 NVPC filing.**

A. Commission Order No. 08-505 authorized PGE's AUT, which allows for an annual adjustment to PGE's rates that accounts for the forecasted changes in the coming year's NVPC. When filed as a stand-alone case, the AUT is filed by April 1 of the preceding year and includes updates to a pre-specified set of data parameters. Since PGE has filed its 2019 NVPC filing concurrently with a general rate case (GRC) proceeding, the Company has included in its filing, not only the parameter revisions allowed under PGE's AUT (Tariff Schedule 125), but also MONET model changes and updates.

Q. What model changes and updates does the company propose in its initial filing?

A. To update its 2018 NVPC for 2019, PGE:

1. Includes an estimated NVPC benefit based on PGE's full participation in the Western EIM;
2. Updates Port Westward 2 to use MONET's dynamic programming dispatch model;
3. Replaces the current Mist Gas Storage and Gap Services contract with the North Mist Expansion Project tariff costs;
4. Updates California Trading Margins to include a more granular forward looking methodology;
5. Updates the forecast of transmission resale net revenue;

- 1 6. Updates to the latest Pacific Northwest Coordination Agreement (PNCA)
- 2 Headwater Benefits study for their hydro data; and
- 3 7. Includes the new capacity agreement acquired through bilateral
- 4 negotiations pursuant to Commission Order No. 17-494.

5 **Q. What topics will Staff testimony address?**

6 A. Staff discusses the following issues in our opening round of testimony:

- 7 (Staff/100 Gibbens)
- 8 Order Compliance and Standard Inputs
- 9 1. Western EIM
 - 10 2. Port Westward 2 Dynamic Programming
 - 11 3. Headwater Benefits Study
 - 12 4. PCAM and AUT Adjustments

- 13 (Staff/200 Anderson)
- 14 5. North Mist Expansion Project
 - 15 6. PURPA

- 16 (Staff/300 Kaufman)
- 17 7. Direct Access Transition Adjustment
 - 18 8. Carty Gas Transportation Expense
 - 19 9. California-Oregon Border Modeling
 - 20 10. Wind Resource Capacity Factors
 - 21 11. New Capacity Agreements

22 **Q. Please summarize Staff’s adjustments in this docket.**

23 A. Below is a table summarizing the Staff adjustments found in Staff testimony:

Adjustment	Amount
Western EIM	\$3.2 Million
Carty Gas Transportation	
COB Trading Margins	
Wind Resource Capacity Factors	
TOTAL	

ISSUE 1. FILING COMPLIANCE AND STANDARD INPUTS**Q. What is PGE's forecasted NVPC for 2019?**

A. PGE's initial 2019 NVPC forecast is \$375.3 million, based on contracts and forward curves as of December 21, 2017. This is an increase of \$39.3 million relative to the final 2018 NVPC forecast.¹

Q. Did the filing conform to applicable Minimum Filing Requirements (MFRs)?

A. Yes, the filing includes all MFRs. Commission Order No. 08-505 (Order) contains a list of MFRs for PGE in AUT filings. Staff utilized the MFRs during our analysis of PGE's NVPC. From a high level, the supporting documents contain:

- Summary Documents (Items 1-6)
- MONET Input Supporting Docs
- Historical Data

Q. Please describe what MONET inputs the Company updated.

A. The Company updated the following inputs:

- a. Forward Price Curves;
- b. Load Forecasts;
- c. Heat rates;
- d. Pacific Northwest Coordination Agreement Headwater Benefit Study;
- e. Contracts for wholesale power and power purchases and sales;

¹ PGE/300, Niman-Kim-Batzler/1.

- 1 f. Wind availability forecast;
- 2 g. PURPA contract expenses; and
- 3 h. Maintenance and Forced Outage rates.

ISSUE 2. WESTERN EIM**Q. Please provide a background of this issue.**

A. PGE joined the Western EIM on October 1, 2017. The EIM is a market aimed at providing a more efficient means of meeting short-term imbalances in load. MONET estimates the costs of meeting PGE's load without the benefit of the EIM. As such, the benefits and costs of the EIM are estimated separately and an adjustment is made to net NVPC. Last year, Staff argued that the study commissioned by PGE and performed by Energy and Environmental Economics (E3) to estimate the benefits of the EIM provided an insufficient level of certainty to justify a net cost to customers. Being that the EIM is a volunteer program that is meant to improve efficiency and provide benefit to customers, Staff argued that PGE should set costs equal to direct benefits in order to not penalize customers for a lack of information regarding the EIM benefits. The parties stipulated to increase the net benefits by \$0.5 million (approximately half of Staff's proposed adjustment) and to have PGE commission a second study to further develop the information regarding the expected benefits.

Q. Did PGE have the study performed?

A. Yes. PGE had E3 perform an updated study, which included updated parameters and information in order to improve accuracy.

Q. Is Staff satisfied with the resulting EIM adjustment proposed in the 2019 AUT?

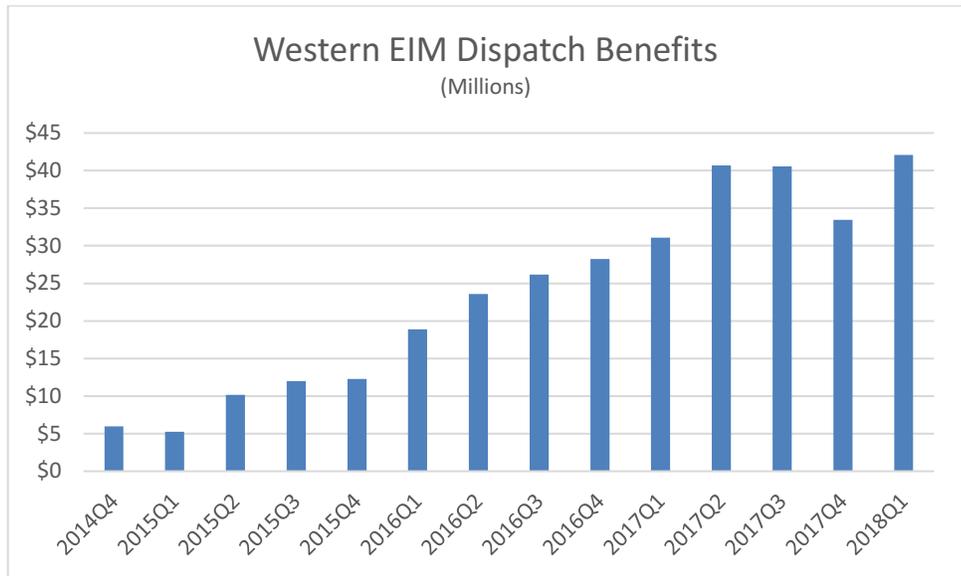
A. No. Staff does not believe that the study produced reasonable results.

1 **Q. Why does Staff believe the results of the study are unreasonable?**

2 A. Staff has concerns with the level of dispatch cost savings estimated in the
3 study. The dispatch cost savings are the benefits to PGE customers from
4 selling power in the EIM when PGE has cheaper than market generation or
5 from purchasing power in the EIM when PGE's generation is more expensive
6 than the market clearing price. Using 2018 dollar values, the study estimates
7 an amount of \$3.0 million for dispatch savings, however in the first two months
8 of 2018, PGE has actual dispatch savings of \$1.35 million. This is roughly 45
9 percent of the total estimate of the year in only the first two months of actual
10 operations in 2018. In looking at PGE's realized benefits since it began
11 operating in the EIM in October 2017, they have already seen roughly \$2.8
12 million in benefits or roughly 94 percent of the forecasted total for the year in
13 the first five months of operation. The annual rolling average of EIM dispatch
14 benefits has increased every quarter since it began operation in Q4 of 2014.
15 The figure below shows the total benefits for each quarter. It is unreasonable to
16 assume a decline in benefits for participants given the steady increase every
17 quarter as more participants join.

1

Figure 1



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3 **Q. Does Staff have any other concerns regarding the estimate?**

4 A. Yes, in discussions with PGE it was found that the benefit calculation for the
 5 actuals listed above incorporates an estimated incremental cost for major
 6 maintenance and O&M. Both of these costs are recovered outside of the AUT.
 7 The issue is one of double counting when these costs are included in the
 8 calculation of EIM benefits. PGE is unable to quantify the import and export
 9 benefit separately so the overall impact is indeterminate, but PGE's current
 10 benefit calculation method opens the door to either an over or under-estimation
 11 of the benefits.³ The Commission recently approved PGE's application for
 12 authority to defer 2018 costs approved for major maintenance in Docket No.
 13 UM 1915, so all costs associated with major maintenance will likely be

² See CAISO Western EIM Quarterly Benefits Reports.

³ CAISO 4th Quarter 2017 and 1st Quarter 2018 report showed that PGE imported more than they exported.

1 recovered. When PGE exports power to the EIM, major maintenance is being
2 counted twice, once as a reduction to EIM benefits on an incremental basis
3 and once through the deferral mechanism. When PGE imports power from the
4 EIM, major maintenance is being reduced twice, once as an addition to the
5 avoided cost calculation for EIM benefits and in the absence of the cost in the
6 deferral.⁴ O&M costs, although not recovered through a deferral function in a
7 similar manner. If and when PGE utilizes historic EIM data to estimate EIM
8 benefits in future AUT's, this issue may need to be corrected.

9 **Q. What is Staff's recommendation for EIM benefits?**

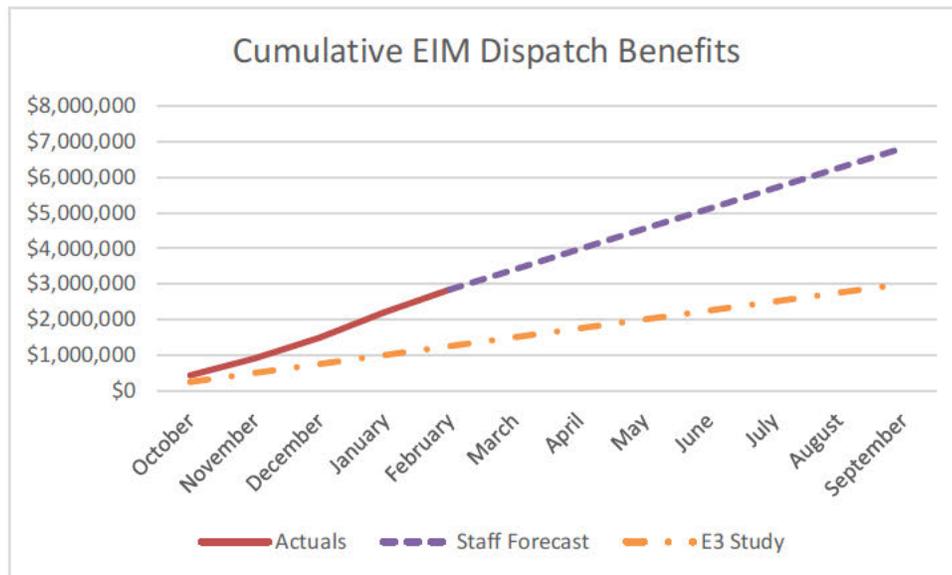
10 A. Given that the forecast does not seem reasonable based on the actuals
11 achieved to date, Staff does not feel confident utilizing it as the sole basis for
12 an estimate. PGE has stated that they will have additional months of actual
13 data beginning in June. The Commission recently approved the use of a six-
14 month set of historical data to forecast EIM benefits in Docket No. UE 323,
15 PacifiCorp's 2018 TAM.⁵ Staff prefers to utilize a longer dataset due to
16 seasonal factors. Staff recommends that PGE create a forecast based on the
17 monthly average of actuals, for months which actual data is not yet available
18 and utilize actual results for any months which it currently has data. Based on
19 the data available so far, this would result in a \$6.8 million estimate for dispatch
20 cost savings. PGE would then update the forecast at the same time it provides
21 MONET updates, as more data becomes available to increase the accuracy.

⁴ This cost would technically not be absent, but delayed to the future.

⁵ Order No. 17-444, pages 15 and 16.

1 Figure 1, below, shows the difference between Staff's methodology using the
 2 current data available and the E3 study. Note that the graph shows the
 3 cumulative amount, which is already at the same level as the E3 study after 5
 4 months. Also note that the forecast section will become smaller as time
 5 passes.

Figure 2



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 9 This method provides a conservative estimate. First, it does not consider any
 10 increases in efficiency realized by PGE as it becomes more familiar in
 11 operating within the EIM. This is something that PacifiCorp states it has seen
 12 as it gained experience operating in the EIM.⁶ Second, the forecast makes no
 13 incremental adjustments for further increases to benefits as Idaho Power,

⁶ See UE 339, PAC/100, Wilding/7, lines 3 and 4.

1 Powerex, and the Balancing Authority of Northern California join the EIM.⁷
2 Staff's proposal is essentially the same forecast methodology approved by the
3 Commission for PAC's 2018 TAM, without additional new entrant or solar over-
4 supply adjustments. This forecast will provide a more accurate estimate of
5 benefits and currently would result in a \$3.8 million reduction to NVPC.

⁷ Idaho Power and Powerex joined in April 2018, for which data is currently unavailable. BANC plans to join in 2019.

ISSUE 3. PORT WESTWARD 2 DYNAMIC PROGRAMMING**Q. Please provide a background on this issue.**

A. PGE has proposed to change the modeling of the Port Westward 2 (PW2) from “up/down” to its Dynamic Programming (DP) dispatch. The difference is that it changes the number of “states” the plant can be in from two to four. In the “up/down” dispatch logic the plant’s “state” is either in the money and at full capacity or not in the money and thus not on. In the dynamic programming model, there are two additional states that the plant could be placed in: “minimum operating level” and “ramping up.” PGE’s Power Supply Engineering Services department updated the plant parameter sheet to include a start-up cost, which previously had not been estimated. Due to this, the plant was switched from up/down to DP in order to incorporate the start-up cost.

Q. What is Staffs view of this proposed modeling change?

A. In reviewing the change, Staff finds that the proposal is reasonable. The start-up cost is a quantifiable real cost that the model previously was not capturing in its dispatch decision-making. The Commission has previously approved the DP model, most recently in Order 13-280, which approved the use of the DP model on all coal plants. The use of a multi-stage decision tree to model each hour makes sense given modeling constraints and a desire to closely reflect actual dispatch decision-making. A concern Staff has is that actual dispatch decisions are made with at least a modicum of foresight available as to what future load requirements might look like, while the dynamic programming model simply makes the optimal decision based on the information for that given stage in the

1 decision tree. If for example, a plant is needed in hour one, not needed in hour
2 two, and then needed again in hour three and four, actual operations might
3 predict the future need and only put the plant at its minimum operating level in
4 the second hour, while MONET would completely shut the plant down and then
5 have to ramp the plant back up in hour three.

6 **Q. What is Staff's recommendation for the proposed model change?**

7 A. Staff understands the need to maintain a model that can run in a reasonable
8 amount of time, and many of the solutions to the problem could be resource
9 intensive. One solution may be to create an iterative process by the model
10 optimizes over a single stage followed by multiple stages in order to provide
11 the model with some foresight. Staff encourages PGE to explore ways to
12 incorporate better decision making into its model, but makes no proposed
13 recommendation for the 2019 AUT.

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ISSUE 4. HEADWATER BENEFITS STUDY

Q. Please provide a background for this issue.

A. PGE has traditionally included the most recent Headwater Benefits Study (HB Study) provided by the Northwest Power Pool in each of its annual AUT filings. The HB Study is used to develop the average hydro energy inputs to MONET. In Docket No. UE 319, PGE found an issue with the 2015-2016 HB Study, which resulted in that Study not being utilized in the AUT forecast. In the current filing, PGE has proposed to use the newest study, the 2016-2017 HB Study, but has indicated that this Study also requires validation and correction of errors.

Q. What is Staff's position on this proposed model update?

A. During the technical conference on April 17, 2018, PGE notified parties that it was in the process of working with the Northwest Power Pool to rectify certain issues. At the meeting the Company stated that it would provide parties with a detailed explanation of the process it goes through in order to verify the results of the HB Study. The Company agreed to provide information on the results of the corrected HB Study to parties prior to its July update. Staff continues to review the information provided by PGE as a result of the discussions held during the technical conference. At this time, Staff has no position on the matter.

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ISSUE 5. PCAM AND AUT ADJUSTMENTS

Q. Please provide a background for this issue.

A. As a result of the stipulated agreement in Docket No. UE 329 regarding PGE's Power Cost Adjustment Mechanism (PCAM), parties agreed that prior to its initial 2019 NVPC filing, PGE would hold a technical workshop with Staff to compare the treatment of NVPC in Schedule 125 and Schedule 126. PGE's forecast of NVPC are recovered in Schedule 125, which is set in AUT filings like this one. Schedule 126 is meant to collect or refund the difference between actual and forecast NVPC in the subsequent year if the amount passes certain thresholds. In Docket No. UE 329, Staff desired to better understand the interaction and adjustments made to the amounts ultimately used to calculate the forecast and actual net power costs. PGE held the technical conference on January 16, 2018.

Q. What was the result of the technical conference?

A. Staff felt that the technical conference helped to clarify the ways in which the PCAM and the AUT relate to each other. The majority of the adjustments made during the true-up process, in which certain costs or benefits are removed or added to actuals, are meant to ensure that the PCAM calculation of the forecast and actuals remains an apples to apples comparison. Some of the adjustments included steam sales from Coyote Springs, gas resale revenues, costs outside true-up period, and ancillary services costs and revenues. Several of the adjustments stem from the fact that Schedule 125 and Schedule 126 do not have the same definition of costs to be included in the respective

1 schedules. Other adjustments result from certain costs being forecasted as a
2 power cost but recovered outside of traditional power cost accounts. Staff was
3 concerned that this difference could result in unintended consequences
4 regarding the true-up of power costs. Limiting the number of items that are not
5 included in the forecast but included in the true-up is important to ensure that
6 the accuracy of the forecast remains the driving factor in the outcome of the
7 true-up. However after review of the adjustments, Staff does not believe that
8 the magnitude of adjustments that may be of concern are near a level that
9 could have a meaningful impact on the outcome of the true-up mechanism, the
10 absolute value of all adjustments Staff reviewed was less than one percent of
11 the total NVPC in the 2016 PCAM.

12 **Q. Does this conclude your testimony?**

13 A. Yes.

CASE: UE 335
WITNESS: SCOTT GIBBENS

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 101

Witness Qualifications Statement

May 24, 2018

WITNESS QUALIFICATION STATEMENT

NAME: Scott Gibbens

EMPLOYER: Public Utility Commission of Oregon

TITLE: Senior Economist
Energy Rates, Finance and Audit Division

ADDRESS: 201 High St. SE Ste. 100
Salem, OR 97301-3612

EDUCATION: Bachelor of Science, Economics, University of Oregon
Masters of Science, Economics, University of Oregon

EXPERIENCE: I have been employed at the Oregon Public Utility Commission (Commission) since August of 2015. My current responsibilities include analysis and technical support for electric power cost recovery proceedings with a focus in model evaluation. I also handle analysis and decision making of affiliated interest and property sale filings, rate spread and rate design, as well as operational auditing and evaluation. Prior to working for the OPUC I was the operations director at Bracket LLC. My responsibilities at Bracket included quarterly financial analysis, product pricing, cost study analysis, and production streamlining. Previous to working for Bracket, I was a manager for US Bank in San Francisco where my responsibilities included coaching and team leadership, branch sales and campaign oversight, and customer experience management.

CASE: UE 335
WITNESS: ROSE ANDERSON

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 200

Net Variable Power Costs

Opening Testimony

May 24, 2018

1 **Q. Please state your name, occupation, and business address.**

2 A. My name is Rose Anderson. I am a Senior Utility Analyst employed in the
3 Energy Resources and Planning Division of the Public Utility Commission of
4 Oregon (OPUC). My business address is 201 High Street SE., Suite 100,
5 Salem, Oregon 97301.

6 **Q. Please describe your educational background and work experience.**

7 A. My witness qualification statement is found in Exhibit Staff/201.

8 **Q. What is the purpose of your testimony?**

9 A. I discuss PGE's request to include the North Mist Expansion Project in PGE's
10 forecast of Net Variable Power Costs (NVPC) for 2019 and an issue regarding
11 the accuracy of forecasting Commercial Online Dates (COD) of new Qualifying
12 Facilities (QF).

13 **Q. Did you prepare an exhibit for this docket?**

14 A. Yes. I prepared exhibit Staff/202 – Language from PGE's Schedule 201
15 Standard Contract, consisting of one page.

16 **Q. How is your testimony organized?**

17 A. My testimony is organized as follows:

18 Issue 1. North Mist Expansion Project 2
19 Issue 2. New Qualifying Facilities Forecast 4

1 NW Natural customers. PGE has maintained communication with NW Natural
2 about project costs, schedule, and any setbacks.

3 **Q. What is Staff's recommendation regarding the NMEP in-service date?**

4 A. Staff recommends that PGE continue to update the in-service date for the
5 NMEP in the 2019 AUT based on updates it receives from NW Natural. Staff
6 recommends that, similar to the 2018 AUT, PGE provide an updated in-service
7 date for NMEP in the final MONET update to the 2019 AUT, scheduled on
8 November 15, 2018. At the time of the final MONET update in November
9 2018, PGE should have a better idea of the likelihood of meeting a January 1,
10 2019 in service date for NMEP. Staff requests that PGE provide with its final
11 MONET update a copy of the communications with NW Natural that supports
12 its final estimated in service date for NMEP.

13

ISSUE 2. NEW QUALIFYING FACILITIES FORECAST**Q. Please summarize PGE's request regarding its forecast of new Qualifying Facilities (QFs).**

A. PGE acknowledges in opening testimony that new QFs can experience delays that prevent them from achieving a scheduled Commercial Operation Date (COD). PGE states that because PURPA expenses are non-optional for a utility, the utility's shareholders and ratepayers should not bear the risk of forecasting QF CODs.² PGE proposes to track actual QF costs and true-up actual costs of new QFs coming on-line with forecasted costs within the AUT. Staff's understanding of PGE's proposal is that PGE would track actual costs for new QFs during 2019 and net these costs against the forecasted costs. PGE would do this by comparing the original MONET forecast of 2019 NPSE (Original Forecast) with another MONET forecast using actual CODs observed in 2019 (Updated Forecast).³ The Updated Forecast would use all of the same inputs as the Original Forecast, except PGE would replace the estimated CODs with the actual CODs observed during 2019. Then, the monetary difference between the NPSE results of the Original Forecast and the Updated Forecast would be credited or debited to customers in the April 1, 2020 forecast of NPSE for 2021.⁴

² PGE/300, Niman-Kim-Batzler/30-31.

³ PGE/300, Niman-Kim-Batzler/36.

⁴ PGE/300, Niman-Kim-Batzler/36.

1 **Q. Does Staff have any recommendations with respect to PGE's**
2 **proposal?**

3 A. Yes. Although PGE says it will continue to update CODs through the first
4 MONET update in November, Staff hopes PGE will continue to update QF
5 CODs through the final MONET update on November 15. Staff also believes
6 that PGE must request authority under ORS 757.259 to defer the difference
7 between forecasted and actual costs in order to recover or credit this variance
8 in a subsequent NVPC proceeding. Accordingly, to the extent that the
9 Commission authorizes PGE's proposal, Staff recommends the Commission
10 specify that PGE must file an application to defer the difference between actual
11 and forecasted QF costs relating to differences between scheduled and actual
12 CODs.

13 **Q. Does Staff propose any adjustments to PGE's method?**

14 A. Yes. Staff proposes an adjustment for cure period payments made to PGE by
15 QFs for delayed CODs (Cure Payments), as described in PGE's Schedule
16 201.⁵ QFs that experience a delay in COD are liable to pay PGE a penalty
17 representing any amount that market power prices exceed the QF contract rate
18 during the delay. Staff recommends that PGE include any Cure Payments in
19 the calculation of the QF COD True-Up.

20 Staff suggests that PGE could implement this adjustment in the 2020
21 AUT by subtracting any Cure Payments made by QFs in 2019 from NPSE in
22 the Updated Forecast, but not in the Original Forecast. By subtracting the

⁵ Staff/202, Anderson/1.

1 Cure Payments from NPSE in the Updated Forecast, the Updated Forecast
2 would more accurately reflect the actual NPSE incurred by the Company in
3 2019. This would make the COD True-Up a more accurate process.

4 **Q. Does this conclude your opening testimony?**

5 A. Yes.

CASE: UE 335
WITNESS: ROSE ANDERSON

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 201

Witness Qualifications Statement

May 24, 2018

WITNESS QUALIFICATION STATEMENT

NAME: Rose Anderson

EMPLOYER: Public Utility Commission of Oregon

TITLE: Senior Renewal Energy Analyst
Energy Resources and Planning Division

ADDRESS: 201 High Street SE. Suite 100
Salem, OR. 97301

EDUCATION: Master of Science, Agriculture and Resource Economics,
University of California Davis, Davis, CA

Bachelor of Arts, International Political Economy
University of Puget Sound, Tacoma, WA

EXPERIENCE: I have been employed at the Public Utility Commission of Oregon since September of 2016. My position is Senior Utility Analyst in the Energy Resources and Planning Division. My current responsibilities include review of load forecasting, advertising, and Renewable Portfolio Standards. I perform economic analysis in Rate Cases, Integrated Resource Plans and Rulemaking dockets. Prior to working for the PUC I was a Research Associate at McCullough Research for two years. My responsibilities included economic analysis of energy markets and utilities.

CASE: UE 335
WITNESS: ROSE ANDERSON

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 202

**Exhibits in Support
Of Opening Testimony**

May 24, 2018

8.1.2. Seller's failure to provide default security, if required by Section 6, prior to delivery of any Net Output to PGE or within 10 days of notice.

8.1.3. Seller's failure to meet the Guarantee of Mechanical Availability established in Section 3.1.10 for two consecutive Contract Years or Seller's failure to provide any written report required by that section.

8.1.4. If Seller is no longer a Qualifying Facility.

8.1.5. Failure of PGE to make any required payment pursuant to Section 7.1.

8.1.6. Seller's failure to meet the Commercial Operation Date.

8.2. **In the event of a default under Section 8.1.6, PGE may provide Seller with written notice of default. Seller shall have one year in which to cure the default during which time the Seller shall pay PGE damages equal to the Lost Energy Value.** If Seller is unable to cure the default, PGE may immediately terminate this Agreement as provided in Section 8.3. PGE's resource sufficiency/deficiency position shall have no bearing on PGE's right to terminate the Agreement under this Section 8.2.

8.3. In the event of a default hereunder, except as otherwise provided in this Agreement, the non-defaulting party may immediately terminate this Agreement at its sole discretion by delivering written notice to the other Party. In addition, the non-defaulting Party may pursue any and all legal or equitable remedies provided by law or pursuant to this Agreement including damages related to the need to procure replacement power. A termination hereunder shall be effective upon the date of delivery of notice, as provided in Section 20. The rights provided in this Section 8 are cumulative such that the exercise of one or more rights shall not constitute a waiver of any other rights.

8.4. If this Agreement is terminated as provided in this Section 8, PGE shall make all payments, within thirty (30) days, that, pursuant to the terms of this Agreement, are owed to Seller as of the time of receipt of notice of default. PGE shall not be required to pay Seller for any Net Output delivered by Seller after such notice of default.

8.5. In the event PGE terminates this Agreement pursuant to this Section 8, and Seller wishes to again sell Net Output to PGE following such termination, PGE in its sole discretion may require that Seller shall do so subject to the terms of this Agreement, including but not limited to the Contract Price until the Term of this Agreement (as set forth in Section 2.3) would have run in due course had the Agreement remained in effect. At such time Seller and PGE agree to execute a written document ratifying the terms of this Agreement.

8.6. Sections ~~8.1, 8.4, 8.5, 10, and 19.2~~ shall survive termination of this Agreement.

SECTION 9: TRANSMISSION CURTAILMENTS

9.1. Seller shall give PGE notice as soon as reasonably practicable of any Transmission Curtailment that is likely to affect Seller's ability to deliver any portion of energy scheduled pursuant to Section 4.4 of this Agreement.

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 300

Net Variable Power Costs

Opening Testimony

REDACTED
May 24, 2018

1 **Q. Please state your name, occupation, and business address.**

2 A. My name is Lance Kaufman. I am a Senior Economist employed in the Energy
3 Rates, Finance and Audit Division of the Public Utility Commission of Oregon
4 (OPUC). My business address is 201 High Street SE., Suite 100, Salem,
5 Oregon 97301.

6 **Q. Please describe your educational background and work experience.**

7 A. My witness qualification statement is found in Exhibit Staff/301.

8 **Q. What is the purpose of your testimony?**

9 A. The purpose of my testimony is to present analysis of and recommendations
10 regarding Portland General Electric's 2019 net variable power cost (NVPC)
11 forecast.

12 **Q. Did you prepare an exhibit for this docket?**

13 A. Yes. I prepared the following exhibits:

- 14 • Exhibit Staff/302: Non confidential DR Responses
- 15 • Exhibit Staff/303: Confidential DR Responses
- 16 • Exhibit Staff/304: DOE Carty Site Report
- 17 • Exhibit Staff/305: Columbia River Keeper Report
- 18 • Exhibit Staff/306: BPA Klondike Record of Decision
- 19 • Exhibit Staff/307: EnerG Magazine Report on PGE Wind Facility

20 **Q. How is your testimony organized?**

21 A. My testimony is organized as follows:

22	Issue 1. Direct Access Transition Adjustment Changes.....	3
23	Issue 2. Carty Gas Transportation Expense	4
24	Issue 3. Mid-C/COB Trading Margins	8
25	Issue 4. Wind Resource Capacity Factor	10
26	Issue 5. New Capacity Agreements	22

27 **Q. Please summarize your recommendations.**

1 A. I make the following recommendations:

2 Issue 1. Address this issue in the General Rate Case portion of this Docket.

3 Issue 2. Reduce gas transmission expense by **[Begin Confidential]** [REDACTED]
4 **[End Confidential]**

5 Issue 3. Reduce purchased power expense by **[Begin Confidential]** [REDACTED]
6 **[End Confidential]**

7 Issue 4. Incorporate originally forecasted wind capacity factor into forecast,
8 reducing NVPC by approximately **BEGIN CONFIDENTIAL** [REDACTED]
9 **[END CONFIDENTIAL]**

10 Issue 5. Staff is continuing to investigate the prudence of capacity
11 agreements.

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ISSUE 1. DIRECT ACCESS TRANSITION ADJUSTMENT CHANGES

Q. Please summarize this issue and your proposal.

A. PGE proposes certain changes to the transition adjustment charges for cost of service opt out customers in order to make the PGE tariff more consistent with PacifiCorp's tariff. Staff recommends that substantive changes to the direct access tariffs be addressed in the general rate case component of this docket. Staff will provide additional testimony on this issue in the general rate case opening testimony.

1 **ISSUE 2. CARTY GAS TRANSPORTATION EXPENSE**

2 **Q. Please summarize this issue and your proposed treatment.**

3 A. The gas used at PGE's recently acquired natural gas plant, the Carty
4 Generating Station (Carty), is transported through Gas Transmission Northwest
5 (GTN) pipeline. PGE contracted with GTN to build, operate and maintain a
6 25-mile lateral pipeline (Carty Lateral) from the GTN mainline to Carty. This
7 pipeline has more than double the daily capacity that Carty can use. At the
8 time of selecting the lateral capacity PGE was considering building a second
9 gas generation facility at the Carty site. This second facility would have utilized
10 the excess capacity. The extra capacity does not provide a current benefit to
11 customers. Staff proposes a disallowance of the portion of the Carty Lateral
12 expense that exceeds Carty needs.

13 **Q. Please provide the background for this issue.**

14 A. PGE fuels Carty with gas purchased from the AECO trading hub in Alberta,
15 Canada. This gas is transported to the Carty lateral through the GTN mainline
16 pursuant to a 75,000 dekatherm per day contract for capacity.¹ PGE
17 contracted with GTN to build, operate and maintain a 25-mile lateral pipeline
18 that connects Carty with the GTN mainline (Carty Lateral). PGE executed a
19 175,000 dekatherm per day contract for the Carty Lateral.² The annual cost of
20 the Carty Lateral contract is **[BEGIN CONFIDENTIAL]** [REDACTED] **[END**

¹ See Docket No. UE 294 PGE/400, Niman – Peschka – Hager/10.

² See Docket No. UE 294 PGE/400, Niman – Peschka – Hager/10.

³ See Staff/303 Kaufman/2, Attachment A of PGE response to ICNU DR No. 75 from Docket No. UE 319.

1 **CONFIDENTIAL]** However, because PGE has a 75,000 dekatherm per day
2 contract for capacity to transport gas to the Carty lateral, the majority of the
3 Carty Lateral capacity is unused.⁴

4 **Q. What evidence is there that the Carty Lateral was sized to deliver**
5 **175,000 DTH/day?**

6 A. The pipeline sizing documents used to evaluate pipeline options focused on
7 deliveries of **[Begin Confidential]** ██████████ **[End Confidential]**⁵

8 **Q. What size pipe should PGE have requested be built?**

9 A. PGE should have requested a pipeline sized to provide 75,000 dekatherms per
10 day. This is the maximum daily use of gas by Carty. The 175,000 DTH/day
11 capacity of the option that PGE selected is 233 percent of the necessary
12 capacity. A 16-inch pipeline without a compressor station would have been
13 sufficient to achieve these deliveries at the necessary delivery pressure. The
14 last two years of Carty operations show that the GTN mainline pressures
15 average **Begin Confidential]** ██████████ **[End Confidential]**⁶ PGE estimates
16 that the 16-inch pipeline would have had a pressure drop of approximately
17 **[Begin Confidential]** ██████████ **[End Confidential]** when transporting 75,000
18 DTH/day, for a net Carty delivery pressure of approximately **[Begin**
19 **Confidential]** ██████████ **[End Confidential]** This means that the 16-inch pipe

⁴ See UE 294 PGE/400, Niman – Peschka – Hager/10.

⁵ UE 319 PGE Response to Staff DR 621.

⁶ Calculated as the 2016 and 2017 average Carty Delivery pressure of 813 PSI (Response to Staff DR 298) plus the 20-inch pressure drop of **[Begin Confidential]** ██████████ **[End Confidential]** (Response to Staff DR 621, Confidential Attachment A).

1 would have achieved the required minimum Carty delivery pressure of 667 PSI
2 without additional compression.⁷

3 **Q. Why do you suppose that PGE secured a gas transportation contract**
4 **that had 233 percent of the necessary capacity to serve Carty?**

5 A. This contract appears to be in anticipation of the construction of a second
6 generating facility at Carty. PGE's original siting permit for Carty included a
7 second phase. This second phase was for another large gas generator.⁸ PGE
8 has since ended plans to build a second facility at Carty.⁹

9 **Q. Is there any other evidence that PGE committed to higher expenses for**
10 **Carty in preparation for a second phase?**

11 A. Yes. As I already mentioned, PGE has engaged in the planning expenses for
12 a second unit at the Carty site. Staff is also investigating the size and design of
13 the Grassland switchyard and the transmission capacity from Carty to
14 customers and other markets. The Grassland switchyard is a switchyard that
15 connects Carty to the transmission grid. The Grassland switchyard is part of
16 the Carty plant investment and Staff has agreed to wait until after the Docket
17 No. UM 1909 is resolved to continue the Grassland investigation.

18 **Q. Given the cancellation of additional gas generation at Carty, how do**
19 **you propose to treat Carty Lateral costs that are related to the over-**
20 **build?**

⁷ PGE First Supplemental Response to Staff DR 621, Docket No. UE 319.

⁸ See Staff Exhibit Staff/304, page 1, Department of Energy website capture regarding Carty.

⁹ See Staff Exhibit Staff/305 <https://www.columbiariverkeeper.org/news/2018/2/pge-withdraws-plan-expand-fracked-gas-fired-power>.

1 A. Staff proposes to exclude overbuild costs from rates until such time as the
2 capacity is used.

3 **Q. How does your proposal apply to the Carty lateral, which is a fixed**
4 **capacity contract?**

5 A. The Carty lateral contract is a cost-based contract. A less costly lateral
6 pipeline would have directly resulted in a less costly contract. Staff
7 recommends excluding the portion of the Carty lateral contract costs that
8 exceeds the cost of the minimum pipeline necessary to supply Carty. Staff has
9 not calculated this value yet.

10 **Q. What would the annual NVPC cost of a 16-inch pipeline be relative to**
11 **the 20-inch pipeline actually built?**

12 A. The forecasted total cost of the 16-inch pipeline installation was approximately
13 **[Begin Confidential]** [REDACTED] **[End Confidential]**¹⁰ of the cost of the
14 20-inch pipe. Applying this ratio to the annual cost of the 20-inch pipe the
15 annual cost of the 16-inch pipe would have been **[Begin Confidential]**
16 [REDACTED] **[End Confidential]** which results in a **[Begin Confidential]**
17 [REDACTED] **[End Confidential]** decrease to NVPC.

¹⁰ Staff/303, Kaufman/361. UE 319 PGE Response to OPUC DR 621, Confidential Attachment A.

ISSUE 3. MID-C/COB TRADING MARGINS

Q. Please summarize this issue and Staff's proposal.

A. In Docket No. UE 319 Staff noted that PGE consistently under-forecasted the value of wholesale transaction at the California-Oregon Border (COB). PGE's proposal in the current docket attempts to be responsive to Staff's concern; however, it does not fully resolve Staff's issue.

Q. How does PGE propose to value COB transactions?

A. PGE proposes to create an hourly shape for COB prices using three years of historic data, apply this shape to the COB monthly forward price curve, calculate the hourly COB margin relative to the hourly Mid-C margin, and multiply the forecasted margin by the historic COB sales when margin is positive and historic COB purchases when the margin is negative.

Q. What is Staff's objection to PGE's method?

A. This approach creates a forecasted COB value that is **[Begin Confidential]** [REDACTED] **[End Confidential]** lower than the historic COB value. One reason PGE's method continues to under forecast is because while it accounts for hourly variation in price, it continues to fail to account for daily variation in price. This means that Staff's argument from Docket No. UE 319 continues to be relevant to PGE's new method.

In addition to having the aggregation issues described in Docket No. UE 319, the new method also under estimates the number of transactions. This is because in hours where the method allows sales at COB it ignores the

1 historic value of purchases, and in hours where it allows purchases at COB it
2 ignores the historic value of sales.

3 **Q. What is your proposed treatment?**

4 A. In Docket No. UE 319 Staff proposed a static approach that looked at the
5 average historic value at COB. One problem with a historic approach is that it
6 is not responsive to changing market conditions. In the spirit of creating a
7 forward looking forecast Staff proposes the following mechanism:

- 8 1. Calculate the historic value of COB transactions by month.
- 9 2. Calculate the historic monthly COB-MidC price margin.
- 10 3. Calculate the historic COB transaction value per dollar of margin by dividing
11 the results of 1 by the results of 2.
- 12 4. Calculate the forecasted COB-MidC monthly price margin.
- 13 5. Forecast COB values by multiplying the historic COB transaction value per
14 dollar of margin by the forecasted monthly margin.

15 This calculation results in a forecasted COB value of **[Begin Confidential]**

16 **[Redacted]** **[End Confidential]** PGE's forecasted COB value is \$6.1 million.

17 Staff's approach results in a decrease to 2019 NVPC of **[Begin Confidential]**

18 **[Redacted]** **[End Confidential]**

ISSUE 4. WIND RESOURCE CAPACITY FACTOR

1 **Q. Please summarize this issue and your proposal.**

2 A. PGE may have substantially over-estimated the capacity factors for all three
3 facilities at its Biglow Canyon Wind Farm (Biglow) and for the Tucannon facility.
4 PGE was aware of the risks associated with the forecasted capacity factors
5 when it chose to build these facilities, [BEGIN CONFIDENTIAL] [REDACTED]
6 [REDACTED] [END CONFIDENTIAL] and
7 chose not to mitigate these risks. Staff proposes splitting the risk associated
8 with capacity factor forecasting between the utility and the customers. This
9 treatment is appropriate because it incentivizes the utility to appropriately
10 forecast wind capacity factors and it helps to create a competitive environment
11 for the procurement of renewable generation.
12

13 **Q. How has Staff's position on this issue changed since Staff initially filed**
14 **testimony on this matter in Docket No. UE 319?**

15 A. PGE has developed plans to invest in a large amount of new wind generation
16 since Staff initially filed testimony on this issue. The treatment of wind capacity
17 risk will have a much greater impact on customers if PGE implements the plans
18 for new wind generation. Staff's proposed treatment will help insulate
19 customers from the substantial risk involved in utility owned wind facilities, and
20 will help PGE make an efficient choice between wind power purchase
21 agreements and utility owned wind facilities.

22 **Q. What evidence and argument did Staff provide in Docket No. UE 319**
23 **related to this issue?**

1 A. Staff provided detailed information about the development, planning, and
2 implementation of the Biglow wind project. Staff showed that PGE was aware
3 of substantial capacity factor risks associated with the project, but failed to take
4 mitigating measures. In fact, PGE took measures that increased customer
5 exposure to capacity factor risk. Biglow has produced less than **[Begin**
6 **Confidential]** [REDACTED] **[End Confidential]** of the energy forecasted. Under
7 PGE's proposed treatment of wind capacity factor forecast, customers pay the
8 cost of all of this shortfall. The remainder of this section restates Staff's
9 analysis and proposal from Docket No. UE 319.

10 **Q. What were the forecasted and actual capacity factors for PGE wind**
11 **facilities?**

12 A. The table below provides the forecasted and actual capacity factors for each
13 plant.¹¹

14 *Table 1 PGE Wind Facility Capacity Factors*



15
16 **Q. How did PGE represent the risk associated with the capacity factors of**
17 **these facilities?**

¹¹ The actual value for Tucannon is based on only three years of operations.

1 A. PGE asked to include Biglow Phase 1 in rates in Docket No. UE 188. PGE's
2 testimony in Docket No. UE 188 discusses two types of risk, regulatory risk and
3 fire risk. There is no mention of the significant uncertainty related to Biglow's
4 wind output. The only written documentation of PGE's assessment related to
5 Biglow wind output risk is found in Docket No. UP 234. PGE states "...
6 [Developer] Orion is at risk with respect to both PGE's development of the
7 Project and the Project's generation output."¹² PGE's testimony in Docket
8 No. UE 188 does not mention generation risk; however PGE notes that it had
9 the option of owning the project or operating under a power purchase
10 agreement. PGE chose to own the project in order to "gain experience in
11 operating wind turbines."¹³ PGE does not appear to have considered
12 generation risk when it made this decision.

13 Q. [BEGIN CONFIDENTIAL] [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 [REDACTED]
23 [REDACTED]
24 [REDACTED]
25 [REDACTED]

¹² See Docket No. UP 234, PGE Application for Approval of Asset Purchase and Development Agreement in Sherman County, Oregon, p. 3.
¹³ See UE 188 PGE/200, Tooman-Tinker-Schue /12 at line 9.

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[REDACTED]

¹⁴ See Staff/303, Kaufman/22, PGE Response to Staff DR No. 443 Attachment A.
¹⁵ See Staff/302, Kaufman/14, PGE's response to Staff DR No. 567 (indicating PGE did not evaluate the risk factors); Staff/303, Kaufman/22, PGE Response to Staff DR No. 443, **[BEGIN CONFIDENTIAL]** [REDACTED] **[END CONFIDENTIAL]**
¹⁶ See Staff/303, Kaufman/272, PGE response to Staff DR 443.

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[REDACTED]

[REDACTED] [END CONFIDENTIAL]¹⁸

Q. In addition to the risk involved in the forecasted capacity factors, is there evidence that PGE could have known it was over-forecasting its capacity factors?

A. Yes. Staff notes three separate facts that indicate PGE could have or did know it was over forecasting its capacity factors.

1. PGE became aware in 2009 that the Garrad Hassan wind study had likely over-estimated the capacity factors for Biglow 1, as Biglow 2 was developed

¹⁷ See Staff/302 Kaufman/14, PGE response to DR 567.
¹⁸ See Staff/303 Kaufman/107, PGE response to DR 443.

1 and before Biglow 3 was placed in service.¹⁹ Despite this, PGE did not
2 update or revise its forecasted capacity factors.²⁰

3 2. The wind study for Biglow considered [BEGIN CONFIDENTIAL] [REDACTED]
4 [END CONFIDENTIAL] of wind generation at Biglow.²¹ PGE ultimately
5 installed 449.7 MW of wind generation at Biglow.²² PGE also modified the
6 type and layout of the turbines.²³ Turbine type and location affect
7 generation output.²⁴ Garrad Hassan [BEGIN CONFIDENTIAL] [REDACTED]

8 [REDACTED]
9 [REDACTED] [END CONFIDENTIAL] Adding turbines
10 and turbine capacity has the potential to increase wind wake. Wake is a
11 reduction in wind speed caused by the presence of the turbine. The
12 increased wake in turn reduces the generation at the facility. [BEGIN

13 CONFIDENTIAL] [REDACTED]
14 [REDACTED]
15 [REDACTED] [END CONFIDENTIAL]

¹⁹ See Staff/302 Kaufman/10, PGE Response to Staff DR 566 (PGE stating "However, between 2009 and 2010 PGE did begin to become aware that the actual wind at Biglow was consistently underperforming the original forecast."). Biglow 3 was placed in service late in 2010.

²⁰ See Staff/302 Kaufman/11, PGE Response to DR 566. In the response to DR 566 PGE indicates that the performance of Biglow 1 and 2 prevented PGE from revising the capacity factor of Biglow 3 up. Despite this, PGE did not revise the capacity factor down or perform additional studies on what the Biglow 3 capacity factor would be.

²¹ See Staff/303, Kaufman/320, PGE Response to Staff DR No. 566.

²² See Staff/303, Kaufman/320, PGE Response to Staff DR No. 566.

²³ See Staff/303, Kaufman/320, PGE Response to Staff DR No. 566.

²⁴ See Staff/303, Kaufman/320, PGE Response to Staff DR No. 566.

²⁵ See Staff/303, Kaufman/75, PGE Response to Staff DR No. 443.

²⁶ See Staff/303, Kaufman/324, PGE Response to Staff DR No 566.

1 3. The Bonneville Power Administration (BPA) made available an assessment
2 of the adjacent Klondike 3 wind facility.²⁷ The BPA estimated production of
3 the adjacent facility at 30 percent, five percent lower than PGE's forecast for
4 the combined Biglow projects.²⁸ The BPA's analysis is publicly available
5 and PGE could have used the BPA projections to vet the Garrad Hassan
6 study.

7 **Q. Does your proposal require that the Commission make a finding**
8 **regarding PGE's past decisions?**

9 A. No, my proposal is not based on what PGE could have known or did know
10 about the over forecasting of wind capacity factors. The Commission has
11 already determined the prudence of PGE's past wind investments and Staff is
12 not requesting the Commission reconsider those determinations. The purpose
13 of the preceding testimony is to show that PGE could have exercised a greater
14 degree of caution when evaluating the past wind facilities. Staff's proposal
15 provides PGE incentive to be more diligent in future resource acquisitions.
16 Furthermore, as explained below Staff's proposal will allow ratepayers and
17 PGE to share generation risk.

18 **Q. Please summarize your proposed treatment for Company-owned wind**
19 **resource capacity factors.**

20 A. Staff proposes the following two alternatives:

²⁷ An excerpt of the BPA report is provided in Staff Exhibit 306. The full report was accessed from <https://www.bpa.gov/power/pgc/wind/KlondikeROD.pdf> on May 31, 2017.

²⁸ See Staff/303, Kaufman/20, PGE Response to Staff DR No. 443.

1 1. Calculate NVPC using half of the difference between the original expected
2 capacity factor included as part of the prudence review and the now-current
3 projected output, this translates to a capacity factor of [BEGIN
4 CONFIDENTIAL] [REDACTED] [END CONFIDENTIAL]

5 This alternative shares the costs between customers and shareholders.²⁹

6 2. Calculate NVPC using the higher of the *current* expected capacity factor or
7 the *original* 75 percent probability of exceedance capacity factor.

8 For example, the original CF forecast for Biglow 1 was 38 percent,³⁰ the
9 original 75 percent exceedance CF was [BEGIN CONFIDENTIAL]

10 [REDACTED],³¹ [END CONFIDENTIAL] and the current forecast is [BEGIN
11 CONFIDENTIAL] 29.35 [END CONFIDENTIAL] percent.³² Option 1 would use
12 the estimate of [BEGIN CONFIDENTIAL] [REDACTED], [END

13 CONFIDENTIAL] regardless of whether the current forecast is higher or lower.

14 Option 2 would use the [BEGIN CONFIDENTIAL] [REDACTED] [END CONFIDENTIAL]

15 percent number. If the actual forecast is revised in the future to be higher than

16 [BEGIN CONFIDENTIAL] [REDACTED], [END CONFIDENTIAL] the actual forecast

17 would be used.

²⁹ This approach splits the generation value of forecast error evenly between customers and shareholders. Staff finds that an even split of the generation value is fair, given that the company bears none of the production tax credit risk associated with forecast error. However, this mechanism is capable of accomplishing any split of value between customers and shareholders. For example, customers could bear 90 percent of the risk with the following formula: [BEGIN CONFIDENTIAL] [REDACTED] [END CONFIDENTIAL]

³⁰ For Biglow 1 this would be 38 percent.

³¹ The original 75 percent probability of exceedance for Biglow 1 was [BEGIN CONFIDENTIAL] [REDACTED] [END CONFIDENTIAL] This was calculated from PGE's Response to Staff DR 443, pp. 18 and 22, and grossed up by PGE's estimated turbine upgrade impact from PGE's Response to Staff DR No. 443.

³² The actual forecasted capacity factor of [BEGIN CONFIDENTIAL] [REDACTED] [END CONFIDENTIAL] percent was provided in PGE's April 14 MONET update.

1 Staff also recommends that the PCAM true up mechanism be consistent
2 with the treatment in the AUT.

3 **Q. Please explain why Staff's proposal is fair, just, and reasonable.**

4 A. Staff's proposal has the following benefits:

- 5 • Wind generation risk is split between customers and shareholders;
- 6 • Utilities are incentivized to accurately forecast wind capacity factor of
7 new projects;
- 8 • Allowing utility shareholders to share in generation risk will make the
9 RFP process more competitive and improve outcomes for customers;
- 10 • PGE's decision to "gain experience in wind generation"³³ benefited PGE
11 shareholders through a return on rate base. Staff's proposal aligns a
12 portion of the risk with shareholders.

13 **Q. How is generation risk split between customers and shareholders?**

14 A. When the actual capacity factor of wind facilities is lower than forecasted, there
15 are two financial impacts: energy value and production tax credit (PTC) value.
16 Wind generation has little to no marginal cost. When wind production is lower
17 than expended, PGE has to replace that energy with higher cost sources. Staff
18 previously estimated that dollar value of lost energy associated with over
19 forecasting wind capacity factors was about **[BEGIN CONFIDENTIAL]**

20 **[REDACTED]** **[END CONFIDENTIAL]**³⁴ In addition to the lost energy, PGE does

³³ See UE 188 PGE/200, Tooman-Tinker-Schue/12 at line 9.

³⁴ This was calculated in Docket No. UE 319 by modifying PGE's Monet model using the originally forecasted capacity factors and splitting out the change in NVPC between PTC value and generation value.

1 not receive the expected PTCs. Staff estimates that the value of the lost PTCs
2 is about [BEGIN CONFIDENTIAL] [REDACTED] [END CONFIDENTIAL] Under
3 Staff's proposal, PGE shareholders will bear a portion of the risk associated
4 with the lost energy value, and customers will bear the risk associated with the
5 lost PTC value. This approach appropriately shares the risk associated with
6 ownership of wind resources between the utility shareholders and customers.

7 Under Staff's approach, customers cover more of the risk than the utility.³⁵
8 Some may argue that it would be fairer to split the risk 50-50. However, in
9 Senate Bill 1547 (2015), the Oregon legislature adopted language indicating
10 that the PTC forecast risk is to be borne by customers.³⁶ Staff's proposal is
11 consistent with this legislation but still shares risk of over forecasting
12 generation between customers and the Company. Furthermore, Staff's
13 proposal is reasonable because it incentivizes the utility to accurately forecast
14 the capacity factor of utility owned wind generation.

15 **Q. How does Staff's proposal incentivize utilities to accurately forecast**
16 **wind generation?**

17 A. Under PGE's method, the Company updates the wind capacity factor every
18 year. In addition, actual wind generation is incorporated in the PCAM. The
19 PCAM includes mechanisms that prevent 100 percent of costs passing through
20 to customers. Thus the only exposure the Company has to wind generation
21 forecast risk is through the difference between the year-ahead wind forecast

³⁵ This is because customers cover all of the PTC risk and half of the generation risk.

³⁶ Senate Bill 1547, Section 18b (2015).

1 and the actual wind generation. Staff's approach makes the Company
2 accountable for its resource decision. Because of this the Company will be
3 more likely to evaluate and vet the wind forecasts.

4 Staff's first alternative does benefit the Company in the case of forecasts
5 that are too low. However under both alternatives, customers are guarded
6 against the risk of a low forecast through the competitive bidding process. If
7 the Company under-forecasts wind generation, competing bids will be more
8 likely to be selected.

9 **Q. How does allowing utility shareholders to share in generation risk**
10 **make the RFP process more competitive?**

11 A. PGE's recent generation RFPs have primarily resulted in PGE ownership of
12 new resources. If shareholders are exposed to some of the generation risk
13 associated with ownership, the utilities will incorporate generation risk into their
14 bids. This is a risk that other bidders already bear. Staff's proposal will bring
15 the Company ownership in line with non-company ownership bids. As a result,
16 the competitive bidding process will be more effective.

17 A more competitive bidding process will benefit customers. PGE's recent
18 self-owned resource acquisitions have faced substantial problems, either with
19 lower than expected benefits or higher than expected costs.

20 **Q. Why is it fair for PGE shareholders to share in the risk of wind**
21 **generation?**

1 A. PGE has made a substantial investment in its wind facilities. PGE has
2 invested \$1.7 billion in wind facilities.³⁷ At PGE's current capital structure and
3 cost of equity that represents \$82 million dollars per year in profit for PGE
4 shareholders.³⁸ Staff's proposal reduces power costs by **[BEGIN**
5 **CONFIDENTIAL]** [REDACTED] **[END CONFIDENTIAL]** dollars. This is only
6 a fraction of wind facilities' annual return to PGE shareholders. PGE
7 acknowledges that at the time of the investments it was not experienced in
8 owning or operating wind facilities, and that one purpose of the investment was
9 to gain experience.³⁹ It is fair that PGE shareholders bear some of the risk that
10 comes with gaining this experience.

11 **Q. How do you propose to address capacity factor in the PCAM?**

12 A. The PCAM includes a sharing mechanism in which PGE recovers a portion of
13 the deviation between forecasted and actual power costs from customers.
14 Staff does not propose any associated adjustment in the PCAM. This means
15 that actual wind generation is used in the PCAM and the PCAM sharing
16 mechanism further reduces the impact of Staff's adjustment has on the
17 Company's risk.

18 **Q. What is the impact of your proposal to NVPC?**

19 A. My proposal decreases NVPC by approximately **[BEGIN CONFIDENTIAL]**
20 [REDACTED] **[END CONFIDENTIAL]**

³⁷ See Staff Exhibit 307, which indicates a Biglow investment of \$1.2 billion and a Tucannon investment of \$500 million excluding AFUDC.

³⁸ Calculated as \$1.7 billion times 50 percent equity times 9.6 percent cost of equity.

³⁹ See UE 188 PGE/200, Tooman-Tinker-Schue /12 at line 9.

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ISSUE 5. NEW CAPACITY AGREEMENTS

Q. Please summarize this issue and your recommendation.

A. PGE's 2016 Integrated Resource Plan demonstrated a capacity need beginning in 2021. PGE recently began pursuing bilateral negotiations with owners of existing resources to fill this capacity need. PGE is including additional costs in the 2019 NVPC forecast associated with one of the agreements reached in the bilateral negotiation process. Staff is examining whether the contracts selected are prudent. Due to the highly confidential nature of the data involved in these contracts Staff has not received access to the financial analysis supporting the contract selection. In an abundance of caution Staff recommends excluding the incremental cost of this contract from rates pending review of PGE's financial analysis of the contracts. This recommendation **[Begin Confidential]** [REDACTED] **[End Confidential]**

Q. Please summarize the analysis that Staff has performed to date on this issue.

A. Staff is investigating two questions:

1. Were the contracts selected prudent and cost effective?
2. Were the contracts not selected not prudent or cost effective?

Staff requested data on PGE's scoring criteria and analysis of the final short list options. PGE declined to provide the analysis of the final short list. PGE did provide an explanation of why contracts were or were not selected. Regarding the first topic, Staff needs to review the financial analysis of the Company prior

1 to making a final determination of cost effectiveness. However, Staff notes that
2 the contract appears to acquire capacity two years in advance of when it is
3 needed.

4 Regarding the second question, PGE selected three of the top five
5 contracts. The terms of one initial offer were changed in subsequent rounds to
6 be less advantageous and no longer fit PGE's requirements. The terms of
7 another contract were advantageous, but PGE found that it had acquired
8 sufficient capacity to meet the expected need in 2021.

9 **Q. What is your recommendation regarding this issue?**

10 A. Staff recommends that PGE provide Staff access to the financial analysis
11 supporting the selection of these contracts.

12 **Q. Does this conclude your opening testimony?**

13 A. Yes.

CASE: UE 335
WITNESS: LANCE KAUFMAN

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 301

Witness Qualifications Statement

May 24, 2018

WITNESS QUALIFICATIONS STATEMENT

NAME: Lance Kaufman

EMPLOYER: Public Utility Commission of Oregon

TITLE: Senior Utility Economist
Energy Rates, Finance and Audit Division

ADDRESS: 201 High Street SE. Suite 100
Salem, OR. 9730

EDUCATION: In 2013 I received a Doctorate degree in economics from the University of Oregon. In 2008 I received a Master of Science degree in Economics from the University of Oregon. In 2004 I received a Bachelor of Business Administration in Economics from the University of Alaska Anchorage.

EXPERIENCE: From March of 2013 to September of 2014 and from September of 2015 to the present I have been employed by the Oregon Public Utility Commission (OPUC). My current responsibilities include analysis of power costs, cost allocations, decoupling mechanisms, and sales forecasts. I have worked on power costs in the following OPUC dockets: IPC UE 301, IPC UE 305, PAC UE 307, PGE UE 308, IPC UE 314, PGE UE 319, and PAC UE 327.

From September 2014 to September 2015 I was employed by Regulatory Affairs Public Advocacy group of the Alaska Department of Law.

From 2008 to 2012 I was employed by the University of Oregon as an instructor. I taught undergraduate level courses in Microeconomics, Urban Economics, and Public Economics.

CASE: UE 335
WITNESS: LANCE KAUFMAN

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 302

**Exhibits in Support
Of Opening Testimony**

May 24, 2018

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May 9, 2017

TO: Tyler Pepple
Bradley Van Cleve
Davison Van Cleve, P.C.

FROM: Patrick Hager
Manager, Regulatory Affairs

**PORTLAND GENERAL ELECTRIC
UE 319
PGE Response to ICNU DR No. 075
Dated April 25, 2017**

Request:

Please provide actual expenses on a monthly basis over calendar year 2016 associated with the following gas transportation contracts:

- a. Carty Gas Transp. - TransCanada NGTL**
- b. Carty Gas Transp. - Foothills**
- c. Carty Gas Transp. - GTN**
- d. Carty Gas Transp. - Carty Lateral**

Response:

Attachment 075-A provides the information requested in parts (a) through (d). Please note that the gas transportation costs provided in Attachment 075-A were recorded as a capital cost prior to the date of July 29, 2016, when Carty was placed into service for full commercial operation.

Attachment 075-A is protected information and subject to Protective Order No. 17-057.

UE 319

Attachment 075-A

Provided in Electronic Format only

Protected Information and Subject to Protective Order No. 17-057

2016 Carty Gas Transportation Costs

April 21, 2017

TO: Kay Barnes
Oregon Public Utility Commission

FROM: Patrick Hager
Manager, Regulatory Affairs

**PORTLAND GENERAL ELECTRIC
UE 319
PGE Response to OPUC Data Request No. 443
Dated April 7, 2017**

Request:

Please provide the following information for each wind facility with a lifetime capacity factor different than the capacity factor provided in response to parts c and d of OPUC DR 442:

- a. **Please explain how the capacity factor was initially estimated or forecasted.**
- b. **Please provide any studies, reports, or analysis supporting the initial capacity factor estimate.**
- c. **Please explain why the actual capacity factor is lower than the estimated or forecasted capacity factor.**

Response:

- a. The assumed capacity factor of Biglow Canyon Phase 1 at the time PGE determined to construct the Biglow Canyon facility was 37.3%. At the time of the decision, PGE had not yet identified the preferred wind turbine manufacturer. The assumed capacity factor reflected the Garrad Hassan 2005 wind assessment, which anticipated development of three Biglow Canyon phases with General Electric 1.5 MW SLE turbines. PGE then selected Vestas as the preferred wind turbine manufacturer. The Vestas V82 turbines selected for the project have a greater rotor diameter and were expected to produce more energy than the GE turbines assumed in the Garrad Hassan 2005 wind assessment. Those expected benefits led PGE to increase the Garrad Hassan forecasted capacity factor by approximately two percent to 38.0%, which we used in the first NVPC case for Biglow 1, the 2008 power cost update filing (AUT).

The assumed capacity factor of Biglow Canyon Phase 2 at the time PGE determined to construct the Biglow Canyon facility was 35.0% based on the Garrad Hassan 2005 wind assessment and using GE turbines. PGE then selected Siemens as the preferred wind

turbine manufacturer. The Siemens SWT 2.3-93 turbines selected for the project have a greater rotor diameter and were expected to produce more energy than the GE turbines assumed in the Garrad Hassan 2005 wind assessment. Those expected benefits led PGE to increase the Garrad Hassan forecasted capacity factor by approximately 3.7% percent to 36.27%, which PGE used in the first NVPC case including Biglow 2, the 2010 AUT.

The assumed capacity factor of Biglow Canyon Phase 3 at the time of PGE's decision to construct the Biglow Canyon facility was 32.87%, based on the Garrad Hassan 2005 wind assessment and using GE turbines. PGE used the 32.87% capacity factor, with no adjustment, in the first NVPC case for Biglow 3, the 2011 general rate case (GRC).

The assumed capacity factor of Tucannon River Wind Farm at the time PGE decided to construct the facility was 38.4%. The assumed capacity factor reflected the Garrad Hassan 2013 wind assessment of Tucannon River Wind Farm. For the initial filing of PGE's first NVPC case for Tucannon, the 2015 AUT/GRC, we used a calculated capacity factor of 36.75% based on a 02/07/2013 Draft Review of Wind Resource and Energy Assessments to Support PGE's Renewable request for proposal (RFP), by DNV/KEMA Energy & Sustainability. This filed capacity factor was then adjusted to 38.2%, pursuant to a stipulated agreement between PGE, the Industrial Customers of Northwest Utilities, the Citizens' Utility Board, and the Public Utility Commission of Oregon Staff.

- b. Attachment 443-A includes Garrad Hassan's 2005 wind assessment of Biglow Canyon Wind Farm.

Attachment 443-B includes GL Garrad Hassan's 2013 wind assessment of Tucannon River Wind Farm.

Attachment 443-C includes DNV KEMA's 02/07/2013 Draft Review of Wind Resource and Energy Assessments to Support PGE's Renewable RFP.

- c. Actual capacity factors are based on the actual generation of the wind turbines and can vary from study information due to a number of uncertainties including but not limited to:
- Accuracy of wind measurements;
 - Modelling accuracy;
 - Actual variability of wind compared to study information;
 - Turbine technology selected;
 - Actual (vs modeled) location and number of wind turbines built; and
 - In general, many explicit and implicit input and modeling assumptions made in the studies that may or may not accurately represent real-life conditions and operations.

It is also worth noting that, in determining the initial capacity factors for our wind plants, PGE relied on the expertise of independent industry experts to prepare these forecasts. During the time of PGE's construction and completion of Biglow, wind forecasting was still a relatively new subject area, which had limited expertise or history to draw upon.

This led to the systematic over forecasting of wind capacity factors, not only for Biglow, but throughout the country for large-scale wind projects. Since then and in conjunction with the rapid increase of wind turbine data and experience across the country, the forecasting of wind capacity factors has and continues to be improved.

Attachments 443-A, 443-B and 443-C are protected information and subject to Protective Order No. 17-057.

UE 319

Attachment 443-A

Provided in Electronic Format only

Protected Information Subject to Protective Order No. 17-057

Garrad Hassan's 2005 wind assessment of Biglow Canyon Wind Farm

UE 319

Attachment 443-B

Provided in Electronic Format only

Protected Information Subject to Protective Order No. 17-057

GL Garrad Hassan's 2013 wind assessment of Tucannon River Wind
Farm

UE 319

Attachment 443-C

Provided in Electronic Format only

Protected Information Subject to Protective Order No. 17-057

DNV KEMA's 02/07/2013 Draft Review of Wind Resource and Energy
Assessments to Support PGE's Renewable RFP

May 23, 2017

TO: Kay Barnes
Oregon Public Utility Commission

FROM: Patrick Hager
Manager, Regulatory Affairs

**PORTLAND GENERAL ELECTRIC
UE 319
PGE Response to OPUC Data Request No. 566
Dated May 9, 2017**

Request:

Please refer to PGE's response to DR 443.

- a. When did PGE first become aware that the wind forecast for Biglow was over estimated?**
- b. When PGE chose to increase the size of the wind turbines for Biglow Phase I or II, did PGE consult with Garrad Hassan to determine the impact of larger turbines on Garrad Hassan's estimated the wake effect? If no, why not?**
- c. Please provide the analysis used by PGE to determine that the larger turbines would increase the capacity factor of Biglow Phase I by 2 percent and Phase II by 3.7 percent. If no analysis was performed how did PGE determine the change in capacity factor?**
- d. Please explain why PGE chose not to modify the turbines for Biglow Phase III.**
- e. Please provide the meteorological data provided to Garrad Hasson to support the wind studies in attachments of this DR. Please provide the data for the entire length of time the observations are available, even if the time periods extend beyond that provided to Garrad Hasson.**
- f. Does PGE have evidence that the wind data used in the Biglow or Tucannon wind studies were abnormal and not representative of average wind? If yes, please provide such evidence.**

Response:

PGE objects to this request on the basis that it is unduly burdensome. Subject to and without waiving its objection, PGE replies as follows:

- a. With only nine years of actual generation data, PGE has no certainty the overall average of wind at Biglow will continue to come in lower than originally forecasted. However, between 2009 and 2010 PGE did begin to become aware that the actual wind at Biglow was consistently underperforming the original forecast. Additionally, PGE does know

that, since completed, actual wind at Biglow has consistently come in lower than originally projected.

- b. When making the turbine selection for Biglow Canyon Phase 1 and Phase 2, PGE held discussions with wind resource experts at Orion Renewable Energy Group in order to determine what effects larger rotors and larger blades would have on energy production. As wind farms in the United States were in their infancy, little was known at the time regarding wake effects, so it is likely that this was not discussed.
- c. The capacity factors for all three phases of Biglow are primarily based upon the Garrad Hassan 2005 study as provided in PGE's response to OPUC Data Request No. 443, Attachment 443-A. PGE is unable to find a specific analysis at this time supporting the increase in capacity factor for Phase 1 and Phase 2 and the subject matter experts who worked on developing these factors are no longer at PGE. However, the reasons for the increase can be summarized as follows:

The assumed wind turbine generator used as the basis for the 2005 Garrad Hassan report is the GE 1.5 MW SLE, which is a substantially smaller unit than either the Vestas unit used in Phase 1 or the Siemens SWT 93 unit used in Phase 2. The approximate 2% increase from the 2005 Garrad Hassan study for Phase 1 was based on the Vestas unit having an 82 meter diameter rotor and stronger power curve compared to the 77 meter rotor on the GE unit. The approximate 3.7% increase from the 2005 Garrad Hassan report for Phase 2 was based on the Siemens unit having a 93 meter diameter rotor and a substantially stronger power curve compared to the 77 meter rotor on the GE unit.

- d. PGE assumes that part (d) is referring to adjusting the capacity factor from what was assumed in the 2005 Garrad Hassan report. PGE did not adjust the capacity factor for Biglow Phase 3 due primarily to the review of actual data from Phase 1 and Phase 2 and the recognition that actual production seemed to suggest a lower than expected capacity factor even with a larger turbine unit than assumed in the 2005 Garrad Hassan study.
- e. PGE cannot locate any additional data beyond that provided in PGE's response to OPUC Data Request No. 443, Attachment A.
- f. No. PGE has approximately 15 years of wind data that appears to indicate the study years were high. However, without a larger data set (i.e., 100 plus years) or a full understanding of how natural climate cycles and events or if climate change is affecting the wind regime, PGE cannot definitively state that the 2005 study information was "abnormal". Attachment 566-A provides the 2012 Garrad Hassan reassessment. This study indicates a number of reasons why actual output at Biglow was underperforming the 2005 estimate. One of the sources of the deviation was the wind itself. A discussion of the original study potentially being performed during a high wind period begins on page 67 of Attachment 566-A. However, there is no high quality anemometer data, prior to siting Biglow, that can prove the 2005 study information was from a high-wind, or "abnormal" wind period.

Attachment 566-A is protected information and subject to Protective Order No. 17-057.

UE 319

Attachment 566-A

Provided in Electronic Format only

Protected Information Subject to Protective Order No. 17-057

2012 Garrad Hassan Assessment of Energy Production at Biglow
Canyon

May 23, 2017

TO: Kay Barnes
Oregon Public Utility Commission

FROM: Patrick Hager
Manager, Regulatory Affairs

**PORTLAND GENERAL ELECTRIC
UE 319
PGE Response to OPUC Data Request No. 567
Dated May 9, 2017**

Request:

Please refer to the file produced in response to DR 433 named "OPUC_DR_443_Attach_A_CONF.pdf" at page 9 (page 5 of the report's pagination).

- a. Did Garrad Hassan provide PGE with the numerical impact that including the [Begin Confidential] long term meteorological data [End Confidential] had on forecasted energy output or forecast uncertainty?
- b. Did PGE ask Garrad Hassan what the impact of including the [Begin Confidential] long term meteorological data [End Confidential] had on the forecasted energy output of the proposed wind projects? If no, why not?
- c. Please refer to page 19 (15 in report pagination) of the attachment. Did PGE evaluate the risk factors that Garrad Hassan listed and recommended PGE consider carefully?

Response:

OPUC Staff sent portions of this data request as confidential. PGE does not believe the question itself is confidential and therefore we are including the question as non-confidential.

PGE objects to this request on the basis that it is unduly burdensome and vague. It is unclear to PGE what Staff means by the numerical impact of long-term meteorological data. Additionally, the primary PGE subject matter experts, who directly worked with Garrad Hassan in developing Biglow's wind forecasts, are no longer with PGE. Subject to and without waiving its objection, PGE replies as follows:

- a. PGE is unable to locate any supplemental data or analysis from Garrad Hassan directly associated with the 2005 study, (referenced above as PGE's response to OPUC Data Request No. 443, Attachment 443-A).

- b. PGE's subject matter experts who directly worked with Garrad Hassan in the development of the 2005 study are no longer with the company and email communications from this period are no longer accessible in PGE's current email archive. Therefore, PGE is unable to determine what questions its experts asked or did not ask Garrad Hassan in regard to the 2005 study.

- c. While PGE's subject matter experts who directly worked with Garrad Hassan in the development of the 2005 study are no longer at PGE, a project of this size would have required extensive study and review. As discussed in PGE's response to OPUC Data request No. 443, wind forecasting was a relatively new subject area when PGE determined to build Biglow. PGE had no reasonable basis or historical data to draw upon that could have led PGE to determine a reduction in forecasted energy output was appropriate.

June 28, 2017

TO: Kay Barnes
Oregon Public Utility Commission

FROM: Patrick Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 319
PGE's *First Supplemental* Response to OPUC Data Request No. 621
Dated May 18, 2017

Request:

Please refer to UE 294 / PGE / 400, Niman - Peschka - Hager / 10-11.

- a. Please explain whether PGE or GTN chose to build a 20 inch rather than 16 inch pipeline.**
- b. Please provide the workpapers demonstrating that the 16 inch pipeline is more costly than the 20 inch pipeline.**
- c. What is the minimum size of pipeline needed to transport 75,000 Dth/day from the GTN interconnection with the Carty lateral to Carty Unit 1 with and without a compressor station?**
- d. What amount of gas does Carty use in one day at full capacity?**
- e. Please explain why PGE secured a transportation agreement for 175,000 Dth/day through the Carty lateral, but only 75,000 Dth/day on the GTN mainline.**
- f. Please explain why PGE secured a 30 year transportation agreement for the Carty Lateral but only 20 year agreement for the GTN mainline.**
- g. What was the assumed gas transportation cost for the Carty Unit 1 bid? Please provide the related sections of the bid.**

Response (Dated June 2, 2017):

PGE objects to this request on the basis that it seeks information that is not relevant to the decisions to be made in this proceeding. Costs regarding the Carty lateral were examined in Docket UE 294, and included in costs approved by the Commission in that docket through OPUC Order No. 15-356. Subject to and without waiving its objection, PGE responds as follows:

- a. PGE chose to build the 20" gas pipeline. A 16" diameter gas pipeline would need a compressor station to ensure the necessary pressures for operating Carty's gas turbine. The addition of the compressor made the 16" pipeline more costly than the 20" alternative.
- b. Attachment 621-A provides the evaluation of the different sized pipelines.
- c. Varying pipe sizes could be used to transport 75,000 DTH/day. A gas turbine requires a minimum pressure to operate. A smaller pipe would require compression to maintain the pressure needed to operate the gas turbine. A larger pipe size requires less, or no, compression.
- d. Approximately 75,000 DTH/day.
- e. To meet the Carty Generating Station's (Carty) fueling requirements, PGE secured firm transmission rights for 75,000 DTH/day on the GTN mainline. PGE's firm transmission service agreement for the Carty lateral is structured differently than the firm transmission service agreement on the GTN mainline. While PGE will pay the tariffed rate on the GTN mainline, we will pay a negotiated rate on the lateral. After no other parties elected firm transmission rights on the Carty lateral during GTN's open season, GTN and PGE developed the negotiated rate structure using the estimated costs for GTN to construct, own, and operate the Carty lateral.

Since the negotiated rate includes the costs for GTN to construct and own the Carty lateral, GTN would have adjusted the rate based on the amount of firm transmission rights PGE elected. For example, if PGE had only elected firm transmission rights for 75,000 DTH/day, the negotiated rate (on a DTH/day basis) would have been higher in order for GTN to recover the same costs it is recovering under the rate for 175,000 DTH/day. The costs included in the negotiated rate are derived from the least-cost option available to PGE for the construction of the Carty lateral.

- f. As part of the lateral negotiations, GTN preferred a 30-year service agreement since they would be depreciating the lateral over 30 years. GTN wanted the life and term of the contract to sync up to the life and term of its lifecycle cost of service, which is an industry standard. Most pipelines will only build a major capital project with a lifecycle contract attached to it.

PGE negotiated the shortest term possible on the service agreement on the GTN mainline in order to refrain from overcommitting the company financially. The 20-year term includes Right of First Refusal at the expiration date.

- g. Attachment 621-B provides the co-owner's gas transportation costs.

Attachment 621-A and 621-B are protected information and subject to Protective Order No. 17-057.

First Supplemental Response (Dated: June 28, 2017):

In response to a verbal request from Staff, PGE has agreed to provide the following information regarding PGE's decision to use a 20" pipeline for the Carty Lateral:

The initial 2011 cost estimates PGE received from Gas Transmission Northwest (GTN) for the gas compression station necessary for pipelines less than 20" in diameter ranged from \$10 million to \$20 million. The initial estimates were based on delivering 75,000 million standard cubic feet per day (MMSCFD) of gas to Carty at 625 pounds per square inch gauge (psig). This also assumed the compression station would be located off-site, approximately 25 miles away from the Carty site. When PGE received the final M501GAC gas turbine, gas pressure requirements from Mitsubishi, the required minimum delivery pressure to Carty was revised from 625 psig up to 667 psig. Thus, the initial cost estimates were based on an underestimation of the required gas compression station horsepower (hp). In addition, it was also determined that the gas compression station could be located on site, which helped reduce its total cost. Ultimately, using industry data, which provided a range of \$2,800/hp up to \$8,000/hp, coupled with the estimated total required hp of 3,000 (with redundancy), PGE conservatively estimated a compression station cost of approximately \$8 million.

Pages 8 and 9 of Attachment 621-A provide the final cost estimates from GTN of the 20" and 16" diameter pipe. Adding the conservative estimate of \$8 million to the 16" diameter cost estimate, makes the total capital cost of the 16" pipeline approximately \$1 million greater than the 20" pipeline. The higher capital cost for the 16" pipeline and compressor, plus the long-term operations and maintenance costs of operating a compression station led to the final determination of selecting the 20" diameter pipeline.

Attachment 621-C provides the final GTN Pipeline Size Evaluation white paper. Attachment 621-C is the final version of the white paper previously provided as pages 1-6 of Attachment 621-A, which was a draft document. The key difference between the two versions is the conclusion of Attachment 621-C, which specifically references \$8 million as the estimated capital cost of the compression station.

Attachment 621-C is protected information and subject to Protective Order No. 17-057.

UE 319

Attachment 621-C

Provided in Electronic Format only

Protected Information Subject to Protective Order 17-057

Final GTN Pipeline Size Evaluation

May 9, 2018

TO: Kay Barnes
Public Utility Commission of Oregon

FROM: Stefan Brown
Manager, Regulatory Affairs

**PORTLAND GENERAL ELECTRIC
UE 335
PGE Response to OPUC Data Request No. 298
Dated April 25, 2018**

Request:

Please provide the Carty Lateral pipeline pressures by day from January 1, 2015 to present. Please identify where these pressures were read from and the approximate pressure drop between the reading point and the junction of the Carty lateral and the GTN mainline.

Response:

PGE objects to this request on the basis that it is unclear and seeks information that is not relevant to the decisions to be made in this proceeding. Costs regarding the Carty Lateral were examined in Docket No. UE 294, and included in costs approved by the Commission in that docket through Commission Order No. 15-356. Subject to and without waiving its objection, PGE responds as follows:

Per an email exchange with OPUC Staff, PGE is providing hourly interval gas pressures at Carty instead of daily interval data. Attachment 298-A provides the hourly actual gas pressure at Carty between June 1, 2016 and May 7, 2018. Please note that there are hourly intervals with missing data because of technological issues PGE encountered when pulling the information from the PI software. PGE monitors Carty gas pressure with pressure transmitters located at Carty, upstream of the gas turbine inlet. The gas pressures monitored and recorded at Carty help PGE ensure that the Gas Transmission Northwest (GTN) mainline is providing the adequate gas pressures required by contract.

Prior to July 29, 2016, Carty was still under construction and the gas combustion turbine was not fully tuned. As such, any gas pressures recorded prior to July 29, 2016 do not provide relevant pipeline and plant design information.

PGE does not record gas pressures at the junction of the Carty Lateral pipeline and the GTN mainline. Therefore PGE has no means for providing gas pressure differences between the reading point at the Carty Lateral – GTN mainline junction and Carty.

However, as described in the final GTN Pipeline Size Evaluation white paper provided as Attachment 298-B, when the Carty Lateral was being designed, the two year average GTN historical pressure showed a minimum gas pressure on the GTN mainline of 712.23 pounds per square inch gauge (psig). This average met the minimum gas pressure requirement of 710.2 psig for a 20 inch diameter gas pipeline, but did not meet the 738.2 psig minimum gas pressure requirement for a 16 inch diameter gas pipeline.

Attachment 298-B is protected information subject to Protective Order No. 18-047.

UE 335

Attachment 298-A

Provided in Electronic Format

Carty Daily Average Natural Gas Pressures
June 1 2016 – May 7, 2018

UE 335

Attachment 298-B

Provided in Electronic Format

Protected Information Subject to Protective Order 18-047

Final GTN Pipeline Size Evaluation

Staff Summary of PGE Response to Staff DR Attach A

Row Labels	Average of Carty Gas Pressure
2016	823.6224825
2017	815.205342
2018	793.8769788
Total Period	813.8102916

CASE: UE 335
WITNESS: LANCE KAUFMAN

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 303

**Exhibits in Support
Of Opening Testimony**

May 24, 2018

STAFF EXHIBIT 303
IS CONFIDENTIAL AND SUBJECT TO
PROTECTIVE ORDER NO. 18-047

STAFF EXHIBIT 303 IS VOLUMINOUS
IT WILL BE PROVIDED ON A CD.

CASE: UE 335
WITNESS: LANCE KAUFMAN

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 304

**Exhibits in Support
Of Opening Testimony**

May 24, 2018

Oregon Department of Energy (/energy/Pages/index.aspx) / Energy Facilities & Safety
(/energy/facilities-safety/Pages/default.aspx) / Facilities (**/energy/facilities-**
safety/facilities/Pages/default.aspx) / Carty Generating Station

Carty Generating Station

The certificate holder received approval to construct and operate a 900-megawatt, natural gas-fueled, combined-cycle electric generating plant consisting of two 450-megawatt units (Unit 1 and Unit 2). Unit 1 was fully operational in July 2016. Construction of Unit 2 has not yet begun.

Status: Suspended review/Operating. The certificate holder submitted a request to amend the site certificate in August 2016. In May 2017, the certificate holder requested to suspend review of the amendment request. While the amendment request is still “active” until further notice from the certificate holder, the Department has suspended review and coordination with state and local agencies. If the certificate holder requests to re-initiate review of the amendment request, this webpage will be updated. Also, additional noticing will be issued regarding any changes to the amendment request and next applicable comment period.

Location: Morrow and Gilliam counties (Map) (**/energy/facilities-safety/facilities/Documents/CGS/Carty_map.gif**)

Applicant/Certificate holder: Portland General Electric

ODOE contact: **Sarah Esterson (mailto:sarah.esterson@oregon.gov)**

Application/Certificate holder contact: **Arya Behbehani (mailto:Arya.Behbehani@phn.com)**

4. Proposed Changes and Analysis

A. Proposed Changes

Changes to the Carty Generating Station include modifications to Unit 2, extension of the construction timeline for Unit 2, the addition of Unit 3 and the Carty Solar Farm and associated transmission and other supporting facilities. The major components, structures, and systems of Unit 1 and Unit 2 are described in the Site Certificate. Modifications to Unit 2 are described below, along with a description of Unit 3 and the Carty Solar Farm. All units would be fully integrated into the operations and maintenance of the Carty Generating Station.

Unit 2

There are no proposed substantive changes to the major equipment required for Unit 2 as described in the Site Certificate. Minor changes in the internal design of the unit and improvements in technology since the original design was submitted have resulted in the increased nominal electric generating capacity of Unit 2 from approximately 450 MW described in the ASC to 530 MW (net). Condition 4.3 of the Site Certificate requires that construction of Unit 2 begin no later than five years after the effective date of the Site Certificate. The Site Certificate was countersigned on July 2, 2012; therefore, construction of Unit 2 would have to start construction by July 2, 2017. PGE is requesting an extension to the construction beginning deadline.

Unit 3

The new proposed Unit 3 would consist of a high efficiency CTG in simple cycle with the capability of building out into a combined cycle unit in the future. Unit 3 would be located next to the Boardman boiler building. The following major new equipment required to support the Unit 3 simple cycle CTG and balance of plant additions include:

- One CTG 330 MW net at International Organization for Standardization (ISO) standard reference conditions;
- Fin fan coolers for auxiliary equipment;
- Exhaust system, including exhaust silencer and stack;
- Service water system for new buildings and equipment (this would tie into the existing Boardman system or extend the system from Carty Unit 1);
- All environmental control systems required to meet the emissions and discharge requirements of the facility;
- Compressed air systems, including instrument air;
- Fire detection, alarm, and protection systems;

Additional areas in the vicinity of the proposed Carty Generating Station are provided for construction offices, construction parking, construction staging, and temporary storage of soil displaced during the construction process. Similar temporary construction areas are provided in the vicinity of the Grassland Switchyard ~~and Carty Solar Farm.~~

4.0 GENERAL ADMINISTRATIVE CONDITIONS

4.1. The certificate holder shall begin construction of the facility within three years after the effective date of the site certificate. Under OAR 345-015-0085(9), a site certificate is effective upon execution by the Council Chair and the applicant. The Council may grant an extension of the deadline to begin construction in accordance with OAR 345-027-0030 or any successor rule in effect at the time the request for extension is submitted.

[Final Order III.D.3] [Mandatory Condition OAR 345-027-0020(4)]

4.2. The certificate holder must complete construction of Unit 1 of the facility within three years of beginning construction of Block-Unit 1. Construction is complete when: 1) the facility is substantially complete as defined by the certificate holder's construction contract documents; 2) acceptance testing has been satisfactorily completed; and 3) the energy facility is ready to begin continuous operation consistent with the site certificate. The certificate holder shall promptly notify the Department of the date of completion of construction of Block-Unit 1. The Council may grant an extension of the deadline for completing construction in accordance with OAR 345-027-0030 or any successor rule in effect at the time the request for extension is submitted.

[Final Order III.D.4] [Mandatory Condition OAR 345-027-0020(4)] [Amendment No. 1]

4.3. The certificate holder must begin construction of Block-Unit 2 no later than ~~five~~ three ~~July 2, 2019~~ years after the effective date of the site certificate. The certificate holder shall complete construction of ~~the facility each unit~~ Unit 2 within three years of beginning construction ~~of that unit~~ Block-2. Construction is complete when: 1) Block 2 the unit is substantially complete as defined by the certificate holder's construction contract documents; 2) acceptance testing has been satisfactorily completed; and 3) Block-2 the unit is ready to begin continuous operation consistent with the site certificate. The certificate holder shall notify the Department when the construction of Block-2-Unit 2 begins, and notify the Department of the date of completion of Block-2 construction for Unit 2. The Council may grant an extension of the deadline for completing construction in accordance with OAR 345-027-0030 or any successor rule in effect at the time the request for extension is submitted.

The certificate holder must begin construction of Unit 3 no later than five years after the effective date of Amendment No. 1 of the site certificate. The certificate holder shall complete construction of Unit 3 within three years of beginning construction.

CASE: UE 335
WITNESS: LANCE KAUFMAN

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 305

**Exhibits in Support
Of Opening Testimony**

May 24, 2018

PGE WITHDRAWS PLAN TO EXPAND FRACKED GAS- FIRED POWER

February 22, 2018

But Asks to Increase Pollution by 800% At Existing Plant

By Dan Serres, Conservation Director

On February 20, 2018, Portland General Electric (PGE) officially ended plans to expand the Carty Generating Station, a fracked gas-fired facility located near Boardman, Oregon. This is a huge victory for our climate and public health.

PGE took a big step in this direction in 2017 when it suspended permitting requests for two new fracked gas-fired power plants at the Carty site. However, PGE's decision to abandon the second and third fracked-gas fired power plant is welcome news to the thousands of Oregonians who urged PGE to rely on clean energy rather than expanding the region's reliance on highly polluting fracked gas.

Riverkeeper strongly supports PGE's decision to abandon its proposed expansion of fracked gas power plants near Boardman.

But controversy remains.

PGE wants to dramatically increase air pollution at the existing Carty gas plant. PGE wants approval from the Oregon Department of Environmental Quality (DEQ) for:

- *an eight-fold increase smog-forming volatile organic compounds (VOCs), and*
- *a three-fold increase in carbon monoxide.*

VOCs are of particular concern because they combine with nitrogen oxides and sunlight to form low-level ozone (smog), a powerful respiratory irritant.

You can join us in urging DEQ to reject PGE's requested pollution increase by commenting [here](#).

Huge Pollution Increase

PGE proposes a massive increase in air pollution from carbon monoxide and volatile organic compound emissions. PGE seeks to increase carbon monoxide pollution by 324%, and VOCs by 808%. *Current Pollution Limit for Carty Plant: Proposed Pollution From Carty Plant (Percentage Increase):*

- Carbon Monoxide (CO) 99 tons/year [1] 321 tons/year [2] 324%
- Volatile Organic Compounds (VOCs) 24 tons/year [3] 194 tons/year [4] 808%

The specific reasons for PGE's proposed increase in pollution deserve more investigation. PGE and its manufacturer failed to account for these emissions when the company obtained its initial air pollution permit for the recently completed Carty natural gas-fired power plant. PGE claims that it received new information after construction from its manufacturer about the plant's air pollution. Additionally, PGE may be operating its facility differently than originally planned. PGE planned for

Carty Unit 1 to be a baseload 450 MW power plant. Yet, the plant is now anticipating frequent startup and shutdowns, a major contributor to VOC pollution.

Regardless of its cause, PGE's request for a massive increase in smog-forming pollution demonstrates that fracked gas power plants are major polluters. In addition to spurring more fracking, huge greenhouse gas emissions, and the consumption of millions of gallons of water, gas-fired power plants create immediate health and environmental impacts, such as the formation of low-level ozone (smog).

Instead of granting PGE's request to increase its smog-forming pollution by 800%, DEQ should:

- Hold PGE to current annual pollution limits for VOCs and carbon monoxide.
- Limit startup and shutdown events. DEQ proposes an hourly limit during startup and shutdown. But these hourly emissions still result in a massive annual increase in smog-forming pollution, based on PGE's expected operations. This is unacceptable.
- Cold startups are particularly polluting events, according to the emissions summary for the Carty Plant. If these events are pushing PGE over its pollution limit, then PGE should limit cold startups.
- Investigate additional Best Available Control Technologies (BACT) that could reduce VOC and carbon monoxide pollution, including restrictions on how PGE operates its facility.
- Study the potential impact of smog-forming pollution on the Gorge National Scenic Area and nearby communities.

[You can read more about the Carty plant issue here.](#)

DEQ is accepting public comments until April 30, 2018. [DEQ's revised public notice and permit information are here](#), and you can [send a short comment by clicking here](#).

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JOBS

Main office (mailing address)

MEDIA

111 Third Street

STAFF DIRECTORY

Hood River, OR 97031

Staff/305
Kaufman/4

1125 SE Madison Street, Suite 103A

Portland, OR 97214

[541-387-3030](tel:541-387-3030)

info@columbiariverkeeper.org

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CASE: UE 335
WITNESS: LANCE KAUFMAN

**PUBLIC UTILITY COMMISSION
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May 24, 2018

public utility loads in the period after current contracts expire in September 2011. While BPA has not made any final decisions regarding how much, if any, of the 550 aMW will ultimately be required, BPA believes it is likely that some augmentation will be necessary, and that it is prudent to make some limited, cost-effective acquisitions at this time. Furthermore, BPA has identified a potential increase in demand for renewable resources due to Renewables Portfolio Standards ("RPS") recently put in place by the State of Washington ("Energy Independence Act") and Oregon ("Oregon Renewable Energy Act"). These laws require many of BPA's public and investor owned utility customers to meet a certain percentage of their load using renewable resources. For these reasons, BPA began exploring available renewable resources to identify any potential lost opportunity projects that BPA might acquire now to meet the projected power requirements of these customers.

II. The Project and Power Purchase Agreement

Seller, a limited liability company incorporated in the state of Oregon, is an affiliate of PPM Energy, Inc., which in turn is a subsidiary of Scottish Power, plc. Credit support is being provided to BPA by Scottish Power Finance (US), Inc. The Klondike III Wind Project is located adjacent to the Klondike I and II wind projects near the town of Wasco, Sherman County, Oregon. The Project is currently expected to consist of 125 wind turbines and towers, new roads, new maintenance facilities, and a new substation. Several turbine types are currently expected to be used, with capacities ranging from 1.5 MW to 2.4 MW. Project facilities occupy approximately 74 acres of private agricultural land. The total generating capacity of the Project is expected to be 223.6 MW.

The Project is under construction and expected to be completed and ready for commercial operation by December 31, 2007. Such date may be extended by Seller until June 1, 2009, and for up to an additional 180 days in the event of an uncontrollable force, at which time if commercial operation has not been achieved, Seller (with some preconditions) or BPA (unconditionally) may terminate the PPA.

BPA's contractual percentage share of actual Project output is 22.36 percent, or 49.99 MW of the anticipated generating capacity. However, BPA's share of actual output is capped at 50 MW, even in the event that the generating capacity of the Project as finally constructed exceeds 223.6 MW. The balance of the Project's anticipated generating capacity has been sold to other purchasers. Because wind energy is an inherently intermittent resource, the actual projected annual average output of the Project is well below its nameplate capacity. Based on historical performance of similar wind generation resources in the same area, BPA projects that the Project will have an annual average capacity factor of 30 percent (a conservative assumption), which means BPA expects on a planning basis that its annual average output share of Project generation will not exceed 15 aMW.

Under the PPA, Seller is responsible for providing schedules to the transmission provider before each hour, specifying the amount of energy it will deliver to BPA in such hour. BPA is obligated to pay Seller the contract price for the amount of energy actually generated and metered at the metering point. At the end of each month, the hourly metered amounts will be true-up to the hourly schedules submitted by Seller in such month. Depending on whether Seller

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Going big with wind in Biglow

Portland General Electric is getting into wind power in a big way, with the 450MW Biglow Canyon wind farm in Oregon, one of the largest wind power facilities in the Pacific Northwest.

By Paul MacDonald



The Biglow Canyon wind farm in Oregon is Portland General Electric's (PGE) first fully owned wind power facility, and the utility is going big with this project.

When it's completed in the fall of 2010, the multi-phase project will deliver 450 MW of power, making it one of the largest wind power facilities in the Pacific Northwest.

Projects such as Biglow Canyon deliver a lot of power, but they are also capital intensive, notes Gary Hackett, plant manager of the Biglow facility. "It represents a significant investment by PGE," he says. But the company is on a solid financial footing, he added. "We're a strong company and not having any problems getting the financing we need. It helps that Biglow Canyon is a premium

site-there are good wind resources here in northern Oregon."

The Biglow project represents the Oregon-based utility's largest ever single power plant investment, with an estimated price tag of \$1.2 billion.

The wind project has a large site-25,000 acres-and it has lots of company in this area of Oregon/Washington.

As in the heyday of oil, when hundreds of derricks were tightly clustered in areas of Texas, today there are hundreds of wind turbines, delivering renewable energy along this stretch of north-central Oregon and southern Washington.

"It's right in the center of prime wind country," says Hackett. "We can stand at a high point on Biglow and see upwards of eight wind power projects, either completed or going up around us."

Biglow was originally developed by Orion Energy LLC. Before acquiring the project, the PGE team worked with the Orion team for over two years on all aspects of the project, from land rights to obtaining the site certificate and transmission rights. By the time PGE purchased the project, it was-as the term goes-pretty close to being shovel ready. "When we purchased the development rights from Orion, pretty much everything was in place except for the turbine procurement and a balance of plant construction contract," explains Hackett.

PGE talked with a number of turbine suppliers. Due to an order cancellation, an opportunity opened with turbine manufacturer Vestas. PGE quickly struck a deal to purchase 76 Vestas 1.65 MW turbines-for a total of 124.5 MW-for phase one of Biglow Canyon.

Along with the wind resource itself, one of the most attractive features of Biglow was that PGE could get a quick start on it. All the major permits had been obtained, and Orion had worked with the landowners, getting contracts and agreements in place. PGE wanted to move ahead with a major wind project, "and Biglow was ready to go," explained Hackett.

From the beginning, Biglow was planned as a three-phase construction project. Phase one was completed in 2007, phase two will be completed this fall, and the third phase is scheduled to be delivering power in September 2010, from this largely agricultural area.

While the land in this area can become a bit rocky as it drops off to the Columbia and John Day rivers, it is generally rolling land used for dryland farming. There is about 60 feet of soft, rock-free soil before you hit bedrock.

"It's not perfectly flat, like a wind project site in the Midwest or Texas," says Hackett. "The rolling hills tend to define where we can build our turbines. As a result, it's not laid out perfectly uniform-the turbines are spaced out mostly on the ridges and high points."

The geography of the region does vary a bit. Hackett notes that across the Columbia River, which divides Oregon and Washington, there is a high ridgeline that runs along the river, then drops steeply into the river valley. "It's quite different from what we have to deal with." But the area as a whole is still very open, with good wind resources, and it is lightly populated.

The Biglow wind project is in Sherman County, which has about 1800 residents, most of whom welcomed the wind farm and its benefits to

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the local economy, including local jobs. Local landowners even formed their own group to facilitate the wind farm development and management process (see sidebar story).

Like other major rural areas, the county has its share of young people not interested in farming, who were relocating to find work. But they now have new job opportunities working in construction and, longer term, in operations and maintenance, with Biglow and the other wind farms. And Biglow has added significantly to the tax base.

In terms of siting the turbines, PGE was granted corridors from the Energy Facility Siting Council (EFSC) as part of the permitting process and, for the most part, was able to locate turbines on the originally planned sites.

"In the early days of development, we worked with Orion to optimize and microsite turbine locations," said Hackett. "During the construction phase, we made minor moves here and there to accommodate construction requirements or landowners, where they wanted to have a road over here, rather than over there, because it made it easier to farm, while still doing what we needed to do.

"I'd say we have excellent working relationships with all of our landowners and the farmers we work with. In general, wind is not a negative four letter word in this county and with the landowners that we work with," he added.

While PGE opted for Vestas turbines for phase one, the overall scope of the project dictated a change in suppliers for phases two and three of the Biglow project.

Their EFSC permit allows them to have 450 MW of power or 225 turbine units for the project. "If we had continued with the Vestas turbines, we would have reached our hard limit on the number of wind turbines before we reached our hard limit on megawatts," explained

Hackett. "We had to look at bigger turbine units, and we were able to work out an agreement with Siemens."

For phases two and three, PGE will be installing 141 Siemens 2.3 MW units. At the time, Biglow represented one of the largest single turbine sales Siemens had ever made in North America.



Phase one of Biglow was completed in 2007, phase two will be completed this fall, and the third phase is scheduled to be delivering power in September 2010. D. H. Blattner is the general contractor for all three phases.

Landowners set up group for dealing with PGE

Dealing with multiple landowners can be a bit of a production for wind farm developers and owners.

It's quite common for wind farm developers to spend many an hour

at the kitchen tables of farmers and other landowners, explaining the details of a project and dealing with individual landowners on an ongoing basis.

It was quite a bit different with the Biglow wind project.

Early in the project development process, a local wheat farmer, John DeMoss, and several others formed a local landowners' group, called Praise the Wind Inc. In total, Praise the Wind Inc. represented about two dozen landowners in negotiations with the developer of Biglow, Orion Energy, and subsequently, the owner of Biglow, Portland General Electric.

Having one central group has made it much easier for the landowners and for PGE, reports project manager Gary Hackett. "We disseminate our payments to the landowners through Praise the Wind. It makes it much easier-we deal with Praise the Wind, rather than the individual landowners and other landowners, such as corporations and trusts."

Sadly, Praise the Wind founder John DeMoss passed away last year. "John's legacy lives on, though," said Hackett. A memorial is being planned for DeMoss as part of the public tour of the Biglow wind farm.

On the actual construction side, high winds-not surprisingly- have been the single biggest challenge in erecting those turbines, says Hackett. "We had a bit of rain and mud, but wind was the biggest challenge. We had over 30 wind day delays during the construction of phase one alone."

They broke ground and started building roads for phase one in April 2007. Their targeted completion date was December 31, to capture tax benefits.

"We were actually able to commission our last unit of phase one on December 21, in spite of wind, snow, and cold weather. So we met our deadline and came in under budget." This included building the substation and an operations and maintenance facility.

The Bonneville Power Administration operates the electricity transmission system in the region, and they built a 230KV transmission line during the

same time window, to take power to their John Day substation. The line serves the Biglow project and the nearby Klondike wind project of Iberdrola Renewables (formerly PPM Energy). The two companies co-funded the line. The primary contractor for the underground transmission system installed at Biglow-between towers and the substation-was Rosendin Electric, a subcontractor to D. H. Blattner.

This being farm country, there was a county road network, some paved/some gravel, for PGE and D. H. Blattner to work with. Each of the three phases is expected to require an additional 20 miles of road.

Hackett praised the work of D. H. Blattner, the general contractor for all three phases. "At one point, they were completing two turbine foundations a day. With phase two, the roads, foundations, and collection systems were completed before the first turbines even arrived on site."

Keeping a three-phase, 450 MW project on track requires a lot of work on everyone's part, from PGE to D. H. Blattner to all the subcontractors involved. To keep it all moving forward, there are daily construction meetings, weekly summary meetings, and monthly management meetings to coordinate all the different moving construction parts.

Hackett noted there was a tremendous amount of work on the turbine parts side alone. "Each turbine involved about ten trucks delivering parts from the Port of Vancouver, Washington. So we had over 700 truckloads of equipment for phase one, and we'll have considerably more for phases two and three because they are bigger turbine units."

This involved a huge amount of truck traffic moving along the Columbia River Gorge transportation corridor. "You could not drive down towards Portland and not pass six or eight trucks of turbine equipment headed up to the Biglow site."

Hackett said there are a number of reasons why PGE opted for a multi-phase, not the least of which was the sheer size of the project. Other reasons included available construction windows and the ability to spread out the financing requirements for such a huge project.

He noted there was a flow of work between the phases. "We moved the construction window for phase two so we could start it right after phase one, so we worked through last winter. We had a lot of cold and snow and freezing weather, which kind of slowed things down. But the crews stayed mobilized and on site, and kept working."

They are taking similar steps with phase three. "We've done the same thing and have worked out an arrangement where crews are continuing road construction and foundations right on through. We're well ahead of the curve."

The only snag, and what might be a caution for other wind farm builders, says Hackett, is that they ran into problems with some communications cable. The cable, which was laid on phase one, was supposed to be rodent-resistant. That said, there was a pocket gopher in the area that just loved to eat cable-and attacked it in a number of areas. They re-laid the cable, this time in a heavy conduit.

Hackett described the cable problem as more of a nuisance, than a problem. But it drives home the point that you can't have too much knowledge about your work area. "Be aware of your surrounding area and the critters that live there so you don't get surprised," he advised. Hackett described these particular critters as "gophers on steroids."

From dealing with local animals to working in demanding weather, it will all be helpful for PGE as it moves forward with other wind and renewable energy projects. About four percent of PGE's power currently comes from renewables, and that is expected to increase to 10 percent by 2011. PGE fully expects to reach Oregon's Renewable Portfolio Standards goal of 15 percent of power from renewables by 2015, and 25 percent from renewables by 2025.

September/October 2009



Along with the wind resource itself, one of the most attractive features of Biglow was that PGE could get a quick start on building the project when it was acquired from Orion Energy LLC. All the major permits had been obtained, and landowner agreements were in place.

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PGE Announces Completion of Tucannon River Wind Farm

Region's newest wind project adds to diversity of renewable energy portfolio

PORTLAND, Ore.--(BUSINESS WIRE)-- Portland General Electric Company (NYSE:POR) today announced its Tucannon River Wind Farm is in service and available to generate power for PGE customers. Tucannon River is PGE's second fully owned and operated large-scale wind project, with 116 turbines and a total installed capacity of 267 megawatts. Given the variability of wind power, the plant is expected to produce an average of 101 megawatts - enough to power the homes of about 84,000 average PGE residential customers.

"Tucannon River Wind Farm is a key infrastructure investment that will serve our customers with clean, renewable energy for decades to come," said Jim Piro, PGE president and CEO. "Tucannon River supports a balanced, diverse energy portfolio for reliable, reasonably priced power. The new wind farm will also help PGE meet Oregon's Renewable Portfolio Standard, which requires us to supply 15 percent of the electricity our customers use from qualified renewable resources by 2015 and 25 percent by 2025."

Tucannon River Wind Farm is located on 20,000 acres near Dayton, Wash. The new wind farm complements PGE's existing portfolio of wind resources located in Eastern and North-central Oregon: Biglow Canyon Wind Farm, which is fully owned and operated by PGE, and power purchase agreements for the output of the Klondike II and Vansycle Ridge wind farms. By securing wind power from different geographic locations, PGE is able to better integrate wind into the system because the facilities are less likely to cycle up and down simultaneously.

In addition to providing carbon-free and emissions-free generation of electric power, Tucannon River is providing economic support to the region.

"The Tucannon River Wind Farm has been a great addition to Columbia County and the Dayton community," said Mike Talbot, Columbia County Chair. "The project brought hundreds of construction jobs to the region, and now 18 permanent, family-wage positions to the Dayton community. It's also bringing income to local businesses and increasing county tax revenue. We're happy to have PGE in our community."

Tucannon River was built for PGE by general contractor and independent renewable power developer Renewable Energy Systems Americas Construction Inc. using wind turbines manufactured by [Siemens, each with a nameplate generating capacity of 2.3 megawatts. Power generated at Tucannon River will be brought to PGE customers via a new interconnection at Central Ferry Substation constructed by the Bonneville Power Administration. The plant was completed on time and on budget under fixed-price contracts, with final construction costs expected to be approximately \\$500 million, excluding AFDC.](#)

Completion of Tucannon River Wind Farm is a significant milestone in the implementation of the action plan that came out of PGE's 2009 Integrated Resource Plan. The plan was acknowledged by the Oregon Public Utility Commission in November 2010. The requests for proposals used to select the project were conducted pursuant to competitive bidding guidelines established by the OPUC, using objective scoring criteria intended to identify projects that provide the best balance of cost and risk while meeting PGE customers' needs for reliable, affordable electric power.

Available resources for media:

- **B-roll video** (http://cts.businesswire.com/ct/CT?id=smartlink&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3D7B0I66rACL4%26list%3DUUERoi8W88sb80aaY7V_Fvg&sheet=51003696&newsitemid=20141215006360&lan=en-US&anchor=B-roll+video&index=1&md5=a57d01f465ee2776734501056c83157d)
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- **Wind turbine construction time-lapse video** (http://cts.businesswire.com/ct/CT?id=smartlink&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3D5zODRt0EmEo%26list%3DUUERoi8W88sb80aaY7V_Fvg&sheet=51003696&newsitemid=20141215006360&lan=en-US&anchor=Wind+turbine+construction+time-lapse+video&index=3&md5=02ed64f73c6f8176dbcd044aa4849ca4)

About Portland General Electric Company

Portland General Electric, headquartered in Portland, Ore., is a fully integrated electric utility that serves more than 843,000 residential, commercial and industrial customers in Oregon. In 2014, PGE celebrated 125 years of powering Oregon. Visit our website at PortlandGeneral.com

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Safe Harbor Statement

Statements in this news release that relate to future plans, objectives, expectations, performance, events and the like may constitute "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995, Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. Such forward-looking statements include statements concerning the future performance of the Tucannon River Wind Farm and other expected benefits of the project, as well as other statements identified by words including, but not limited to, "will," "anticipates," "believes," "intends," "estimates," "promises," "expects," "should," "conditioned upon" and similar expressions. Investors are cautioned that any such forward-looking

statements are subject to risks and uncertainties, including regulatory, operational and legal matters, as well as other factors that could affect the deployment and successful operation of turbines at the Tucannon River Wind Farm project. As a result, actual results may differ materially from those projected in the forward-looking statements. All forward-looking statements included in this news release are based on information available to the Company on the date hereof and such statements speak only as of the date hereof. The Company assumes no obligation to update any such forward-looking statements. Prospective investors should also review the risks and uncertainties listed in the Company's most recent Annual Report on Form 10-K and the Company's reports on Forms 8-K and 10-Q filed with the United States Securities and Exchange Commission, including Management's Discussion and Analysis of Financial Condition and Results of Operation and the risks described therein from time to time.

POR-F

Source: Portland General Electric Company

PGE

Brianne Hyder, 503-464-8442

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