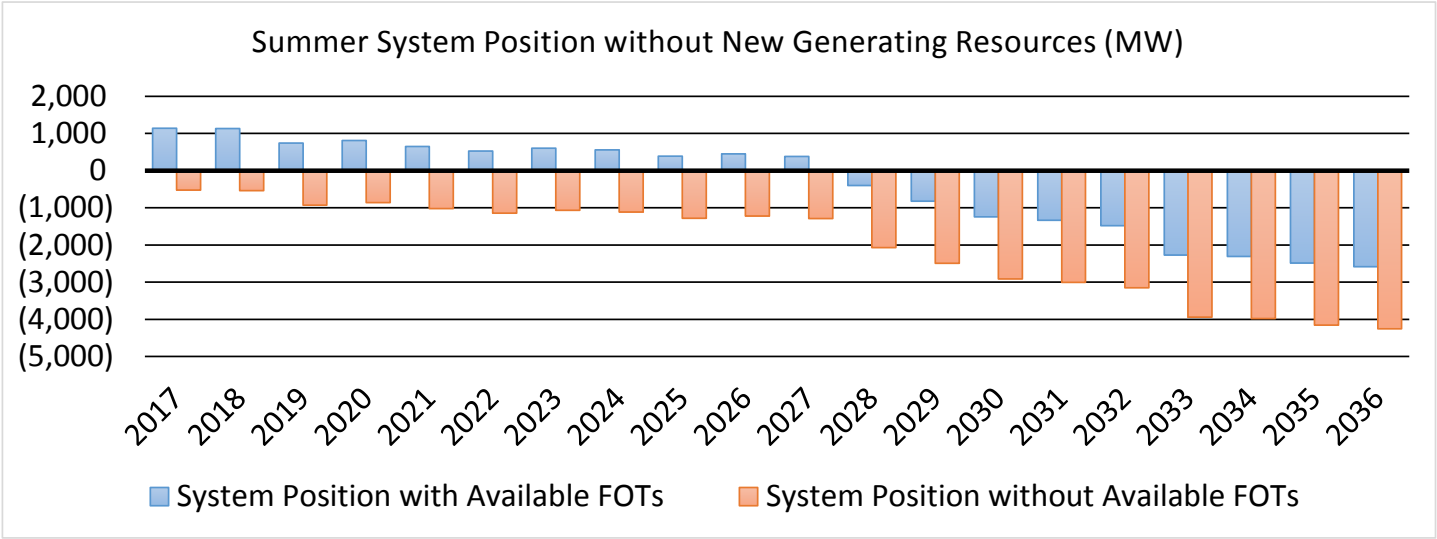
PacifiCorp's 2017 Integrated Resource Plan Public Utility Commission of Oregon Workshop

September 14, 2017

PACIFICORP

IRP and Economic Opportunity

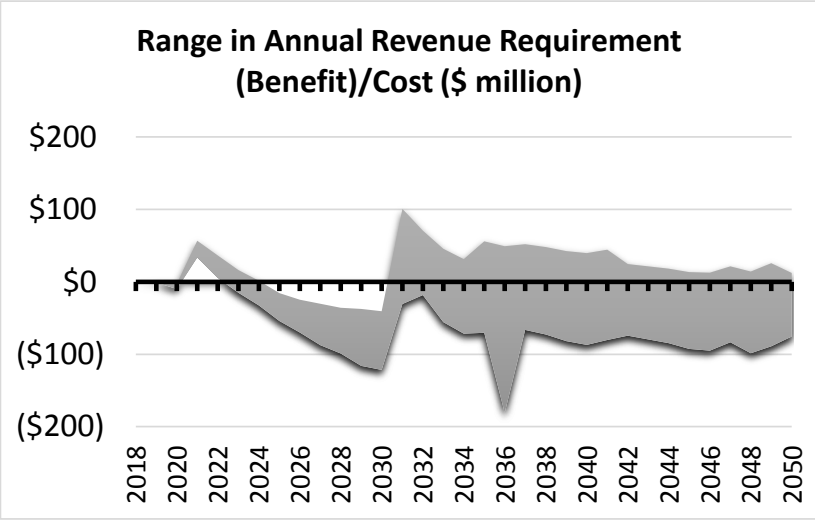
Load and Resource Balance

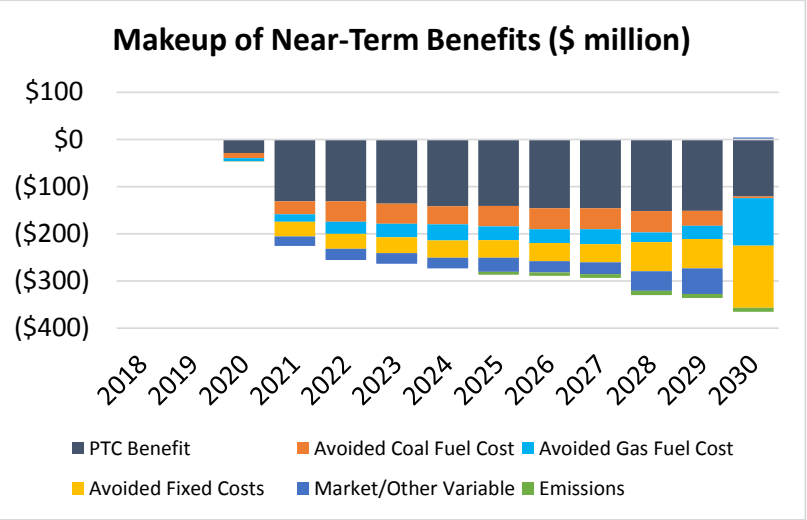


- The proposed Wyoming wind resources are needed to reliably serve load and reduce market reliance risk—an area of concern raised by parties during review of the 2015 IRP.
  - 1,100 MW of new Wyoming wind (~174 MW of capacity contribution) by year-end 2020.
  - Assumed retirement of Cholla 4 (387 MW) at year-end 2020.
- PacifiCorp needs the proposed new transmission line to relieve congestion, enable new resource interconnections, and improve reliability—this need persists even if coal generation is retired.
- These resources are a component of PacifiCorp's least-cost, least-risk plan to meet these needs and are not driven by renewable portfolio standard compliance obligations.

Risk Considerations

(New Wind & Transmission)

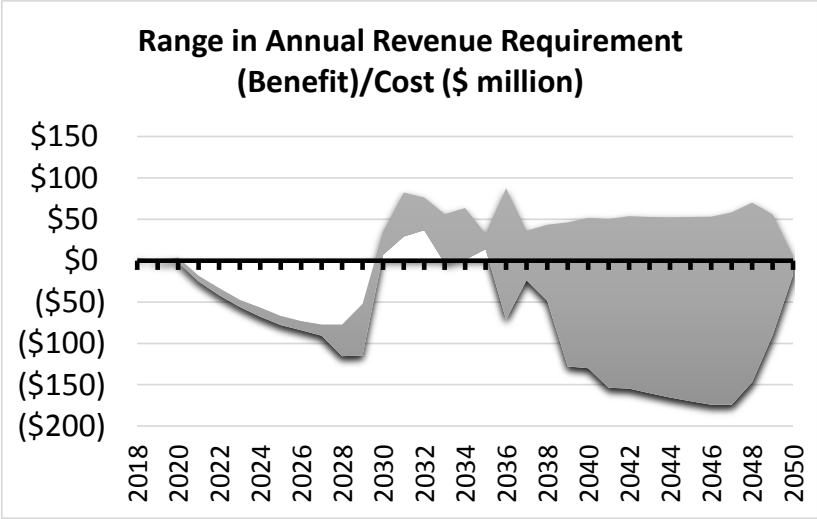


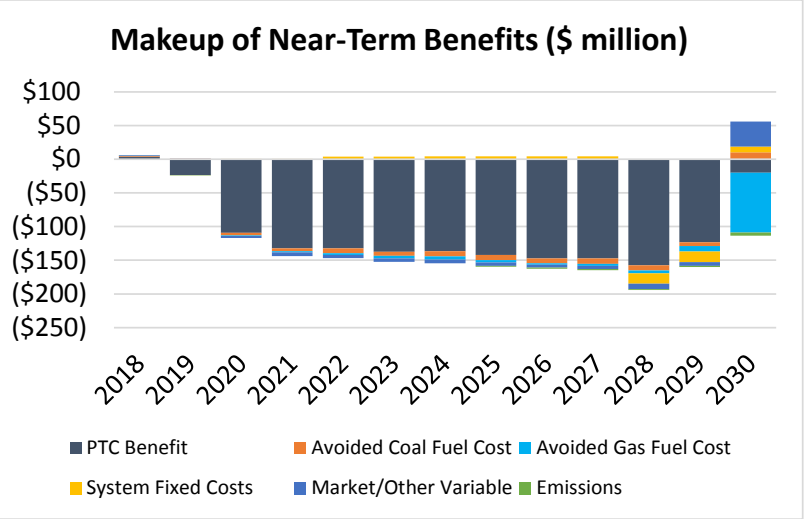


- Near-term net benefits are not speculative and are expected within three to four years after the assets are placed in service.
- Federal production tax credits, avoided fuel costs, and avoided resource costs make up approximately 90% of the benefit stream (~10% tied to increased market sales and emissions).
- Net power cost benefits are expected to persist over the long term as PacifiCorp's fleet transitions away from coal generation; longer-term benefits would increase if coal-unit retirements occurred earlier than assumed.

Risk Considerations

(Wind Repowering)





- Near-term net benefits are not speculative and are nearly immediate.
- Federal production tax credits, avoided fuel costs, and avoided system fixed costs make up approximately 96% of the benefit stream (~4% tied to primarily to increased market sales and emissions).
- Net power cost benefits are expected to persist over the long term, with significant incremental wind generation beyond 2036; longer-term benefits would increase if coal-unit retirements occurred sooner than assumed.

Coal Plant Analysis

Progression of IRP Coal Analysis

(2011 IRP Cycle)

Studies	Model(s)	Approach	Inter-Temporal	Fleet Trade-Off
Coal Utilization Sensitivities	SO Model	System	✘	✘
Supplemental Coal Replacement Study	SO Model	Unit-by-Unit	✘	✘
Coal Screening Model	Spreadsheet	Unit-by-Unit	✘	✘
Updated Coal Replacement Study	SO Model	Unit-by-Unit	✘	✘

- Coal utilization studies were prepared as a "proof-of-concept" analysis to evaluate how CO_2 prices and natural gas prices affected a potential transition to brownfield combined cycles.
- The 2011 IRP was supplemented with a coal replacement study, which eliminated the concept of "growth stations", broadening the scope of replacement resource alternatives.
- The coal screening model is a simplified spreadsheet-based tool developed to prioritize more detailed modeling of certain coal units in an updated coal replacement study.
- PacifiCorp filed a revised action plan, committing to host a technical workshop on the coal replacement study and to include a revised study in the 2011 IRP Update.

Progression of IRP Coal Analysis

(2013 IRP Cycle)

Studies	Model(s)	Approach	Inter-Temporal	Fleet Trade-Off
Portfolio Development	SO Model & PaR	System	✘	✘
PVRR(d) Studies	SO Model	Unit-by-Unit	✘	✘
Hypothetical Regional Haze	SO Model	Unit-by-Unit	✓	✘
Cumulative Investment Analysis	Spreadsheet	Unit-by-Unit	✘	✘

- Early retirement or gas-conversion considered as alternatives to known or assumed regional haze compliance requirements was built into the portfolio development process.
- Present-value revenue requirement differential (PVRR(d)) studies performed for certain units with compliance timelines within two to four years; these studies were required to quantify the economic benefit of compliance outcomes from the portfolio development process.
- Hypothetical regional haze studies evaluated inter-temporal trade-offs in assessing regional haze compliance for Jim Bridger Unit 3 and Unit 4.
- The cumulative investment analysis was prepared at the request of an Oregon commissioner to evaluate past coal investments given then-current assumptions for compliance obligations.
- Consistent with Order No. 14-252, PacifiCorp and parties participated in several workshops to determine parameters of coal analysis in future IRPs and to file an update on Cholla Unit 4.

Progression of IRP Coal Analysis

(2015 IRP Cycle)

Studies	Model(s)	Approach	Inter-Temporal	Fleet Trade-Off
Regional Haze Scenarios	SO Model & PaR	System	✓	✓
PVRR(d) Studies	System Optimizer	System	✓	✓

- Regional haze scenarios are consistent with those developed with parties and reviewed by the Oregon commission during the workshops required in Order No. 14-252, which focused on the parties' interest in expanding inter-temporal and fleet trade-off analysis.
- PVRR(d) studies were performed for certain units with compliance timelines within two to four years—these studies were required to quantify the economic benefit of compliance outcomes from the portfolio development process.
- The Oregon Commission acknowledged, with certain clarifications, PacifiCorp's coal resource action items from the 2015 IRP.

Progression of IRP Coal Analysis

(2017 IRP Cycle)

Studies	Model(s)	Approach	Inter-Temporal	Fleet Trade-Off
Regional Haze Scenarios	SO Model & PaR	System	✓	✓

- PacifiCorp continued its methodology adopted in the 2015 IRP to evaluate a range of potential regional haze compliance scenarios that consider inter-temporal and fleet trade-off compliance outcomes.
- The range of scenarios was broader in the 2017 IRP.
- PVRR(d) outcomes between scenarios are included within the 2017 IRP.
- PacifiCorp accommodated party requests to perform additional scenarios during the 2017 IRP public input process.
- The least-cost, least-risk compliance alternative was identified through robust scenario analysis in the early stages of the portfolio development process.
- Alternative compliance outcomes inform the acquisition path analysis presented in the 2017 IRP (Chapter 9).

A Path Forward

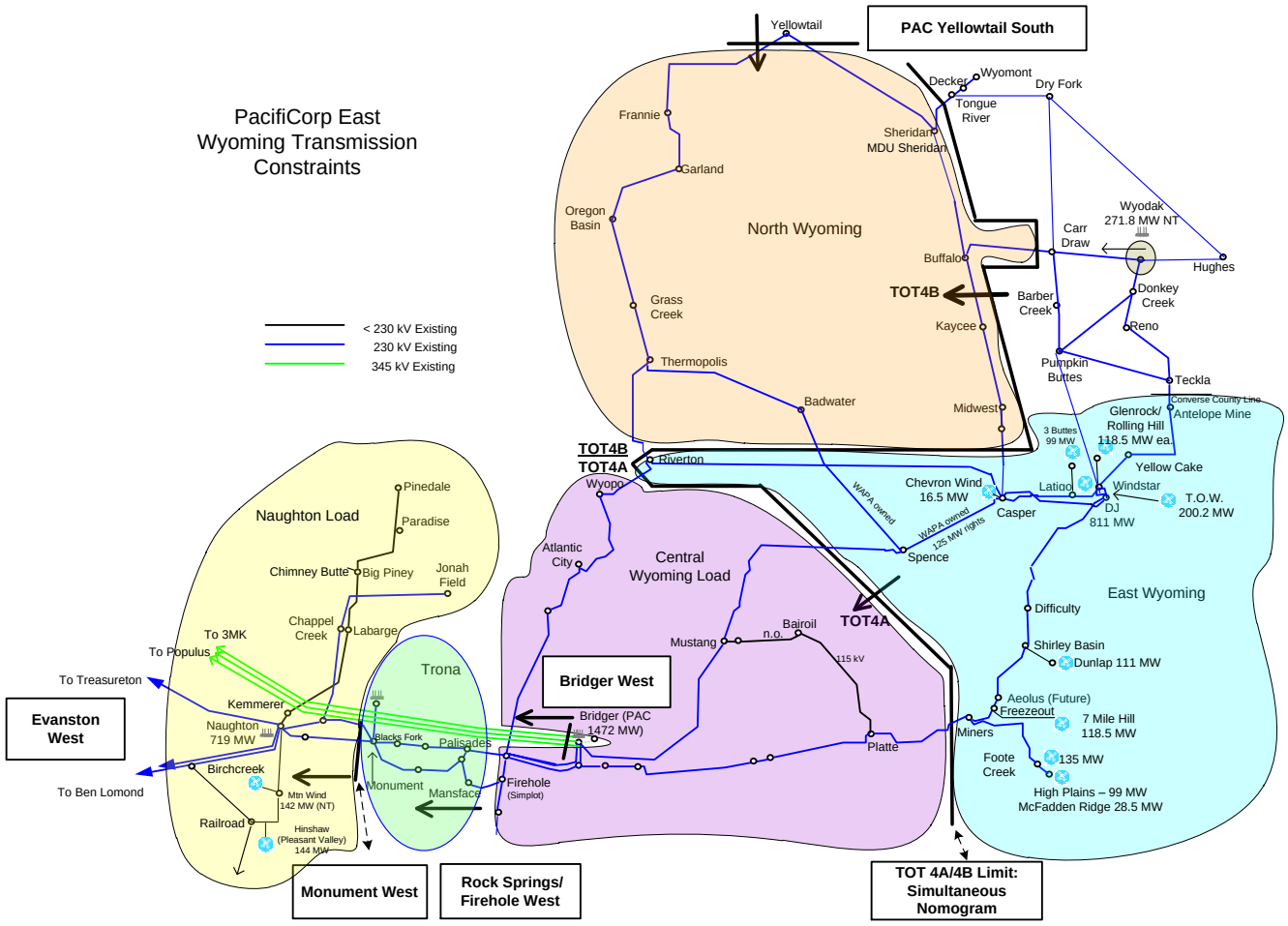
- PacifiCorp has a history of being responsive to parties' concerns and recommendations and working with them to advance coal resource analysis performed within the IRP, and is committed to continuing to work with parties.
- PacifiCorp proposes to schedule a series of technical workshops in early 2018 with IRP stakeholders from all jurisdictions.
  - Before the first technical workshop, PacifiCorp will solicit input from parties to document concerns and specific recommendations.
  - Before the first technical workshop, PacifiCorp will develop and distribute a straw proposal to address parties' concerns and recommendations, including recommendations to improve transparency.
  - The technical workshops will be used to refine and finalize the methodology, with input from stakeholders, to evaluate coal resources before kicking off the 2019 IRP public input process in the summer of 2018.
  - PacifiCorp will report on the status of these technical workshops in its 2017 IRP Update.

Transmission Analysis

Current Transmission System

- With the current mix of synchronous generation and renewable generation in eastern Wyoming, the existing Stiffness Factor is at marginally acceptable levels.
- By removing the Dave Johnston generating plant, the Stiffness Factor would be unacceptable. Adding additional new wind would only weaken the system further.
- Since 2013, PacifiCorp completed the following transmission system enhancement projects that enabled postponement of major transmission projects to 2020:
  - Installing dynamic line rating equipment on the Miners (Standpipe)-Platte 230 kV line (2013).
  - Southern Wyoming Voltage Control Scheme, which coordinated wind generation reactive output to stabilize local area voltages (2015).
  - Construction of the Standpipe substation and (60 MVAr) synchronous condenser for voltage control (2016).

Wyoming Transmission Map



DJ Retirement Assessment

- Based on feedback in the 2017 IRP review meetings, transmission studies are underway to provide additional detail and clarity to the question of earlier retirement of the Dave Johnston plant with the addition of new wind resources and without the addition of the Aeolus-to-Bridger/Anticline transmission line.
- The steady-state analysis identified six 230kV major system reinforcement projects necessary to meet the thermal and voltage criteria to operate the transmission system reliably at a high level estimated cost of $753m.
- Making the six 230kV transmission reinforcements would eliminate the option of upgrading to 500kV in the permitted right of way.
- The following table summarizes the key attributes of a Dave Johnston early retirement alternative relative to PacifiCorp's proposed projects.

Close	Transmission Cost	Voltage	DJ Replacement Capacity	Transfer Capacity at In Service
Company's Proposal	$717m	500 kV	2028 (762 MW)	750 MW
DJ Retirement/230 kV Reinforcements	$753m	230 kV	2021 (762 MW)	562 MW