PACIFIC POWER
A DIVISION OF PACIFICORP

825 NE Multnomah, Suite 2000
Portland, Oregon 97232

October 2, 2018

VIA ELECTRONIC FILING
AND OVERNIGHT DELIVERY

Public Utility Commission of Oregon
201 High Street SE, Suite 100
Salem, OR 97301-3398

Attn: Filing Center

RE: LC 70—Compliance Filing

In accordance with Public Utility Commission of Oregon Order No. 18-360, PacifiCorp d/b/a Pacific Power provides the enclosed materials outlining the scope and major assumptions of its proposed coal analysis, subject to change. This material will be presented at a workshop on October 4, 2018, which has been noticed to all parties on the service list of the above-referenced proceeding. In addition, available supporting workpapers are being provided with this filing. PacifiCorp may supplement this filing with any additional workpapers as necessary as they become available.

Confidential material has been provided under Order No. 18-216.

Please direct any questions on this filing to Natasha Siores at (503) 813-6583.

Sincerely,

Etta Lockey
Vice President, Regulation

CERTIFICATE OF SERVICE

I certify that I filed a true and correct copy of PacifiCorp's **Compliance Filing** on the parties listed below via electronic mail and/or overnight delivery in compliance with OAR 860-001-0180.

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LC 70

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Dated October 2, 2018.

Katie Savarin

Katie Savarin
Coordinator, Regulatory Operations

2019 Integrated Resource Plan

Scope of Updated Coal-Unit Analysis

October 4, 2018




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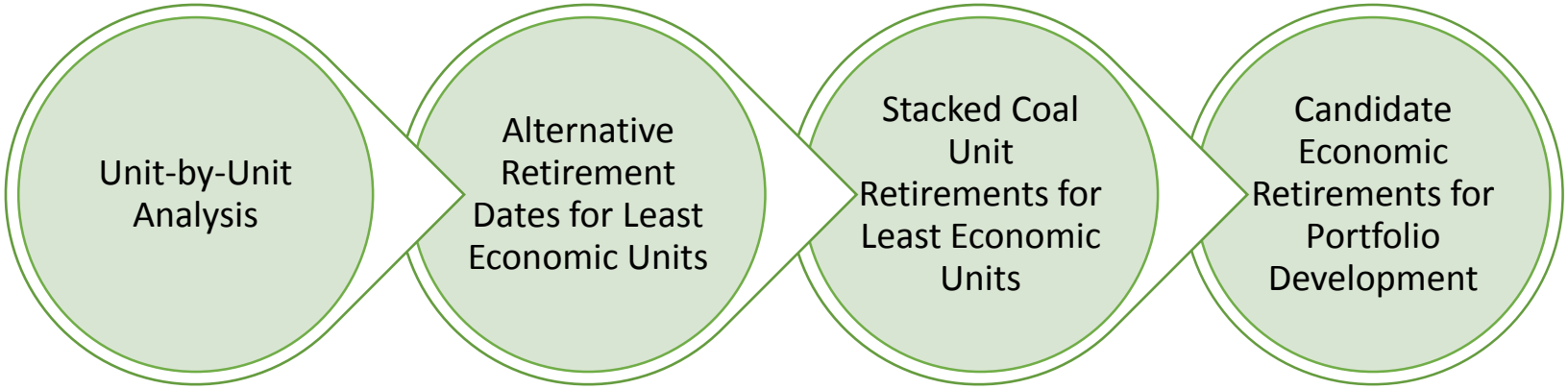
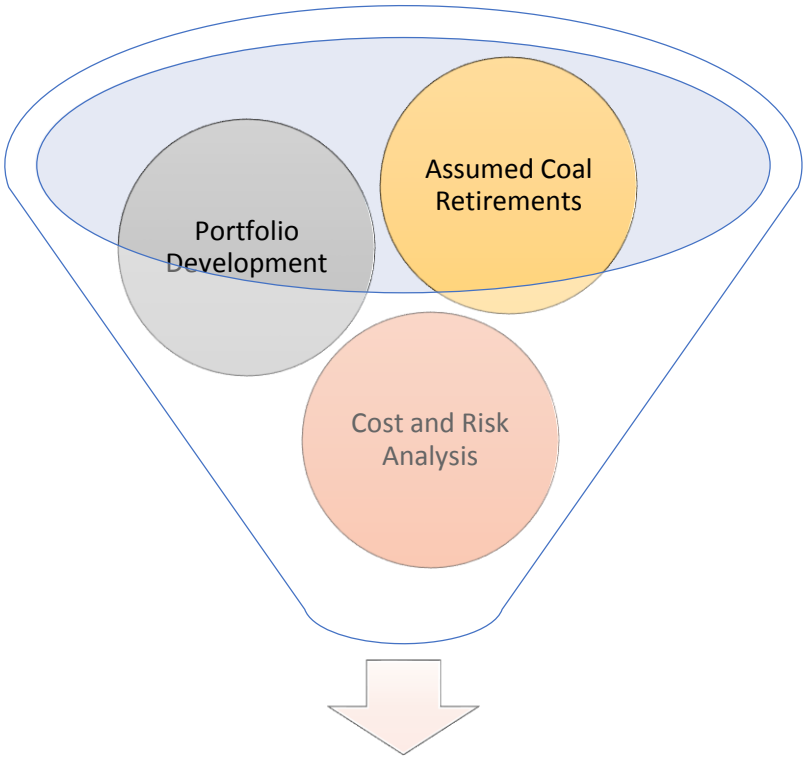
Economic Coal Unit Retirement Analysis Process



- Updated unit-by-unit analysis will reflect 2019 IRP planning assumptions, consider impacts on system reliability, and be evaluated using the Planning and Risk model (PaR).
- PacifiCorp will assess alternative retirement dates for the least economic units (2022, 2025, 2028, and 2031).
- Stacked analysis will be performed on the least economic units, assuming retirement dates that are consistent those identified from the alternative retirement date studies.
- Potential economic retirements, informed by the analysis described above, will be further evaluated in the 2019 IRP portfolio development process.
- Portfolios will be developed using the System Optimizer model with base case price-policy assumptions, and cost-and-risk analysis will be performed using PaR under three different price-policy scenarios.
- ≥ 30 System Optimizer runs and ≥ 90 PaR runs

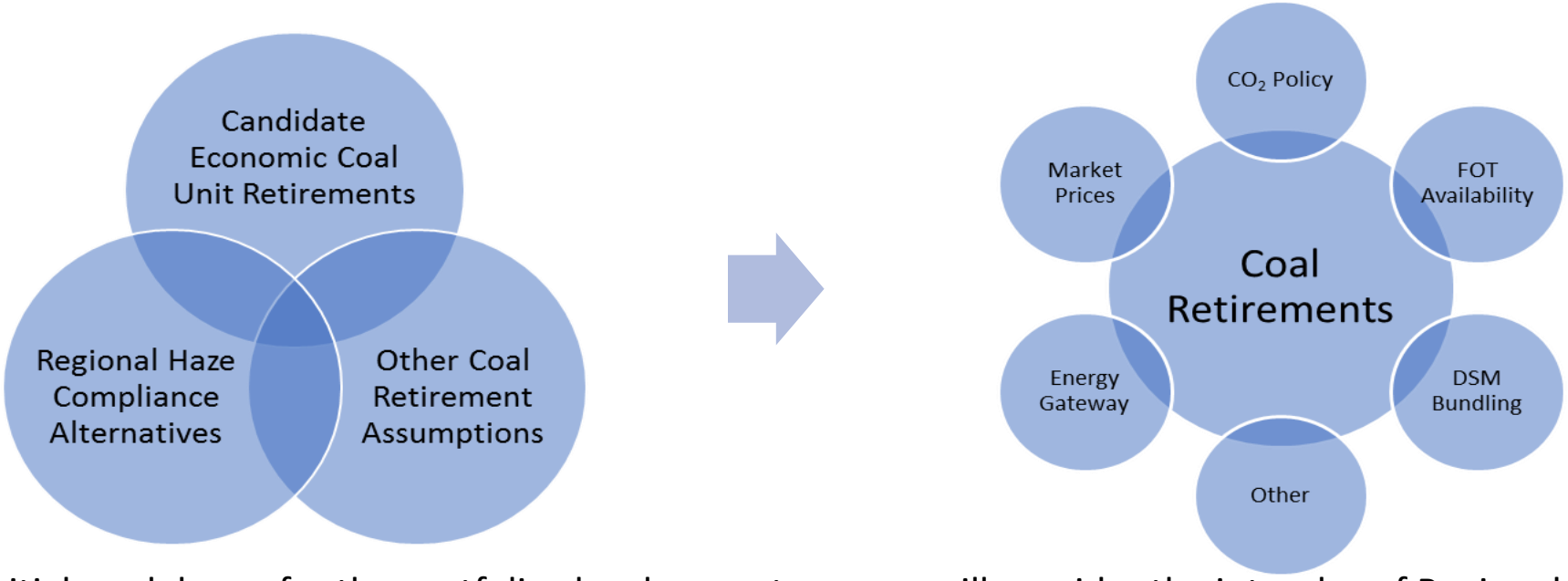
Portfolio Development from 30,000 Feet



Least-Cost, Least-Risk Preferred Portfolio

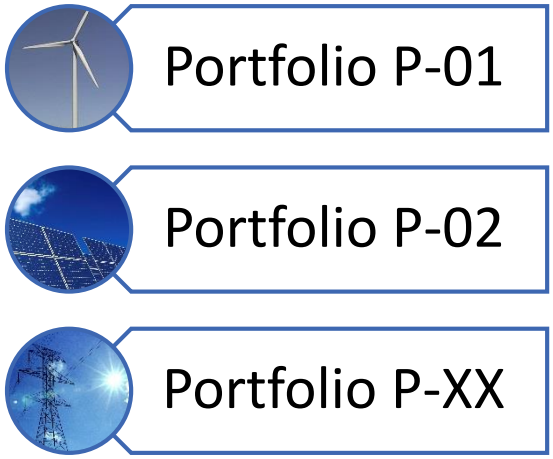
- Assumed Coal Retirements
  - Economic retirements
  - Regional haze compliance
  - Near-term decisions
  - Commission-ordered studies
- Portfolio Development
  - CO_2 policy
  - Market pricing
  - FOT availability
  - Energy Gateway
  - DSM bundling
  - Other (i.e., state RPS)
- Cost and Risk Analysis
  - Stochastic mean
  - Upper tail risk
  - Reliability
  - Emissions
  - Resource diversity
  - Other
- ≥ 62 System Optimizer runs and ≥ 186 PaR runs

Portfolio-Development Process



- Initial model runs for the portfolio-development process will consider the interplay of Regional Haze compliance alternatives with potential economic coal unit retirements while evaluating near-term coal unit decisions (*i.e.*, Naughton 3, Jim Bridger 1 and 2), updating analysis from the 2017 IRP (*i.e.*, Cholla 4), and incorporating commission-ordered analysis (*i.e.*, Colstrip 3 and 4).
- Additional portfolio will be developed, using coal retirement assumptions that can meet compliance obligations and that minimize system costs, using alternative assumptions for other system variables (*i.e.*, CO_2 policies, market prices, FOT availability, Energy Gateway, and DSM).
- Once initial model results are available, additional portfolios may be developed.
- Cost-and-risk analysis will be performed using PaR under three different price-policy scenarios.
- ≥ 23 System Optimizer runs and ≥ 69 PaR runs

Preferred Portfolio Selection Process



- Multiple cost and risk metrics are used to rank resource portfolios across three different price-policy scenarios.
- The Washington Utilities and Transportation Commission (WUTC) 2017 IRP acknowledgement letter requires PacifiCorp to consider the monetary cost of climate change in the preferred portfolio and suggests using the Interagency Working Group on Social Cost of Greenhouse Gases with a three percent discount rate.
- PacifiCorp will meet this requirement by evaluating cost and risk metrics, reflecting the social cost of carbon price assumption, as applied to top-performing portfolios, including the portfolio developed assuming application of the social cost of carbon price.
- The resulting portfolio rankings for the various cost and risk metrics will inform PacifiCorp's selection of the preferred portfolio in the 2019 IRP.

Discussion Items

- *Detailed description of the base case*.
  - Unit-by-unit studies will be compared to a benchmark case that is similar to the benchmark case used in the initial June 2018 analysis—it is assumed that Jim Bridger 1 and 2 will require installation of SCRs if it is assumed to continue operating through 2037.
  - The benchmark case provides a common baseline against which potential early economic retirements can be evaluated in isolation of Regional Haze compliance alternatives.
  - Results from the coal study will be used to develop additional retirement scenarios that consider Regional Haze compliance alternatives in the subsequent portfolio development process in the 2019 IRP.

- *Explanation of how each retirement case differs from the base case.*
  - Unit-by-unit studies will initially include an assumed early retirement, one unit at a time, at the end of 2022.
  - If the unit-by-unit results show benefits from early retirement, those with the most benefits will be analyzed assuming different retirement dates (2025, 2028, and 2031).
  - Results from these studies will be used to identify specific units and specific retirement years in a stacked retirement analysis.

Discussion Items
(Continued)

- *Explanation of which retirement cases that can be realistically implemented*.
  - PacifiCorp is not currently aware of specific impediments that would prevent any of the proposed retirement cases from being implemented.
  - Should near-term early retirements be included as an element of the 2019 IRP preferred portfolio, PacifiCorp will develop an implementation plan to address specific community, employee, commercial, transmission, and resource procurement requirements.

- *How units will be stacked to consider more than one retirement at a time.*
  - Please refer to the second discussion item on the previous slide.

- *Selection of retirement years.*
  - Please refer to the second discussion item on the previous slide.

Discussion Items
(Continued)

- *Regional Haze requirements and assumptions.*
  - Please refer to discussion items on the previous slides.

- *How transmission has been and will be considered moving forward*.
  - Previous IRP studies have considered high-level estimates for transmission reinforcement costs for specific retirement scenarios and high-level estimates transmission-upgrade costs specific to new proxy resources in each portfolio.
  - The updated coal-unit analysis will continue to consider high-level estimates for transmission reinforcement costs and capture transmission upgrades associated with proxy resources for each portfolio.
  - The updated coal-unit analysis will also be performed using transmission modeling enhancements that will allow the System Optimizer to assess proxy resource alternatives while considering: a) the full cost of assumed transmission upgrades; b) incremental transfer capability (as applicable); and c) the loss of network transmission rights associated with a retirement (as applicable).

Discussion Items
(Continued)

- *Assumptions affecting coal capacity factors such as must-take contracts or EIM participation.*
  - Coal capacity factors are an outcome, driven by wholesale market prices and variable dispatch costs, not an input assumption—capacity factors will vary by price-policy scenario.
  - Must-take contracts or EIM participation will not impact modeled coal unit dispatch, and consequently, will not affect coal unit capacity factors.

- *How flexibility benefits and alternatives are accounted for and quantified*.
  - PacifiCorp is finalizing estimates for intra-hour flexible resource credits, which are calculated from EIM data, applicable to a broad range of resource types (coal, baseload gas, peaking gas, storage, renewables, etc.).
  - In response to stakeholder feedback, PacifiCorp does not intend to apply these as inputs to the coal study modeling, which could affect resource selections.
  - PacifiCorp will apply these credits to the resulting portfolios as an out-of-model adjustment that will be reported separately.

Discussion Items
(Continued)

- *How ancillary services are valued.*
  - PacifiCorp's updated analysis will include model runs using Planning and Risk (PaR), which will be configured with operating reserve requirements that must be met with the resource portfolio developed using System Optimizer.
  - For any of the high priority coal units (units showing the largest potential benefit from early closure), PacifiCorp will further evaluate hourly modeled output to evaluate how existing and proxy resources are being used to meet load and reliability metrics.
  - If reliability metrics are not being met, the resource portfolio could be modified with resources that alleviate the reliability shortfall.

- *How decommissioning costs are included in the analysis*.
  - The analysis includes projected decommissioning costs, adjusted for inflation, in the year a retirement is assumed.
  - Present-value results will reflect the time-value of money differential associated with decommissioning between two model runs (one with and one without early closure assumptions).

Discussion Items
(Continued)

- *How the format of reported results will address stakeholder requests for itemization of costs and benefits.*
  - Results will be presented both summary and detailed forms, which will include changes to itemized system costs (fuel, run-rate operating costs, new resource costs, emissions costs, etc.).
  - Additional details will be made available through work papers.
  - Illustrative examples are provided in Appendix A to this document.

- *How the improved analysis will meet the Commission objectives of better integrating evolving coal-unit economics into the long-term planning process*.
  - Please refer to introductory slides discussed earlier in this presentation.

Appendix A
Illustrative Figures and Tables

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Illustrative Unit-by-Unit Summary Results

Study	PVRR ($m)	PVRR(d) (Benefit)/Cost of 2022 Early Retirement ($m)	Levelized Net (Benefit)/Cost of 2022 Early Retirement per MWh of Coal Generation Removed
Benchmark	$X	n/a	n/a
Unit 1	$Y	$Y - $X	+/- $A/MWh
…	…	…	…
Unit 22	$Z	$Z - $X	+/- $V/MWh

- Each of the tables above will be replicated among three price-policy scenario assumptions applied in PaR (i.e., base gas with base CO_2, high gas with high CO_2, and low gas with no CO_2).
- Each will be presented with and without the out-of-model application of intra-hour flexible resource credits.
- Units with the most negative levelized net benefit will be further evaluated using an hourly PaR deterministic run, which will be used to assess any potential reliability concerns.

Illustrative Alternative Year Summary Results

Excluding Intra-Hour Flexible Resource Credit	PVRR ($m)	PVRR(d) (Benefit)/Cost of 2022 Early Retirement ($m)	Levelized (Benefit)/Cost of 2022 Early Retirement per MWh of Coal Generation Removed
Benchmark	$X	n/a	n/a
Unit 1 (2022)	$Y	$Y - $X	+/- $A/MWh
Unit 1 (2025)	$Y’	$Y’ - $X	+/- $A’/MWh
Unit 1 (2028)	$Y’’	$Y’’ - $X	+/- $A’’/MWh
Unit 1 (2031)	$Y’’’	$Y’’’ - $X	+/- $A’’’/MWh
Unit 22 (2022)	$Z	$Z - $X	+/- $V/MWh
Unit 22 (2025)	$Z’	$Z’ - $X	+/- $V’/MWh
Unit 22 (2028)	$Z’’	$Z’’ - $X	+/- $V’’/MWh
Unit 22 (2031)	$Z’’’	$Z’’’ - $X	+/- $V’’’/MWh

- Results from the alternative-year analysis will be used to inform the stacked retirement analysis and be prepared for three price-policy scenarios both with and without the out-of-model application of intra-hour flexible resource credits.
- PVRR(d) results and levelized net (benefits) or costs will be calculated in the same way as in the unit-by-unit studies.

Illustrative Stacked Analysis Summary Results

Excluding Intra-Hour Flexible Resource Credit	PVRR ($m)	PVRR(d) (Benefit)/Cost of 2022 Early Retirement ($m)	Levelized (Benefit)/Cost of 2022 Early Retirement per MWh of Coal Generation Removed
Benchmark	$X	n/a	n/a
Unit 1 (20XX) & Unit 22 (20XX)	$YY	$YY - $X	+/- $AA/MWh
…	…	…	…

- Results from the alternative-year analysis will be used to inform the stacked retirement analysis and be prepared for three price-policy scenarios both with and without the out-of-model application of intra-hour flexible resource credits.
- Multiple unit retirements may be assumed to retire in different years.
- The number of units assumed to retire early will continue (from two units to three units, etc.) until the economics from the stacked analysis reverse sign and show a net cost instead of a net benefit.

Illustrative Results with Line-Item Detail

Specific Unit or Units	PVRR(d) (Benefit)/Cost of Early Retirement ($m)	Levelized (Benefit)/Cost Early Retirement per MWh of Coal Generation Removed
Change in Retired Coal Non-Fuel Operating Costs	($A)	($A/MWh)
Change in Coal Unit Fuel Costs	($B)	($B/MWh)
Change in Coal Unit Emissions Cost	($C)	($C/MWh)
Change in Coal Unit Decommissioning Cost	($D)	($D/MWh)
Change in Proxy Generating Resource Non-Fuel Operating Costs	+/- $A'	+/- $A'/MWh
Change in Proxy Generating Resource Fuel Costs	+/- $B'	+/- $B'/MWh
Change in DSM Costs	+/- $C'	+/- $C'/MWh
Change in Other System Emissions Costs	+/- $D'	+/- $D'/MWh
Change in System Balancing Costs	+/- $E'	+/- $E'/MWh
Change in Transmission Cost	$F'	$F'/MWh

- Line-tem results will be presented for the most economic retirement scenarios, as applicable, for three price-policy scenarios with the out-of-model application of intra-hour flexible resource credits reported separately.
- Line-item results can also be shown graphically by year, similar to what was reported in the June 2018 analysis.
- The levelized results above can also be grouped to show the $/MWh cost savings associated with the retired coal unit relative to the $/MWh cost increase associated with the portfolio of replacement resources and the overall impact these replacement resources have on system operations (i.e., market sales and purchases).