

August 14, 2018

VIA ELECTRONIC FILING

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

Attn: Filing Center

RE: LC 70—PacifiCorp's Coal Analysis

To facilitate the workshop and process outlined by the Public Utility Commission of Oregon (Commission) in its Notice of Commission Workshop issued August 7, 2018, PacifiCorp d/b/a Pacific Power provides the enclosed information, which was originally provided on June 29, 2018, in docket LC 67, in compliance with Order No. 18-138. PacifiCorp clarifies that it is not seeking Commission acknowledgment or approval of the coal analysis nor is it making any resource decisions based on this analysis.

PacifiCorp looks forward to additional engagement with stakeholders during the Commission workshop and throughout the 2019 Integrated Resource Plan public input process.

Please direct any questions on this filing to Natasha Siores, Manager, Regulatory Affairs, 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 **Coal Analysis** on the parties listed below via electronic mail and/or overnight delivery in compliance with OAR 860-001-0180.

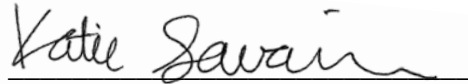
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ALLIANCE OF WESTERN ENERGY CONSUMERS	
TYLER C PEPPLER (C) DAVISON VAN CLEVE 1750 SW HARBOR WAY STE 450 PORTLAND, OR 97204 tcp@dvclaw.com	BRADLEY MULLINS (C) MOUNTAIN WEST ANALYTICS 1750 SW HARBOR WAY STE 450 PORTLAND, OR 97201 brmullins@mwanalytics.com
PATRICK J OSHIE (C) DAVISON VAN CLEVE PC 507 BALLARD RD. ZILLAH WA 98953 pjo@dvclaw.com	
NATIONAL GRID	
NATHAN SANDVIG NATIONAL GRID USA 205 SE SPOKANE ST, STE 300 PORTLAND OR 97202 nathan.sandvig@nationalgrid.com	MONICA SCHWEBS MORGAN, LEWIS & BOCKIUS LLP ONE MARKET SPEAR STREET TOWER SAN FRANCISCO CA 94105 monica.schwebs@morganlewis.com
JACK STODDARD MORGAN LEWIS & BOCKIUS ONE MARKET SPEAR STREET TOWER SAN FRANCISCO CA 94105 fjackson.stoddard@morganlewis.com	
NW ENERGY COALITION	
WENDY GERLITZ (C) NW ENERGY COALITION 1205 SE FLAVEL PORTLAND, OR 97202 wendy@nwenergy.org	FRED HEUTTE (C) NW ENERGY COALITION PO BOX 40308 PORTLAND, OR 97240-0308 fred@nwenergy.org
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	
OREGON DEPARTMENT OF ENERGY	
PATRICK ROWE (C) OREGON DEPARTMENT OF ENERGY 1162 COURT ST NE SALEM OR 97301 patrick.g.rowe@doj.state.or.us	JASON SIERMAN (C) OREGON DEPARTMENT OF ENERGY 625 MARION ST NE SALEM OR 97301 jason.sierman@state.or.us
WENDY SIMONS (C) OREGON DEPARTMENT OF ENERGY 550 CAPITOL ST NE 1ST FL SALEM OR 97301 wendy.simons@oregon.gov	
PACIFICORP	
ETTA LOCKEY (C) PACIFIC POWER 825 NE MULTNOMAH ST., STE 2000 PORTLAND, OR 97232 etta.lockey@pacificcorp.com	MATTHEW MCVEE (C) PACIFIC POWER 825 NE MULTNOMAH STE 1800 PORTLAND, OR 97232 matthew.mcvee@pacificcorp.com
PACIFICORP, DBA PACIFIC POWER 825 NE MULTNOMAH ST, STE 2000 PORTLAND, OR 97232 oregondockets@pacificcorp.com	
PORTLAND GENERAL ELECTRIC	
ERIN APPERSON PORTLAND GENERAL ELECTRIC 121 SW SALMON ST - 1WTC1711 PORTLAND OR 97204 erin.apperson@pgn.com	ELAINE HART PORTLAND GENERAL ELECTRIC 121 SW SALMON ST - 1WTC1711 PORTLAND OR 97204 elaine.hart@pgn.com
JAY TINKER PORTLAND GENERAL ELECTRIC 121 SW SALMON ST 1WTC-0306 PORTLAND OR 97204 pge.opuc.filings@pgn.com	
RENEWABLE NW	
SILVIA TANNER (C) RENEWABLE NORTHWEST 421 SW 6TH AVE, STE 975 PORTLAND, OR 97204 silvia@renewablenw.org	MICHAEL O'BRIEN (C) RENEWABLE NORTHWEST 421 SW 6TH AVENUE STE. 975 PORTLAND, OR 97204 michael@renewablenw.org

RENEWABLE NORTHWEST 421 SW 6TH AVE., STE. 975 PORTLAND, OR 97204 dockets@renewablenw.org	
SIERRA CLUB	
ANA BOYD (C) SIERRA CLUB 2101 WEBSTER ST STE 1300 OAKLAND, CA 94612 ana.boyd@sierraclub.org	GLORIA D SMITH (C) SIERRA CLUB LAW PROGRAM 2101 WEBSTER ST STE 1300 OAKLAND, CA 94612 gloria.smith@sierraclub.org
STAFF	
CAROLINE MOORE (C) PUBLIC UTILITY COMMISSION OF OREGON PO BOX 1088 SALEM, OR 97308-1088 caroline.f.moore@state.or.us	JOHANNA RIEMENSCHNEIDER (C) PUC STAFF - DEPARTMENT OF JUSTICE 1162 COURT ST NE SALEM, OR 97301-4796 johanna.riemenschneider@doj.state.or.us

Dated August 14, 2018.



Katie Savarin
Coordinator, Regulatory Operations

PacifiCorp June 29, 2018 Compliance Filing

Docket No. LC 67

Coal Analysis

June 29, 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 67—PacifiCorp's Compliance Filing

PacifiCorp d/b/a Pacific Power provides the enclosed information in compliance with Order No. 18-138.

On April 27, 2018, the Public Utility Commission of Oregon (Commission) issued Order No. 18-138 in docket LC 67 (Order), PacifiCorp's 2017 Integrated Resource Plan (IRP). As part of the Order, the Commission directed PacifiCorp to "perform 25 system optimizer (SO) runs, one for each coal unit and a base case" and provide the results to the parties in LC 67 by June 30, 2018.¹ Consistent with that directive, PacifiCorp is filing its unit-by-unit coal analysis (Coal Analysis). PacifiCorp performed 23 system optimizer runs that included a reference case and a run for each coal unit that does not have a retirement date earlier than December 31, 2022 in the reference case; Naughton Unit 3 and Cholla Unit 4 have earlier retirement date assumptions of January 30, 2019 and December 31, 2020 in the reference case and were not included in the Coal Analysis. PacifiCorp also presented this analysis to stakeholders at a confidential session of its June 28, 2018 2019 IRP public input meeting, including parties in both docket LC 67 and docket LC 70.

Per the Order, PacifiCorp addressed the three required components of the Coal Analysis. The first two items, a table of the difference in present-value revenue requirement resulting from early retirement of each unit, and a list of coal units that would free up transmission along the path from the proposed Wyoming wind projects if retired, are addressed in the confidential presentation included in this filing. The third item, an itemized list of coal unit retirement cost assumptions used in each SO run, can be found in the confidential workpapers for each unit.

As explained in PacifiCorp's comments in LC 67,² PacifiCorp cautions that the results of this Coal Analysis do not provide a complete, portfolio-level view of the economics of PacifiCorp's coal portfolio. The simplistic nature of the Coal Analysis provides limited insight into a least-cost, least-risk resource portfolio but can inform further work with stakeholders in the 2019 IRP process with regard to PacifiCorp's economic modeling of its coal fleet.

¹ *In the Matter of PacifiCorp d/b/a Pacific Power, 2017 Integrated Resource Plan*, Docket No. LC 67, Order No. 18-138 at 12 (Apr. 27, 2018).


² See PacifiCorp's letter filed June 25, 2018, in docket LC 67.

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PacifiCorp looks forward to additional engagement with stakeholders during the 2019 IRP public input process.

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

Sincerely,



Etta Lockey
Vice President, Regulation

Enclosures

PacifiCorp

Unit-by-Unit Coal Studies Presentation

2019 IRP Public Input Meeting
June 28, 2018



Unit-by-Unit Coal Studies

Confidential Workshop

2019 IRP Public Input Meeting - June 28, 2018



CONFIDENTIAL—SUBJECT TO PROTECTIVE ORDER OR NON-DISCLOSURE AGREEMENT/EXEMPT FROM PUBLIC DISCLOSURE

Note, the enclosed materials include information that is designated as confidential and is subject to confidentiality protection, including but not limited to:

- Business Confidential under Utah Code Ann. § 63G-2-305(2)(a)(b) and under Wyo. Stat. § 16-4-202, et. al. The information is also exempt from disclosure pursuant to Idaho Code §§ 9-340d and 74-107, et. al.
- Confidential under California Public Utilities Commission General Order 66-D as described in the declaration provided to the Office of Ratepayer Advocates.
- 1 • Confidential under Oregon Administrative Rule 860-001-0070.
- Confidential under Washington Administrative Code 480-07-160.

OPUC Coal Study Requirement

- In its 2017 IRP acknowledgement order (Order No. 18-138), the Public Utility Commission of Oregon (OPUC) established requirements for additional coal-unit analysis, to be provided by June 30, 2018, as set forth below.
 - PacifiCorp agrees to perform 25 System Optimizer (SO) model runs, one for each coal unit and a base case.
 - PacifiCorp agrees to summarize results and provide:
 - a table of the difference in present-value revenue requirement (PVRR) resulting from the early retirement of each unit;
 - an itemized list of coal unit retirement cost assumptions used in each SO model run; and
 - a list of coal units that would free up transmission along the path from the proposed Wyoming wind projects if retired.
- These requirements are consistent with OPUC staff data request 65, which was submitted to PacifiCorp during the 2017 IRP acknowledgement proceeding.
 - This data request specified that PacifiCorp should assume a December 2022 retirement date for each early-retirement run.
 - The data request also specified that PacifiCorp should assume Reference Case Regional Haze assumptions (from the 2017 IRP) that are modified to exclude incremental selective catalytic reduction costs for Jim Bridger, Hunter, and Huntington in the base case.
 - In agreeing to perform this analysis, PacifiCorp explained that:
 - the studies will not provide a complete, portfolio-level view of the economics of the company's coal portfolio;
 - the structure of the analysis requested by staff would not capture the system-cost impact that would result from retiring more than one facility; and
 - results from these studies would therefore provide limited insight into a least-cost, least-risk resource portfolio.
- Recognizing PacifiCorp's concerns outlined above, the Utah Public Service Commission in its 2017 IRP acknowledgment order in Docket No. 17-035-16 states "we find that additional analysis will be helpful only if it supplements, rather than replaces, the type of coal plant modeling PacifiCorp utilized for its 2017 IRP."

System Optimizer



- The System Optimizer (SO) model develops resource portfolios with sufficient capacity to achieve a target planning-reserve margin (currently set at 13-percent).
- The SO model is configured to select from a broad range of resource alternatives (*i.e.*, front-office transactions or “FOTs”, demand-side management, direct-load control, gas-fired generation, renewable generation, storage, etc.) that minimize present-value revenue requirement (PVRR).
- The SO model performs time-of-day, least-cost dispatch of existing and prospective resource alternatives for a defined set of system conditions (*i.e.*, resource attributes, transmission, load, market prices, environmental policies, etc.).
- The SO model does not consider in its dispatch:
 - unit-commitment logic, which captures unit-specific operational limitations;
 - operating reserve obligations (spin, non-spin, regulating);
 - granular representation of intra-day system conditions; and
 - volatility and uncertainty in key system parameters (*i.e.*, load, market prices, hydro generation, thermal-unit outages)
- The items identified above can be better assessed using the Planning and Risk model (PaR).
- PaR, configured with resource portfolios established by the SO model, is traditionally used in the IRP to evaluate the relative cost and risk among different resource portfolios under different system conditions.

Methodology



Step	Measure	Description
A	2017-2036 System PVRR (x1)	<p>Base Case (One SO Model Run)</p> <ul style="list-style-type: none"> 2017 IRP Update with following modifications <ul style="list-style-type: none"> Removal of 161 MW Uinta Wind Project (2021-2036) 2017 IRP Reference Case Regional Haze assumptions March 2018 official forward price curve with medium CO₂ price inputs Results are calculated with and without incremental selective catalytic reduction costs for Jim Bridger 1 and 2
B	2017-2036 System PVRR (x22)	<p>Retirement Cases (22 SO Model Runs)</p> <ul style="list-style-type: none"> 2017 IRP Update with following modifications <ul style="list-style-type: none"> Removal of 161 MW Uinta Wind Project (2021-2036) 2017 IRP Reference Case Regional Haze assumptions March 2018 official forward price curve with medium CO₂ price inputs No incremental selective catalytic reduction costs Each run assumes the retirement of a single coal unit at the end of 2022
C	2017-2036 System PVRR(d) (x22)	<p>Present-Value Revenue Requirement Differential (PVRR(d))</p> <ul style="list-style-type: none"> Change in system PVRR between the Base Case (A) and each of 22 Retirement Cases (B)

- High-level estimates of transmission reinforcement costs are applied as an adder to the results from step C.
- Each SO model run reflects unique coal-unit operating cost assumptions consistent with assumed retirement dates (*i.e.*, fuel cost, run-rate operating costs, decommissioning costs).
- PacifiCorp did not perform SO model runs in step B for Naughton Unit 3 and Cholla Unit 4, which are already assumed to retire before 2022.

PVRR(d) Results



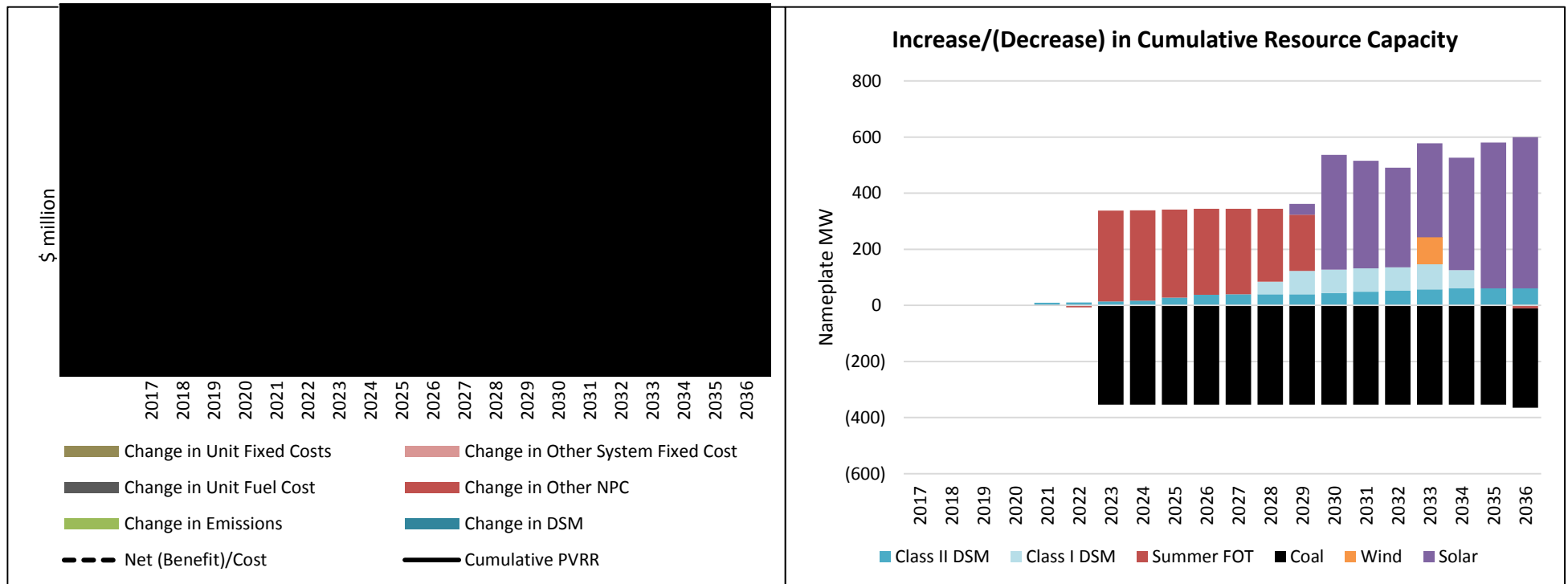
Coal Unit	PacifiCorp Share (MW)	PacifiCorp Percentage Share	State	Reg. Haze Ref. Case Retirement Year	PVRR(d) (Benefit)/Cost of 2022 Retirement (\$ million)
Colstrip 3	74	10%	MT	2046	
Colstrip 4	74	10%	MT	2046	
Craig 1	82	19%	CO	2025	
Craig 2	83	19%	CO	2034	
Dave Johnston 1	106	100%	WY	2027	
Dave Johnston 2	106	100%	WY	2027	
Dave Johnston 3	220	100%	WY	2027	
Dave Johnston 4	330	100%	WY	2027	
Hayden 1	44	24%	CO	2030	
Hayden 2	33	13%	CO	2030	
Hunter 1	418	94%	UT	2042	
Hunter 2	269	60%	UT	2042	
Hunter 3	471	100%	UT	2042	
Huntington 1	459	100%	UT	2036	
Huntington 2	450	100%	UT	2036	
Jim Bridger 1	354	67%	WY	2037	
Jim Bridger 2	359	67%	WY	2037	
Jim Bridger 3	349	67%	WY	2037	
Jim Bridger 4	353	67%	WY	2037	
Naughton 1	156	100%	WY	2029	
Naughton 2	201	100%	WY	2029	
Wyodak	268	80%	WY	2039	

The results for Jim Bridger 1 and 2 reflect SCR costs in the base case. Excluding these costs as specified in OPUC staff data request 65 would show a [REDACTED] for an assumed 2022 retirement of Jim Bridger 1 and a [REDACTED] for an assumed 2022 retirement of Jim Bridger 2. Results for Colstrip do not reflect unquantified equipment removal costs that would be applicable to the assumed 2022 retirement date.

Coal Unit Retirement Assumptions

- Coal unit retirement cost assumptions are included with the confidential work papers supporting the modeling results summarized on the previous slide.
 - Run-rate cost-and-performance assumptions for each coal unit specific to each SO model run.
 - SO model results summarizing changes in the resource portfolio and annual system costs by year.
- Confidential work papers will be provided to interested stakeholders who either sign a non-disclosure agreement or under applicable confidentiality rules in jurisdictions where a docket has been opened.

Example of Data in Confidential Work Papers (Jim Bridger 1)



- Replacement resources (positive values in chart at top right) is initially comprised of incremental FOTs and DSM. In the 2029-2030 time frame, additional solar resources are added. Wind capacity is accelerated by one year (from 2034 to 2033) and Class 1 DSM direct-load control capacity is accelerated by seven years (from 2035 to 2028).
- System costs are presented without SCR costs in the base case.
 - Reduced system costs (negative values in the chart at top left) reflect reduced run-rate operating costs and fuel costs from Jim Bridger 1 beginning 2023 and reduced emissions costs beginning 2030 (when CO₂ prices are first assumed).
 - Increased system costs (positive values in the chart at top left) reflect increased net-power costs, increased system-fixed costs (fixed costs for new replacement resources and decommissioning costs), and increased DSM costs consistent with increased DSM in the resource portfolio.
 - The dashed black line is the net of the annual increase and decrease in costs (net of the bars in the chart), and the solid black line represents the cumulative PVRR(d) (the ending value in 2036 aligns with the results summarized in the PVRR(d) results table presented earlier).

Coal Units in Constrained Area of Wyoming



Coal Unit	PacifiCorp Share (MW)
Wyodak	268
Dave Johnston 1	106
Dave Johnston 2	106
Dave Johnston 3	220
Dave Johnston 4	330
Total	1,030

- Resource capacity in the constrained area of PacifiCorp's transmission system in eastern Wyoming exceeds transfer capability without the proposed new wind and transmission without incremental coal unit retirements.
- The proposed new wind capacity in eastern Wyoming totals 1,150 MW and the Aeolus-to-Bridger/Anticline transmission line is expected to add approximately 950 MW of incremental transfer capability—resource capacity will continue to exceed transfer capability without any incremental early retirements.
- With the retirement of any single unit listed above, resource capacity would continue to exceed transfer capability.
- Generally the retirement of one unit anywhere in the PacifiCorp system does not result in a major impact to system reliability.
- As additional units are retired, the risk of impacts to system reliability increases and more in-depth studies will be necessary to determine possible transmission mitigation, which would be completed in the transmission service request and generator interconnection request queues at the time a definitive retirement decision is made.
- These studies may show a need for additional system support with new generation that can provide rotational inertia, or other devices to provide required system support.
- It is important to note that coal units provide rotational inertia that enables frequency control and power system stability, which can influence the amount of transfer capability that can be freed up upon retirement of a generating unit.

Conclusions and Next Steps



- Relative to the Reference Case from the 2017 IRP, the SO model reports lower system costs with an assumed 2022 early retirement date for [REDACTED]
- Caution! The studies do not capture the impact on system costs if coal unit retirements are stacked—PVRR(d) results for each unit are not additive and system impacts are not linear.
 - Before accounting for operational impacts that are not captured by the SO model, an assumed retirement of Jim Bridger 1 and Jim Bridger 2 in 2022 [REDACTED] (driven by costs shifts to Jim Bridger 3 and Jim Bridger 4 and accelerated need for new generating capacity).
- The studies do not capture the operational and other system-reliability impacts associated with:
 - meeting balancing area reserve requirements;
 - meeting balancing area frequency response requirements;
 - reduced flexibility between balancing areas (*i.e.*, Jim Bridger provides energy and other reliability services in both the east and west balancing areas); and
 - reduced ability to participate in the energy-imbalance market due to a reduction in flexible generation and inability to pass the flex ramp sufficiency test.
- The studies do not capture system planning assumptions being updated for the 2019 IRP (*i.e.*, load forecasts, recent resource additions, planning-reserve margins, capacity-contribution values, conservation-potential assessment, supply-side resources, *etc.*)
- The studies do not analyze scenario-risk and stochastic-risk analysis.
- PacifiCorp will use these results to prioritize additional early retirement analysis for the 2019 IRP—no specific resource decisions are being made at this time.
 - PacifiCorp will incorporate 2019 IRP assumption updates as available and expand the analyses for evaluation using PaR.
 - PacifiCorp will develop “stacked” early retirement scenarios using the SO model and PaR and supplement these results with operational and system-reliability assessments.
 - Updates will be provided to stakeholders during the 2019 IRP public-input process as results become available.

CERTIFICATE OF SERVICE

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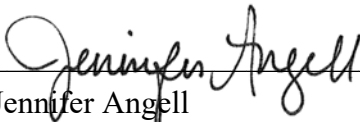
Service List LC 67

ALLIANCE OF WESTERN ENERGY CONSUMERS	
TYLER C PEPPE (C) DAVISON VAN CLEVE 1750 SW HARBOR WAY STE 450 PORTLAND, OR 97204 tcp@dvclaw.com	BRADLEY MULLINS (C) MOUNTAIN WEST ANALYTICS 1750 SW HARBOR WAY STE 450 PORTLAND, OR 97201 brmullins@mwanalytics.com
COALTION LC 67	
NANCY ESTEB PO BOX 490 CARLSBORG, WA 98324 esteb44@centurylink.net	JOHN LOWE RENEWABLE ENERGY COALITION 12050 SW TREMONT ST PORTLAND, OR 97225-5430 jravenesanmarcos@yahoo.com
IRION A SANGER (C) SANGER LAW PC 1117 SE 53RD AVE PORTLAND OR 97215 irion@sanger-law.com	
NATIONAL GRID	
NATHAN SANDVIG NATIONAL GRID USA 205 SE SPOKANE ST, STE 300 PORTLAND, OR 97202 nathan.sandvig@nationalgrid.com	JACK STODDARD MORGAN LEWIS & BOCKIUS ONE MARKET SPEAR STREET TOWER SAN FRANCISCO CA 94105 fjackson.stoddard@morganlewis.com
NIPPC LC 67	
ROBERT D KAHN NORTHWEST & INTERMOUNTAIN POWER PRODUCERS COALITION PO BOX 504 MERCER ISLAND, WA 98040 rkahn@nippc.org	STEVE KNUDSEN (C) NIPPC 2015 SE SALMON ST PORTLAND OR 97214 sknudsen@nippc.org
SIDNEY VILLANUEVA (C) SANGER LAW, PC 1117 SE 53RD AVE PORTLAND, OR 97215 sidney@sanger-law.com	

NW ENERGY COALITION	
WENDY GERLITZ (C) NW ENERGY COALITION 1205 SE FLAVEL PORTLAND, OR 97202 wendy@nwenergy.org	FRED HEUTTE (C) NW ENERGY COALITION PO BOX 40308 PORTLAND, OR 97240-0308 fred@nwenergy.org
ODOE LC 67	
ADAM SCHULTZ (C) OREGON DEPARTMENT OF ENERGY 550 CAPITOL ST NE SALEM, OR 97301 diane.broad@state.or.us	JESSE D. RATCLIFFE (C) OREGON DEPARTMENT OF ENERGY 1162 COURT ST NE SALEM, OR 97301-4096 jesse.d.ratcliffe@doj.state.or.us
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ROBERT JENKS (C) OREGON CITIZENS' UTILITY BOARD 610 SW BROADWAY STE 400 PORTLAND, OR 97205 bob@oregoncub.org	
PACIFICORP LC 67	
PACIFICORP, DBA PACIFIC POWER 825 NE MULTNOMAH ST, STE 2000 PORTLAND, OR 97232 oregondockets@pacificorp.com	MATTHEW MCVEE PACIFIC POWER 825 NE MULTNOMAH STE 1800 PORTLAND, OR 97232 matthew.mcvee@pacificorp.com
ETTA LOCKEY (C) PACIFIC POWER 825 NE MULTNOMAH ST., STE 2000 PORTLAND, OR 97232 etta.lockey@pacificorp.com	
PGE LC 67	
FRANCO ALBI PORTLAND GENERAL ELECTRIC 121 SW SALMON ST, 1WTC0702 PORTLAND, OR 97204 franco.albi@pgn.com	PATRICK G HAGER PORTLAND GENERAL ELECTRIC 121 SW SALMON ST 1WTC0306 PORTLAND, OR 97204 pge.opuc.filings@pgn.com patrick.hager@pgn.com

V. DENISE SAUNDERS PORTLAND GENERAL ELECTRIC 121 SW SALMON ST 1WTC1301 PORTLAND, OR 97204 denise.saunders@pgn.com	
RENEWABLE NW LC 67	
RENEWABLE NORTHWEST 421 SW 6TH AVE., STE. 975 PORTLAND, OR 97204 dockets@renewablenw.org	MICHAEL O'BRIEN (C) RENEWABLE NORTHWEST 421 SW 6TH AVENUE STE. 975 PORTLAND, OR 97204 michael@renewablenw.org
SILVIA TANNER (C) RENEWABLE NORTHWEST 421 SW 6TH AVE, STE 975 PORTLAND, OR 97204 silvia@renewablenw.org	
ROBERT J. PROCTER	
BOB PROCTER PROCTOR ECONOMICS proctereconomics@gmail.com	
SIERRA CLUB	
ANA BOYD (C) SIERRA CLUB 2101 WEBSTER ST STE 1300 OAKLAND, CA 94612 ana.boyd@sierraclub.org	CESIA KEARNS SIERRA CLUB 1821 SE ANKENY ST PORTLAND OR 97214 cesia.kearns@sierraclub.org
GLORIA D SMITH (C) SIERRA CLUB LAW PROGRAM 2101 WEBSTER ST STE 1300 OAKLAND, CA 94612 gloria.smith@sierraclub.org	
STAFF LC 67	
CAROLINE MOORE (C) PUBLIC UTILITY COMMISSION OF OREGON PO BOX 1088 SALEM, OR 97308-1088 caroline.f.moore@state.or.us	SOMMER MOSER (C) PUC STAFF - DEPARTMENT OF JUSTICE 1162 COURT ST NE SALEM, OR 97301 sommer.moser@doj.state.or.us

Dated June 29, 2018.


Jennifer Angell
Supervisor, Regulatory Operations

CERTIFICATE OF SERVICE

I certify that I filed a true and correct copy of PacifiCorp's **Compliance Filing** filed in docket LC 67 on the parties listed below via electronic mail and overnight delivery in compliance with OAR 860-001-0180.

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PACIFICORP	
ETTA LOCKEY (C) PACIFIC POWER 825 NE MULTNOMAH ST., STE 2000 PORTLAND, OR 97232 etta.lockey@pacificorp.com	MATTHEW MCVEE (C) PACIFIC POWER 825 NE MULTNOMAH STE 1800 PORTLAND, OR 97232 matthew.mcvee@pacificorp.com
PACIFICORP, DBA PACIFIC POWER 825 NE MULTNOMAH ST, STE 2000 PORTLAND, OR 97232 oregondockets@pacificorp.com	
RENEWABLE NW LC 67	
SILVIA TANNER (C) RENEWABLE NORTHWEST 421 SW 6TH AVE, STE 975 PORTLAND, OR 97204 silvia@renewablenw.org	MICHAEL O'BRIEN (C) RENEWABLE NORTHWEST 421 SW 6TH AVENUE STE. 975 PORTLAND, OR 97204 michael@renewablenw.org
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SIERRA CLUB	
ANA BOYD SIERRA CLUB 2101 WEBSTER ST STE 1300 OAKLAND, CA 94612 ana.boyd@sierraclub.org	GLORIA D SMITH SIERRA CLUB LAW PROGRAM 2101 WEBSTER ST STE 1300 OAKLAND, CA 94612 gloria.smith@sierraclub.org
STAFF	
CAROLINE MOORE (C) PUBLIC UTILITY COMMISSION OF OREGON PO BOX 1088 SALEM, OR 97308-1088 caroline.f.moore@state.or.us	JOHANNA RIEMENSCHNEIDER (C) PUC STAFF - DEPARTMENT OF JUSTICE 1162 COURT ST NE SALEM, OR 97301-4796 johanna.riemenschneider@doj.state.or.us

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