PACIFIC POWER
A DIVISION OF PACIFICORP

825 NE Multnomah, Suite 2000
Portland, Oregon 97232

April 11, 2017

VIA ELECTRONIC FILING
AND COURIER DELIVERY

Steven V. King
Executive Director and Secretary
Washington Utilities and Transportation Commission
1300 S. Evergreen Park Drive SW
P.O. Box 47250
Olympia, WA 98504-7250

Re: DO NOT REDOCKET
Docket UE-160353—2017 Integrated Resource Plan Replacement Pages

On April 4, 2017, PacifiCorp d/b/a Pacific Power (Pacific Power or Company) filed its 2017 Integrated Resource Plan (2017 IRP) in the above-referenced docket. Pacific Power Pacific provides the attached replacement pages as summarized in the table below. The Company identified clarifying changes and one value correction in the 2017 IRP, Volume II – Appendices. Please note that these changes do not affect the preferred portfolio selection or outcome of the 2017 IRP. The Company has also revised the electronic version of Volume II of the 2017 IRP available online at www.pacificorp.com/irp to reflect the updated pages.

<table>
<tr><th colspan="3">PacifiCorp 2017 IRP Volume II – Appendices</th></tr>
<tr><th>Reference</th><th>Update</th><th>Page</th></tr>
<tr><td>Appendix D</td><td>Replaced Table D.2 (outreach and communication activities)</td><td>66</td></tr>
<tr><td>Appendix H</td><td>Clarified volatility formula and description</td><td>144</td></tr>
<tr><td rowspan="3">Appendix K</td><td>Corrected RE-1c PVRR in Table K.2</td><td>179</td></tr>
<tr><td>Corrected labels in Table K4 (label "FS-1c" corrected to "FS-R1c"; label "FS-2" corrected to "FS-R2")</td><td>180</td></tr>
<tr><td>Added missing portfolio FS-R2</td><td>224</td></tr>
<tr><td>Appendix L</td><td>Replaced Table L.4 (was a duplicate of Table L.1)</td><td>227</td></tr>
<tr><td rowspan="4">Appendix M</td><td>Corrected PVRR value in Quick Reference Guide for RE-1c</td><td>264</td></tr>
<tr><td>Corrected Case Fact Sheet PVRR value for RE-1c</td><td>284</td></tr>
<tr><td>Replaced CO2 emissions chart with CO2 price chart for CO2 sensitivity</td><td>298</td></tr>
<tr><td>Labeled blank line in Portfolio Summary Table with "Gateway Transmission" for GW1 and GW3</td><td>301 & 303</td></tr>
<tr><td rowspan="2">Appendix N</td><td>Replaced "error not found" in text to reference Table N.1</td><td>313</td></tr>
<tr><td>Replaced Table N.1 (removed extra decimal place for 2017 IRP single-axis tracking result)</td><td>316</td></tr>
</table>

In addition, the Company provides the enclosed data discs, which provide support and additional details for the analyses included in the 2017 IRP. The discs contain both non-confidential and confidential work papers. Due to the size of the files contained on the data discs, the data discs cannot be submitted through the filing portal.

Pacific Power requests confidential treatment for Discs 2-4 and requests that this information be treated as confidential information under RCW 80.04.095 and in accordance with WAC 480-07-160. Discs 2-4, labeled as confidential, includes commercially sensitive economic analyses and business projections. This confidential business information is of significant value, and would expose the Company to injury if disclosure is unrestricted. Therefore, the Company requests confidential treatment on the basis that the documents contain "valuable commercial information, including trade secrets or confidential marketing, cost, or financial information, or customer-specific usage and network configuration and design information," as provided in RCW 80.04.095 in accordance with WAC 480-07-160(2)(c).

Interested parties may contact Erin Apperson (contact information listed in the initial filing) for a copy of a non-disclosure agreement that must be executed and submitted before obtaining a copy of the confidential information.

Please direct any questions to Ariel Son, Regulatory Affairs Manager, at (503) 813-5410.

Sincerely,

/s/

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Enclosures

cc: Dave Nightingale
Kyle Frankiewich

currently subject to seasonal or year-round inverted block rate plans. Savings associated with these resources are captured within the Company's load forecast and are thus captured in the integrated resource planning framework. PacifiCorp continues to evaluate Class 3 DSM programs for applicability to long-term resource planning.

Educating customers regarding energy efficiency and load management opportunities is an important component of the Company's long-term resource acquisition plan. A variety of channels are used to educate customers including television, radio, newspapers, bill inserts and messages, newsletters, school education programs, and personal contact. Load reductions due to Class 4 DSM activity will show up in Class 1 and Class 2 DSM program results and non-program reductions in the load forecast over time. Table D.2 provides an overview of DSM related ***watt***smart Outreach and Communication activities (Class 4 DSM activities) by state.

Table D.2 – Current wattsmart Outreach and Communications Activities

Wattsmart Outreach & Communications (incremental to program specific advertising)	**California**	**Oregon**	**Washington**	**Idaho**	**Utah**	**Wyoming**
Advertising		√	√	√	√	√
Sponsorships		√			√	
Social Media	√	√	√	√	√	√
Public Relations	√	√	√		√	√
Business Advocacy (awards at customer meetings, sponsorships, chamber partnership, university partnership)	√	√	√	√	√	√
Wattsmart Workshops		√				
Bewattsmart, Begin at Home - in school energy education			√		√	

Introduction

Long-term planning demands specification of how important variables behave over time. For the case of PacifiCorp's long-term planning, important variables include natural gas and electricity prices, regional loads, and regional hydro generation. Modeling these variables involves not only a description of their expected value over time as with a traditional forecast, but also a description of the spread of possible future values. The following sections summarize the development of stochastic process parameters to describe how these uncertain variables evolve over time[2].

Volatility

The standard deviation[3](σ) is a measure of how widely values are dispersed from the average value:

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \mu)^2}{(n-1)}}$$

Volatility incorporates a time component so a variable with constant volatility has a larger spread of possible outcomes two years in the future than one year in the future (σ_T):

$$\sigma_T = \sigma\sqrt{T}$$

Volatilities are typically quoted on an annual basis but can be specified for any desired time period (T). Suppose the annual volatility of load is two percent. This implies that the standard deviation of the range of possible loads a year from now is two percent, while the standard deviation four years from now is four percent.

Mean Reversion

If volatility were constant over the forecast period, then the standard deviation would increase linearly with the square root of time. This is described as a "Random Walk" process and often provides a reasonable assumption for long-term uncertainty. However, for energy commodities as well as many other variables in the short-term, this is not typically the case. Excepting seasonal effects, the standard deviation increases less quickly with longer forecast time. This is called a mean reverting process - variable outcomes tend to revert back towards a long-term mean after experiencing a shock:

[2] A stochastic or random process is the counterpart to a deterministic process. Instead of dealing with only one possible reality of how the variables might evolve over time, there is some indeterminacy in the future evolution described by probability distributions.

[3] "Standard Deviation" and "Variance" are standard statistical terms describing the spread of possible outcomes. The Variance equals the Standard Deviation squared.

APPENDIX K – CAPACITY EXPANSION RESULTS DETAIL

Portfolio Case Build Tables

This section provides the System Optimizer portfolio build tables for each of the case scenarios as described in the portfolio development section of Chapter 7. There are seven Regional Haze cases, eleven core cases, twenty sensitivity cases, and four final cases.

Table K.1 – Regional Haze Study Reference Guide

Case	Description	Benchmark	Load	Private Gen	CO_2 Policy	FOTs	Gateway	1st Year of New Thermal	SO PVRR. ($m)
Ref.	Reference Case	-	Base	Base	Mass Cap B	Base	None	2032	$24,219
RH-1	Regional Haze 1	-	Base	Base	Mass Cap B	Base	None	2030	$23,159
RH-2	Regional Haze 2	-	Base	Base	Mass Cap B	Base	None	2029	$23,482
RH-3	Regional Haze 3	-	Base	Base	Mass Cap B	Base	None	2029	$23,398
RH-4	Regional Haze 4	-	Base	Base	Mass Cap B	Base	None	2030	$23,663
RH-5	Regional Haze 5	-	Base	Base	Mass Cap B	Base	None	2029	$23,177
RH-6	Regional Haze 6	-	Base	Base	Mass Cap B	Base	None	2028	$23,986

Table K.2 – Core Case Study Reference Guide

Case	Description	Benchmark	Load	Private Gen	CO_2 Policy	FOTs	Gateway	1st Year of New Thermal	SO PVRR ($m)
OP-1	Optimized Portfolio	RH5	Base	Base	Mass Cap B	Base	None	2029	$23,177
OP-NT3	Optimized Naughton 3	OP-1	Base	Base	Mass Cap B	Base	None	2029	$23,052
OP-REP	Wind Repower	OP-NT3	Base	Base	Mass Cap B	Base	None	2029	$22,984
OP-GW4	Energy Gateway + Repower	OP-REP	Base	Base	Mass Cap B	Base	Segment D2	2029	$23,123
FR-1	Flexible Resource	OP-NT3	Base	Base	Mass Cap B	Base	None	2021	$23,585
FR-2	Flexible Resource	OP-NT3	Base	Base	Mass Cap B	Base	None	2021	$24,319
RE-1a	OR RPS Just in Time	OP-NT3	Base	Base	Mass Cap B	Base	None	2029	$23,082
RE-1b	WA RPS Just in Time	OP-NT3	Base	Base	Mass Cap B	Base	None	2029	$23,091
RE-1c	OR & WA RPS Just in Time	OP-NT3	Base	Base	Mass Cap B	Base	None	2029	$23,110
RE-2	OR RPS Early	OP-NT3	Base	Base	Mass Cap B	Base	None	2029	$23,098
DLC1	Direct Load Control	OP-NT3	Base	Base	Mass Cap B	Base	None	2030	$23,103

Table K.3 – Sensitivity Case Study Reference Guide

Case	Description	Benchmark	Load	Private Gen	CO2 Policy	FOTs	Gateway	1st Year of New Thermal	SO PVRR w/ Trans. ($m)
RH2a	Regional Haze	OP-1	Base	Base	Mass Cap B	Base	None	2029	$23,404
LD-1	1 in 20 Loads	OP-1	1 in 20	Base	Mass Cap B	Base	None	2029	$23,364
LD-2	Low Load	OP-1	Low	Base	Mass Cap B	Base	None	2030	$21,567
LD-3	High Load	OP-1	High	Base	Mass Cap B	Base	None	2028	$24,818
PG-1	Low Private Gen	OP-1	Base	Low	Mass Cap B	Base	None	2029	$23,304
PG-2	High Private Gen	OP-1	Base	High	Mass Cap B	Base	None	2030	$22,899
CPP-C	CPP Mass Cap C	OP-1	Base	Base	Mass Cap C	Base	None	2029	$23,268
CPP-D	CPP Mass Cap D	OP-1	Base	Base	Mass Cap D	Base	None	2029	$23,102
FOT-1	Limited FOT	OP-1	Base	Base	Mass Cap B	Restricted	None	2029	$23,347
CO2-1	CO_2 Price	OP-1	Base	Base	Tax, No CPP	Base	None	2030	$26,401
NO-CO2	No CO_2	OP-NT3	Base	Base	No Tax, No CPP	Base	None	2028	$22,891
BP	Business Plan	OP-NT3	Base	Base	Mass Cap D	Base	None	2030	$23,198
GW1	Gateway 1	OP-NT3	Base	Base	Mass Cap B	Base	Segment D	2029	$23,593
GW2	Gateway 2	OP-NT3	Base	Base	Mass Cap B	Base	Segment F	2029	$24,054
GW3	Gateway 3	OP-NT3	Base	Base	Mass Cap B	Base	Segment D&F	2029	$24,627
GW4	Gateway 4	OP-NT3	Base	Base	Mass Cap B	Base	Segment D2	2029	$23,159
Battery	Battery Storage	FS-GW4	Base	Base	Mass Cap B	Base	Segment D2	2029	$23,162
CAES	CAES Storage	FS-GW4	Base	Base	Mass Cap B	Base	Segment D2	2029	$23,121
WCA	WCA	FS-REP	Base	Base	Mass Cap B	Base	None	3033	$7,542
WCA-RPS	WCA RPS	FS-REP	Base	Base	Mass Cap B	Base	None	3033	$7,557

Table K.4 – Final Case Study Reference Guide

	Description	Benchmark	Load	Private Gen	CO_2 Policy	FOTs	Gateway	1st Year of New Thermal	SO PVRR ($m)
FS-REP	Wind Repower	OP-NT3	Base	Base	Mass Cap B	Base	Segment D2	2029	$23,042
FS-GW4	Gateway 4	FS-REP	Base	Base	Mass Cap B	Base	Segment D2	2029	$22,990
FS-R1c	OR & WA RPS Just in Time	FS-GW4	Base	Base	Mass Cap B	Base	Segment D2	2029	$23,006
FS-R2	OR RPS Early	FS-GW4	Base	Base	Mass Cap B	Base	Segment D2	2029	$22,995

FS-R2	Capacity (MW)																				Resource Totals 1/	
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	10-year	20-year
East																						
Existing Plant Retirements/Conversions																						
Craig 1 (Coal Early Retirement/Conversions)	-	-	-	-	-	-	-	-	-	(82)	-	-	-	-	-	-	-	-	-	-	(82)	(82)
Craig 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(82)	-	-	(82)
Hayden 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(45)	-	-	-	-	-	-	(45)
Hayden 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(33)	-	-	-	-	-	-	(33)
Cholla 4 (Coal Early Retirement/Conversions)	-	-	-	-	(387)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(387)	(387)
DaveJohnston 1	-	-	-	-	-	-	-	-	-	-	-	(106)	-	-	-	-	-	-	-	-	-	(106)
DaveJohnston 2	-	-	-	-	-	-	-	-	-	-	-	(106)	-	-	-	-	-	-	-	-	-	(106)
DaveJohnston 3	-	-	-	-	-	-	-	-	-	-	-	(220)	-	-	-	-	-	-	-	-	-	(220)
DaveJohnston 4	-	-	-	-	-	-	-	-	-	-	-	(330)	-	-	-	-	-	-	-	-	-	(330)
Naughton 1	-	-	-	-	-	-	-	-	-	-	-	-	-	(156)	-	-	-	-	-	-	-	(156)
Naughton 2	-	-	-	-	-	-	-	-	-	-	-	-	-	(201)	-	-	-	-	-	-	-	(201)
Naughton 3 (Coal Early Retirement/Conversions)	-	-	(280)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(280)	(280)
Gadsby 1-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(358)	-	-	-	-	(358)
Expansion Resources																						
CCCT - DJohns - J 1x1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	477	-	-	-	-	477
Total CCCT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	477	-	-	-	-	477
SCCT Frame DJ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	-	-	200
SCCT Frame UTN	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	-	-	-	-	-	-	200
Wind, Djohnston	-	-	-	-	-	-	-	-	-	-	-	-	-	-	85	-	-	-	-	-	-	85
Wind, GO	-	-	-	-	61	1	-	-	-	-	-	-	-	-	-	-	-	-	-	774	62	836
Wind, WYAE	-	-	-	-	1,100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,100	1,100
Total Wind	-	-	-	-	1,161	1	-	-	-	-	-	-	-	-	85	-	-	-	-	774	1,162	2,022
Utility Solar - PV - Utah-S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	79	167	210	41	291	13	-	800
DSM, Class 1, ID-Cool/WH	-	-	-	-	-	-	-	-	-	-	-	-	3.4	-	-	-	-	-	-	1.3	-	4.7
DSM, Class 1, ID-Curtail	-	-	-	-	-	-	-	-	-	-	-	-	1.9	-	-	-	-	-	-	-	-	1.9
DSM, Class 1, ID-Irrigate	-	-	-	-	-	-	-	-	-	-	-	10.9	3.9	-	-	3.4	-	-	3.1	-	-	21.3
DSM, Class 1, UT-Cool/WH	-	-	-	-	-	-	-	-	-	-	-	68.4	-	-	-	-	-	-	-	-	-	68.4
DSM, Class 1, UT-Curtail	-	-	-	-	-	-	-	-	-	-	-	34.8	40.5	4.8	-	-	-	3.7	-	2.2	-	85.9
DSM, Class 1, UT-Irrigate	-	-	-	-	-	-	-	-	-	-	-	3.1	-	-	-	-	-	-	-	3.3	-	6.3
DSM, Class 1, WY-Cool/WH	-	-	-	-	-	-	-	-	-	-	-	4.8	-	-	-	-	-	-	-	2.9	-	7.7
DSM, Class 1, WY-Curtail	-	-	-	-	-	-	-	-	-	-	-	-	40.7	-	-	-	3.1	-	-	2.0	-	45.8
DSM, Class 1, WY-Irrigate	-	-	-	-	-	-	-	-	-	-	-	1.9	-	-	-	-	-	-	-	-	-	1.9
DSM, Class 1 Total	-	-	-	-	-	-	-	-	-	-	-	123.8	90.5	4.8	-	3.4	3.1	3.7	3.1	11.6	-	243.8
DSM, Class 2, ID	5	7	7	6	6	5	5	6	5	6	5	5	5	5	4	4	3	3	3	3	56	95
DSM, Class 2, UT	84	58	56	59	62	58	66	66	63	65	64	61	57	57	56	49	44	37	34	35	637	1,130
DSM, Class 2, WY	8	10	11	10	11	13	14	14	14	14	12	11	11	10	11	9	8	7	7	7	119	212
DSM, Class 2 Total	97	74	74	75	78	77	85	85	82	84	82	77	73	72	71	62	55	47	43	44	812	1,438
FOT Mona - SMR	-	-	-	-	-	-	-	-	-	27	27	297	297	288	299	299	299	299	300	300	3	137
West																						
Existing Plant Retirements/Conversions																						
JimBridger 1 (Coal Early Retirement/Conversions)	-	-	-	-	-	-	-	-	-	-	-	-	(354)	-	-	-	-	-	-	-	-	(354)
JimBridger 2 (Coal Early Retirement/Conversions)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(359)	-	-	-	-	(359)
Expansion Resources																						
CCCT - WillamValcc - G 1x1	-	-	-	-	-	-	-	-	-	-	-	-	-	436	-	-	-	-	-	-	-	436
Total CCCT	-	-	-	-	-	-	-	-	-	-	-	-	-	436	-	-	-	-	-	-	-	436
Utility Solar - PV - Yakima	-	-	-	-	-	-	-	-	-	-	-	11	97	-	38	70	16	8	-	-	-	240
DSM, Class 1, CA-Cool/WH	-	-	-	-	-	-	-	-	-	-	-	2.4	-	-	-	-	-	-	-	-	-	2.4
DSM, Class 1, CA-Curtail	-	-	-	-	-	-	-	-	-	-	-	1.2	-	-	-	-	-	-	-	-	-	1.2
DSM, Class 1, CA-Irrigate	-	-	-	-	-	-	-	-	-	-	-	3.7	-	-	-	-	-	-	-	-	-	3.7
DSM, Class 1, OR-Cool/WH	-	-	-	-	-	-	-	-	-	-	-	-	36.1	-	3.3	-	-	-	-	-	-	39.4
DSM, Class 1, OR-Curtail	-	-	-	-	-	-	-	-	-	-	-	35.0	-	-	-	-	-	-	-	-	-	35.0
DSM, Class 1, OR-Irrigate	-	-	-	-	-	-	-	-	-	-	-	12.8	-	-	-	-	-	-	-	-	-	12.8
DSM, Class 1, WA-Cool/WH	-	-	-	-	-	-	-	-	-	-	-	-	13.0	-	-	-	-	-	-	-	-	13.0
DSM, Class 1, WA-Curtail	-	-	-	-	-	-	-	-	-	-	-	9.1	-	-	-	-	-	-	-	-	-	9.1
DSM, Class 1, WA-Irrigate	-	-	-	-	-	-	-	-	-	-	-	4.8	-	-	-	-	-	-	-	-	-	4.8
DSM, Class 1 Total	-	-	-	-	-	-	-	-	-	-	-	69.1	49.1	-	3.3	-	-	-	-	-	-	121.5
DSM, Class 2, CA	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	13	21
DSM, Class 2, OR	46	44	42	37	31	26	23	23	20	19	18	17	17	16	16	17	15	15	16	16	310	474
DSM, Class 2, WA	10	8	9	8	10	9	9	9	8	8	7	7	6	5	5	4	3	3	2	2	88	132
DSM, Class 2 Total	57	53	52	46	42	37	33	33	29	27	27	25	23	23	22	21	20	19	19	18	410	627
Geothermal, Greenfield - West	-	-	-	-	-	-	-	-	-	-	-	-	30	-	-	-	-	-	-	-	-	30
FOT COB - SMR	-	-	7	-	-	37	-	6	163	72	134	400	400	400	400	400	400	400	400	364	29	199
FOT MidColumbia - SMR	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
FOT MidColumbia - SMR - 2	-	21	375	311	296	375	341	375	375	375	375	375	375	375	375	375	375	375	375	375	284	330
FOT NOB - SMR	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
FOT MidColumbia - WTR	281	332	-	307	319	-	-	-	295	297	-	-	400	400	387	-	-	-	376	288	183	184
FOT MidColumbia - WTR2	-	-	273	-	-	308	306	287	-	-	289	308	46	11	-	347	333	373	-	375	117	163
FOT NOB - WTR	-	-	-	-	-	-	-	-	53	54	8	100	100	100	100	100	100	100	100	100	11	51
Existing Plant Retirements/Conversions	-	-	(280)	-	(387)	-	-	-	-	(82)	-	(762)	(354)	(357)	(78)	-	(717)	-	(82)	-		
Annual Additions, Long Term Resources	154	128	126	122	1,282	115	118	118	112	111	108	306	563	536	300	323	980	117	356	861		
Annual Additions, Short Term Resources	781	853	1,154	1,119	1,115	1,220	1,146	1,168	1,386	1,326	1,333	1,979	2,118	2,074	2,061	2,022	2,007	2,048	2,051	2,302		
Total Annual Additions	935	981	1,281	1,240	2,397	1,335	1,264	1,286	1,498	1,437	1,442	2,285	2,680	2,610	2,361	2,345	2,987	2,165	2,407	3,162		

1/ Front office transaction amounts reflect one-year transaction periods, are not additive, and are reported as a 10/20-year annual average.

Table L.4 – Stochastic Mean PVRR by Price Scenario, Final Screening Cases

PVRR ($m)	Low Gas, MC A	Med Gas, MC A	High Gas, MC A	Low Gas, MC B	Med Gas, MC B	High Gas, MC B
FS-REP	22,741	23,372	25,616	22,705	23,353	25,629
FS-GW4	22,821	23,355	25,141	22,785	23,331	25,151
FS-R1c	22,848	23,365	25,095	22,813	23,342	25,109
FS-R2	22,821	23,348	25,098	22,787	23,324	25,109

Table L.5 – Stochastic Risk Results, Regional Haze Cases – Low Gas, MC A

PVRR ($m)	Low Gas, MC A				
	Standard Deviation	5th percentile	90th percentile	95th percentile	Upper Tail (mean of 3 Highest) No Fixed Costs
Ref.	123	23,818	24,097	24,272	15,464
RH-1	118	22,688	22,959	23,134	15,584
RH-2	128	22,771	23,052	23,225	15,638
RH-3	119	22,809	23,107	23,244	15,646
RH-4	121	23,199	23,467	23,629	15,598
RH-5	119	22,614	22,882	23,051	15,681
RH-6	123	23,460	23,738	23,902	15,659

Table L.6 – Stochastic Risk Results, Regional Haze Cases – Medium Gas, MC A

PVRR ($m)	Medium Gas, MC A				
	Standard Deviation	5th percentile	90th percentile	95th percentile	Upper Tail (mean of 3 Highest) No Fixed Costs
Ref.	138	24,375	24,682	24,869	16,086
RH-1	134	23,282	23,606	23,770	16,246
RH-2	145	23,482	23,804	23,987	16,421
RH-3	135	23,444	23,751	23,922	16,335
RH-4	136	23,784	24,086	24,262	16,253
RH-5	136	23,272	23,596	23,758	16,412
RH-6	140	24,119	24,425	24,605	16,386

Case Fact Sheets - Overview

Regional Haze Case Fact Sheets

The following Regional Haze Case Fact Sheets summarize key assumptions and portfolio results for each portfolio being developed for the 2017 IRP. All cases produce resource portfolios capable of meeting state renewable portfolio standard requirements. Similarly, in addition to the Regional Haze compliance requirements specified for each case, all cases include costs to meet known and assumed compliance obligations for Mercury and Air Toxics (MATS), coal combustion residuals (CCR) under subtitle D of the Resource Conservation and Recovery Act (RCRA), cooling water intake structures under §316(b) of the Clean Water Act, and effluent guidelines.

Quick Reference Guide

Case	Description	Benchmark	Load	Private Gen	CO_2 Policy	FOTs	Gateway	1st Year of New Thermal	SO PVRR w/o Trans. ($m)	SO PVRR w/ Trans. ($m)
Ref.	Reference Case	-	Base	Base	Mass Cap B	Base	None	2032	$24,156	$24,219
RH-1	Regional Haze 1	-	Base	Base	Mass Cap B	Base	None	2030	$23,066	$23,159
RH-2	Regional Haze 2	-	Base	Base	Mass Cap B	Base	None	2029	$23,313	$23,482
RH-3	Regional Haze 3	-	Base	Base	Mass Cap B	Base	None	2029	$23,315	$23,398
RH-4	Regional Haze 4	-	Base	Base	Mass Cap B	Base	None	2030	$23,582	$23,663
RH-5	Regional Haze 5	-	Base	Base	Mass Cap B	Base	None	2029	$23,081	$23,177
RH-6	Regional Haze 6	-	Base	Base	Mass Cap B	Base	None	2028	$23,891	$23,986

Core Case Fact Sheets

The following Core Case Fact Sheets summarize key assumptions and portfolio results for each portfolio being developed for the 2017 IRP. All cases produce resource portfolios capable of meeting state renewable portfolio standard requirements. As with the regional haze cases, all core cases comply with the environmental obligations.

Quick Reference Guide

Case	Description	Benchmark	Load	Private Gen	CO_2 Policy	FOTs	Gateway	1st Year of New Thermal	SO PVRR w/o Trans. ($m)	SO PVRR w/ Trans. ($m)
OP-1	Optimized Portfolio	RH5	Base	Base	Mass Cap B	Base	None	2029	$23,081	$23,177
OP-NT3	Optimized Naughton 3	OP-1	Base	Base	Mass Cap B	Base	None	2029	$22,913	$23,052
OP-REP	Wind Repower	OP-NT3	Base	Base	Mass Cap B	Base	None	2029	$22,890	$22,984
OP-GW4	Energy Gateway + Repower	OP-REP	Base	Base	Mass Cap B	Base	Segment D2	2029	$22,612	$23,123
FR-1	Flexible Resource	OP-NT3	Base	Base	Mass Cap B	Base	None	2021	$23,463	$23,585
FR-2	Flexible Resource	OP-NT3	Base	Base	Mass Cap B	Base	None	2021	$24,136	$24,319
RE-1a	OR RPS Just in Time	OP-NT3	Base	Base	Mass Cap B	Base	None	2029	$22,945	$23,082
RE-1b	WA RPS Just in Time	OP-NT3	Base	Base	Mass Cap B	Base	None	2029	$22,962	$23,091
RE-1c	OR & WA RPS Just in Time	OP-NT3	Base	Base	Mass Cap B	Base	None	2029	$22,972	$23,110
RE-2	OR RPS Early	OP-NT3	Base	Base	Mass Cap B	Base	None	2029	$22,967	$23,098
DLC-1	Direct Load Control	OP-NT3	Base	Base	Mass Cap B	Base	None	2030	$22,942	$23,103

Sensitivity Fact Sheets

The following Sensitivity Fact Sheets summarize key assumptions and portfolio results for each sensitivity being developed for the 2017 IRP. All sensitivities produce resource portfolios capable of meeting state

Core Case Fact Sheets

CASE ASSUMPTIONS

Description

Case RE-1c retains endogenous renewables from core case 1 (OP-1) and includes additional renewables added to physically comply with Oregon and Washington RPS. Additions are made beginning the first year in which there is a projected compliance shortfall (just-in-time compliance). This case is a variant of core case OP-NT3.

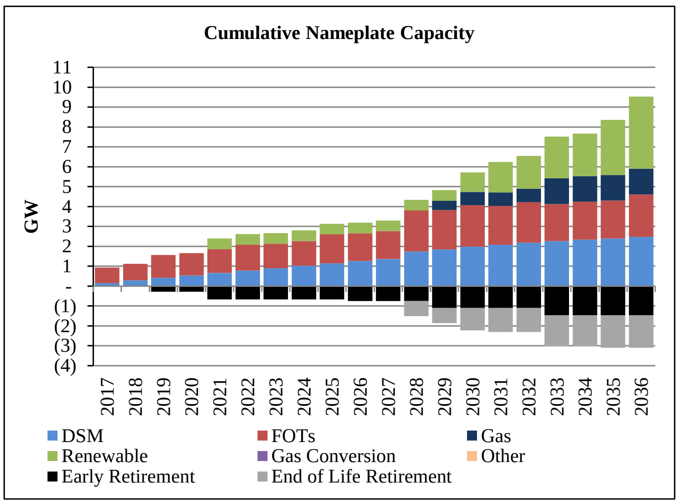
PORTFOLIO SUMMARY

System Optimizer PVRR ($m)

System Cost without Transmission Upgrades	$22,972
Transmission Integration	$126
Transmission Reinforcement	$12
Total Cost	$23,110

Resource Portfolio

Cumulative changes to the resource portfolio (new resource additions and resource retirements), represented as nameplate capacity, are summarized in the figure below.



Sensitivity: CO_2 Price, No CPP (CO2-1)

Sensitivity Fact Sheets

CASE ASSUMPTIONS

Description

The CO_2 Price sensitivity examines the impact of replacing the Clean Power Plan (currently stayed by the U.S. Supreme Court) with an CO_2 proxy price beginning in the year 2025, based on the assumption that even if the CPP is not in effect, there will be some carbon-based policy in place by this time. CO_2 prices applied to each ton of CO_2 emissions from new and existing resources, beginning in 2025 at $4.75/ton and reaching $38.02/ton by 2036. This sensitivity is a variant of core case OP-1.

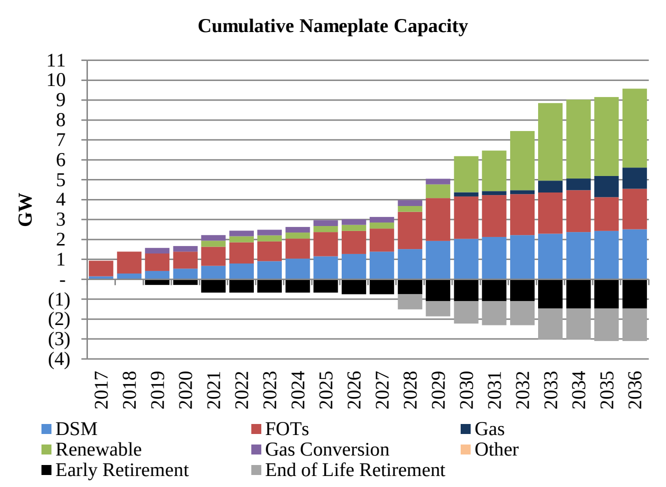
PORTFOLIO SUMMARY

System Optimizer PVRR ($m)

System Cost without Transmission Upgrades	$26,222
Transmission Integration	$166
Transmission Reinforcement	$12
Total Cost	$26,401

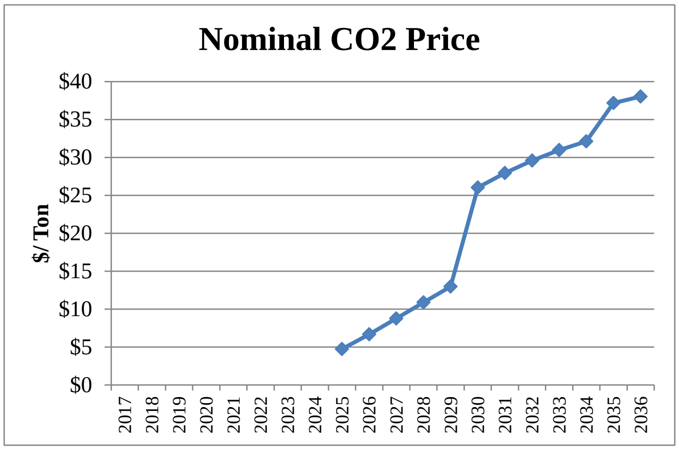
Resource Portfolio

Cumulative changes to the resource portfolio (new resource additions and resource retirements), represented as nameplate capacity, are summarized in the figure below.



CO_2 Emission Price

CO_2 emission prices beginning in 2025 used in the CO_2 Price sensitivity are shown in the figure below.



Sensitivity Fact Sheets

Case Assumptions

Description

Sensitivity GW1 includes segment D – Windstar to Anticline (assumed in-service 2022). In addition to the 300 MW of Wyoming wind in case OP-NT3, the additional transmission enables 440 MW of Wyoming wind additions. This sensitivity is a variant of core case OP-NT3.

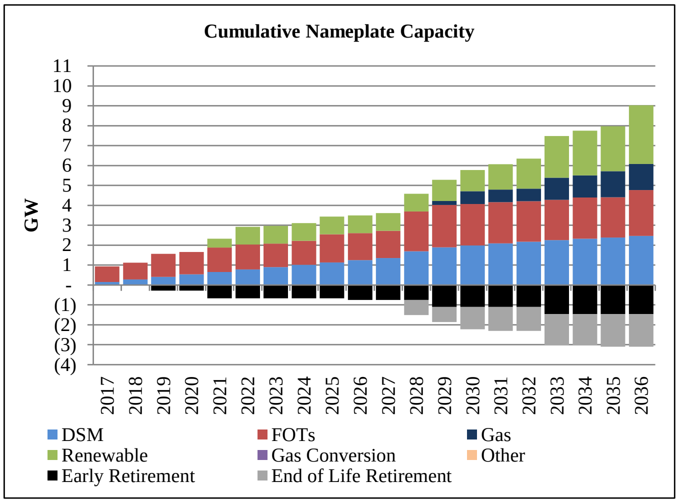
Portfolio Summary

System Optimizer PVRR ($m)

System Cost without Transmission Upgrades	$22,803
Transmission Integration	$125
Transmission Reinforcement	$12
Gateway Transmission	$652
Total Cost	$23,593

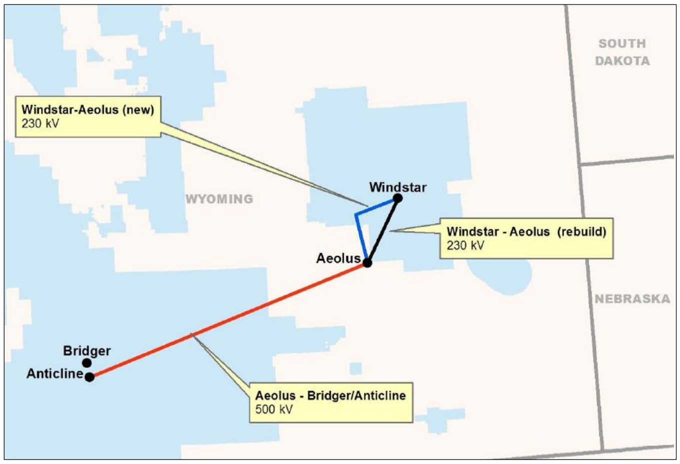
Resource Portfolio

Cumulative changes to the resource portfolio (new resource additions and resource retirements), represented as nameplate capacity, are summarized in the figure below.



Transmission

Transmission path is shown in the map below



Sensitivity Fact Sheets

CASE ASSUMPTIONS

Description

Sensitivity GW3 includes segments D & F – Windstar to Anticline and Aeolus to Mona/Clover (assumed in-service 2022 and 2023, respectively). In addition to the 300 MW of Wyoming wind in case OP-NT3, the additional transmission enables 1,200 MW of Wyoming wind additions. This sensitivity is a variant of core case OP-NT3.

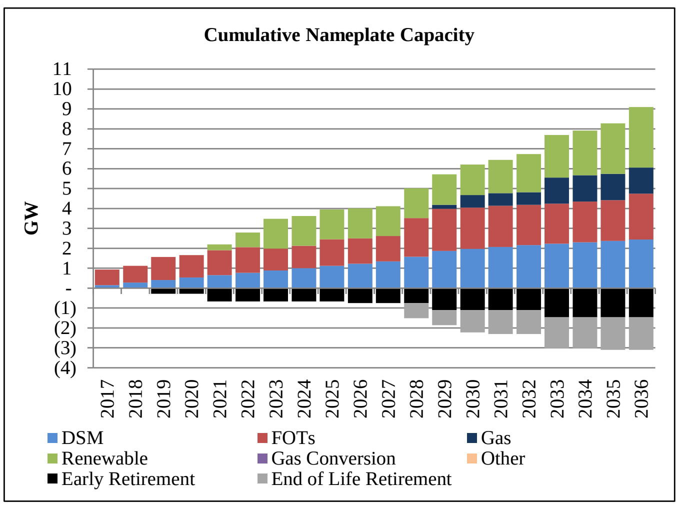
PORTFOLIO SUMMARY

System Optimizer PVRR ($m)

System Cost without Transmission Upgrades	$22,706
Transmission Integration	$96
Transmission Reinforcement	$12
Gateway Transmission	$1,813
Total Cost	$24,627

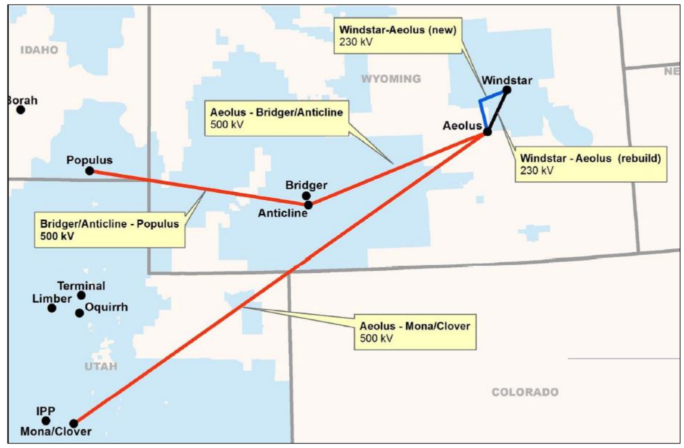
Resource Portfolio

Cumulative changes to the resource portfolio (new resource additions and resource retirements), represented as nameplate capacity, are summarized in the figure below.



Transmission

Transmission path is shown in the map below



APPENDIX N – WIND AND SOLAR CAPACITY CONTRIBUTION STUDY

Introduction

The capacity contribution of wind and solar resources, represented as a percentage of resource capacity, is a measure of the ability for these resources to reliably meet demand. For purposes of this report, PacifiCorp defines the peak capacity contribution of wind and solar resources as the availability among hours with the highest loss of load probability (LOLP). PacifiCorp calculated peak capacity contribution values for wind and solar resources using the capacity factor approximation method (CF Method) as outlined in a 2012 report produced by the National Renewable Energy Laboratory (NREL Report)[1].

The capacity contribution of wind and solar resources affects PacifiCorp's resource planning activities. PacifiCorp conducts its resource planning to ensure there is sufficient capacity on its system to meet its load obligation at the time of system coincident peak inclusive of a planning reserve margin. To ensure resource adequacy is maintained over time, all resource portfolios evaluated in the integrated resource plan (IRP) have sufficient capacity to meet PacifiCorp's net coincident peak load obligation inclusive of a planning reserve margin throughout a 20-year planning horizon. Consequently, planning for the coincident peak drives the amount and timing of new resources, while resource cost and performance metrics among a wide range of different resource alternatives drive the types of resources that can be chosen to minimize portfolio costs and risks.

PacifiCorp derives its planning reserve margin from a LOLP study. The study evaluates the relationship between reliability across all hours in a given year, accounting for variability and uncertainty in load and generation resources, and the cost of planning for system resources at varying levels of planning reserve margin. In this way, PacifiCorp's planning reserve margin LOLP study is the mechanism used to transform hourly reliability metrics into a resource adequacy target at the time of system coincident peak. This same LOLP study was utilized for calculating the peak capacity contribution using the CF Method. Table N.1, summarizes the peak capacity contribution results for PacifiCorp's East and West balancing authority areas (BAAs).

The CF Method ignores transmission constraints that can prevent resource output in a location from reaching an area location where loss of load events occur. If transmission constraints prevent resources from reaching areas with loss of load events, additional capacity in those areas may not provide an adequate planning reserve margin or contribute to reliability. At the January 26-27, 2017 public input meeting PacifiCorp identified the potential for transmission constraints to impact the effective capacity contribution from resources in Wyoming Northeast, Oregon, and Utah South.[2]

[1] Madaeni, S. H.; Sioshansi, R.; and Denholm, P. "Comparison of Capacity Value Methods for Photovoltaics in the Western United States." NREL/TP-6A20-54704, Denver, CO: National Renewable Energy Laboratory, July 2012 (NREL Report). http://www.nrel.gov/docs/fy12osti/54704.pdf

[2] 2017 IRP: Public Input Meeting 7. January 26-27, 2017. Presentation available at http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2017_IRP/PacifiCorp_2017_IRP_PIM07_1-26-17_Presentation.pdf

Table N.1 – Peak Capacity Contribution Values for Wind and Solar

	East BAA			West BAA		
	Wind	Fixed Tilt Solar PV	Single Axis Tracking Solar PV	Wind	Fixed Tilt Solar PV	Single Axis Tracking Solar PV
2017 IRP Results	15.8%	37.9%	59.7%	11.8%	53.9%	64.8%
2015 IRP Results	14.5%	34.1%	39.1%	25.4%	32.2%	36.7%

Figure N.1 presents daily average LOLP results from the PaR simulation, which shows that loss of load events are most likely to occur during the summer when load peaks in July.

Figure N.1 – Daily LOLP

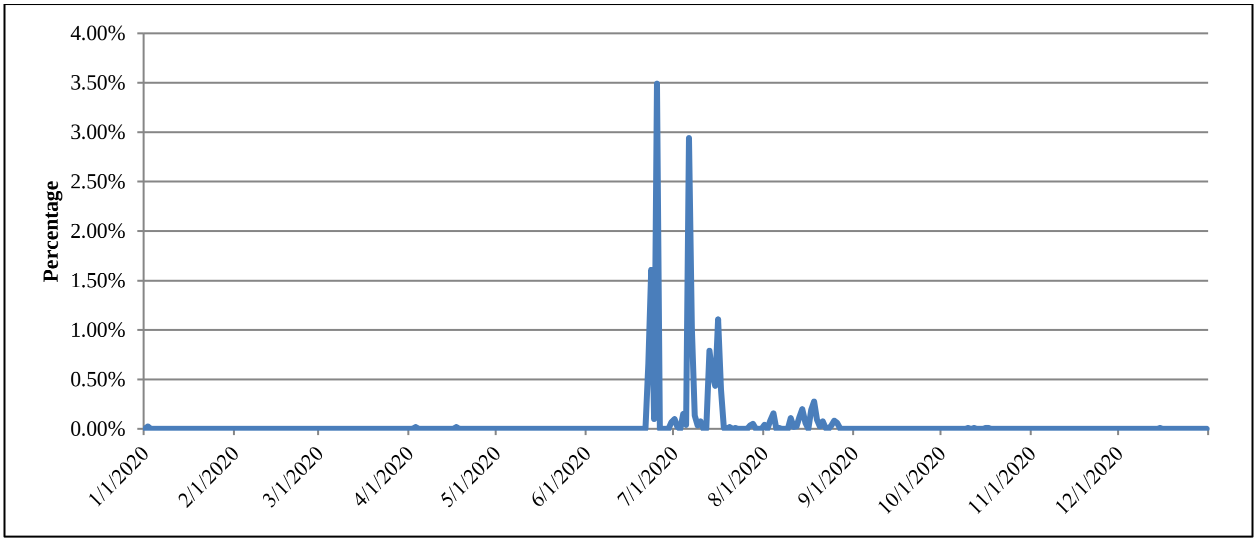


Figure N.2 presents the relationship between monthly capacity factors among wind and solar resources (primary y-axis) and average monthly LOLP from the PaR simulation (secondary y-axis) in PacifiCorp's CF Method analysis. As noted above, the average monthly LOLP is most prominent in summer (July peak loads).