



The Energy To Do Great Things

Puget Sound Energy
P.O. Box 97034
Bellevue, WA 98009-9734
PSE.com

January 12, 2018

Via Web Portal and Federal Express

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

**Re: 2017 Integrated Resource Plan
UE-160918 and UG-160919
Corrected Pages D-43 and N-67**

Dear Mr. King:

On November 14, 2017, Puget Sound Energy (“PSE”) filed its Integrated Resource Plan (“IRP”) in the above-referenced dockets. The purpose of this filing is to correct two charts in the IRP, as provided below:

Correction to Figure D-20: Generic Renewable Resource Cost Assumptions

Figure D-20, Appendix D, page D-43, includes three typographical errors. The Capital Costs associated with MT Wind, Biomass, and Solar are incorrect. The correct values do appear in Figure 4-18, page 4-32, Chapter 4: Key Analysis Assumptions. Please note this was simply a typographical error in the table; PSE staff have verified that the correct information was used in the portfolio modeling and these errors do not result in any tariff changes. The attached page D-43 incorporates the corrected Figure D-20 and is marked “Updated 01/12/2018.” A redlined version is provided for your reference.

Correction to Figure N-37: Indicative Avoided Capacity Resource Costs for Resources Delivered to PSE (Base + CAR Only Scenario)

Figure N-37, Appendix N, page N-67, includes a peak capacity value assigned to solar resources which was input incorrectly. The Expected Unserved Energy-Based, Effective Load Carrying Capability (“ELCC”) should be 2%, as opposed to 1%. The attached page N-67 incorporates the corrected Figure N-37 and is marked “Updated 01/12/2018.” A redlined version is provided for your reference.

Mr. Steven V. King
January 12, 2018
Page 2

Ten hard copies of corrected pages D-43 and N-67 are being sent via Federal Express. Please incorporate these into the ten copies provided to the Commission on November 14, 2017. The corrected pages will also be incorporated into the online version of PSE's IRP.

PSE's current Schedule 91 Fixed Price option rates and recently-filed Schedule of Estimated Avoided Costs were based on the incorrect 1% ELCC for solar resources. PSE will be filing an update to Schedule 91 and PSE will make a compliance filing to provide a Schedule of Estimated Avoided Costs (consistent with WAC 480-107-055), to ensure the ELCC of 2% is applied in those two processes.

If you have any questions about the information contained in this filing, please contact Phillip Popoff, Manager-Resource Planning and Analysis, at 425-462-3229 or Phillip.popoff@pse.com, or myself at (425) 456-2110 for additional information about this filing.

Sincerely,

/s/ Kenneth S. Johnson

Ken Johnson
Director, State Regulatory Affairs
Puget Sound Energy
PO Box 97034, PSE-08N
Bellevue, WA 98009-9734
425-456-2110
ken.s.johnson@pse.com

Attachments: Updated Page D-43
Redlined Page D-43
Updated Page N-67
Redlined Page N-67

Appendix D: Electric Resources



Figure D-20: Generic Renewable Resource Cost Assumptions

2016 \$	UNITS	WA WIND	MT WIND	BIOMASS	SOLAR	OFFSHORE WIND
ISO Capacity Primary	MW	100	300	15	25	100
Winter Capacity Primary	MW	9	192	0	0	
Capacity Credit	%	9%	64%	0%	1%	
Operating Reserves	%	3%	3%	3%	3%	3%
Capacity Factor	%	30%	46%	85%	27%	35%
Capital Cost ¹	\$/kW	\$1,936	\$2,065 ⁶	\$3,950	\$2,041	\$7,150 ⁷
O&M Fixed	\$/kW-yr	\$27.12	\$33.79	\$113.70	\$10.00	\$77.30
O&M Variable ²	\$/MWh	\$3.15	\$3.50	\$5.66	\$0.00	\$3.15
Degradation	%/year				0.5%	
Location		SE WA	Montana	Western WA	PSE - Central WA	Coast of WA
Fixed Transmission ³	\$/kW-yr	\$35.88	\$72.94	\$21.48	\$0.00	\$35.88
Variable Transmission ⁴	\$/MWh	\$1.85	\$1.85	\$0.35	\$0.00	\$1.85
Loss Factor to PSE	%	1.9%	7.3%	1.9%	0.0%	1.9%
Heat Rate – Baseload (HHV)	Btu/kWh			13,500		
Emissions:						
NO _x	lbs/MMBtu			0.00		
SO ₂	lbs/MMBtu			3.152		
CO ₂	lbs/MMBtu			195.0		
First Year Available ⁵		2020	2022	2021	2020	2022
Economic Life	Years	25	25	35	25	25
Greenfield Dev. & Const. Leadtime	years	3	3	4	3	5

NOTES

1. Solar PV cost for AC installed
2. Idaho Solar includes Spin and Supplemental from Idaho Power. WA Wind includes wind integration cost from BPA. MT Wind includes wind integration cost from NWMT. WA solar includes a solar integration charge from BPA as a placeholder.
3. BPAT variable cost includes spin, supplemental and imbalance. Idaho solar includes solar integration cost from Idaho Power.
4. MT wind includes generation tax and WET tax.
5. First year available for MT wind is 2022 to correspond to retirement of Colstrip 1 & 2.
6. Includes \$52 Million of transmission upgrades. If the resource were only 100 MW, then the capital cost would be higher since the transmission upgrades are \$52 million regardless of size of plant.
7. Offshore wind capital cost does not include the cost of the marine cable.

Appendix D: Electric Resources



Figure D-20: Generic Renewable Resource Cost Assumptions – Note, this table includes corrections for typos in the November 14, 2017 IRP filing.

2016 \$	UNITS	WA WIND	MT WIND	BIOMASS	SOLAR	OFFSHORE WIND
ISO Capacity Primary	MW	100	300	15	25	100
Winter Capacity Primary	MW	9	192	0	0	
Capacity Credit	%	9%	64%	0%	1%	
Operating Reserves	%	3%	3%	3%	3%	3%
Capacity Factor	%	30%	46%	85%	27%	35%
Capital Cost ¹	\$/kW	\$1,936	\$3,950 2,065 ⁶	\$7,150 3,950	\$2,171 2,040	\$7,150 ⁷
O&M Fixed	\$/kW-yr	\$27.12	\$33.79	\$113.70	\$10.00	\$77.30
O&M Variable ²	\$/MWh	\$3.15	\$3.50	\$5.66	\$0.00	\$3.15
Degradation	%/year				0.5%	
Location		SE WA	Montana	Western WA	PSE - Central WA	Coast of WA
Fixed Transmission ³	\$/kW-yr	\$35.88	\$72.94	\$21.48	\$0.00	\$35.88
Variable Transmission ⁴	\$/MWh	\$1.85	\$1.85	\$0.35	\$0.00	\$1.85
Loss Factor to PSE	%	1.9%	7.3%	1.9%	0.0%	1.9 5 %
Heat Rate – Baseload (HHV)	Btu/kWh			13,500		
Emissions:						
NO _x	lbs/MMBtu			0.00		
SO ₂	lbs/MMBtu			3.152		
CO ₂	lbs/MMBtu			195.0		
First Year Available ⁵		2020	2022	2021	2020	2022
Economic Life	Years	25	25	35	25	25
Greenfield Dev. & Const. Leadtime	years	3	3	4	3	5

NOTES

- Solar PV cost for AC installed
- Idaho Solar includes Spin and Supplemental from Idaho Power. WA Wind includes wind integration cost from BPA. MT Wind includes wind integration cost from NWMt. WA solar includes a solar integration charge from BPA as a placeholder.
- BPAT variable cost includes spin, supplemental and imbalance. Idaho solar includes solar integration cost from Idaho Power.
- MT wind includes generation tax and WET tax.
- First year available for MT wind is 2022 to correspond to retirement of Colstrip 1 & 2.
- Includes \$52 Million of transmission upgrades. If the resource were only 100 MW, then the capital cost would be higher since the transmission upgrades are \$52 million regardless of size of plant.
- Offshore wind capital cost does not include the cost of the marine cable.



Figure N-37: Indicative Avoided Capacity Resource Costs for Resources Delivered to PSE
(Base + CAR Only Scenario)

	Capacity Resource Addition	Levelized Net Cost (\$/kw-yr)	Firm Resource ELCC = 100% (\$/kw-yr)	Wind Resource ELCC = 16% (\$/kw-yr)	Solar Resource ELCC = 2% (\$/kw-yr)
2018	Avoided Energy Supply Capacity Cost	\$0.10	\$0.10	\$0.02	\$0.00
2019		\$0.10	\$0.10	\$0.02	\$0.00
2020		\$0.10	\$0.10	\$0.02	\$0.00
2021		\$0.10	\$0.10	\$0.02	\$0.00
2022	Transmission Redirect	\$3.26	\$3.26	\$0.52	\$0.07
2023	Flow Battery-4 hr	\$93.00	\$93.00	\$14.88	\$1.86
2024	Flow Battery-4 hr	\$93.00	\$93.00	\$14.88	\$1.86
2025	Frame Peaker	\$80.00	\$80.00	\$12.80	\$1.60
2026	Frame Peaker	\$80.00	\$80.00	\$12.80	\$1.60
2027	Frame Peaker	\$80.48	\$80.48	\$12.88	\$1.61
2028		\$80.48	\$80.48	\$12.88	\$1.61
2029		\$80.48	\$80.48	\$12.88	\$1.61
2030		\$80.48	\$80.48	\$12.88	\$1.61
2031	Frame Peaker	\$84.16	\$84.16	\$13.47	\$1.68
2032		\$84.16	\$84.16	\$13.47	\$1.68
2033		\$84.16	\$84.16	\$13.47	\$1.68
2034	Frame Peaker	\$88.31	\$88.31	\$14.13	\$1.77
2035		\$88.31	\$88.31	\$14.13	\$1.77
2036	Frame Peaker	\$91.09	\$91.09	\$14.57	\$1.82
2037		\$91.09	\$91.09	\$14.57	\$1.82



Figure N-37: Indicative Avoided Capacity Resource Costs for Resources Delivered to PSE
 (Base + CAR Only Scenario) – last column Solar Resource corrected for 2% ELCC

	Capacity Resource Addition	Levelized Net Cost (\$/kw-yr)	Firm Resource ELCC = 100% (\$/kw-yr)	Wind Resource ELCC = 16% (\$/kw-yr)	Solar Resource ELCC = 2% (\$/kw-yr)
2018	Avoided Energy Supply Capacity Cost	\$0.10	\$0.10	\$0.02	\$0.00
2019		\$0.10	\$0.10	\$0.02	\$0.00
2020		\$0.10	\$0.10	\$0.02	\$0.00
2021		\$0.10	\$0.10	\$0.02	\$0.00
2022	Transmission Redirect	\$3.26	\$3.26	\$0.52	\$0.70 0.03
2023	Flow Battery-4 hr	\$93.00	\$93.00	\$14.88	\$1.86 0.93
2024	Flow Battery-4 hr	\$93.00	\$93.00	\$14.88	\$1.86 0.93
2025	Frame Peaker	\$80.00	\$80.00	\$12.80	\$0.60 0.80
2026	Frame Peaker	\$80.00	\$80.00	\$12.80	\$1.60 0.80
2027	Frame Peaker	\$80.48	\$80.48	\$12.88	\$1.61 0.80
2028		\$80.48	\$80.48	\$12.88	\$1.61 0.80
2029		\$80.48	\$80.48	\$12.88	\$1.61 0.84
2030		\$80.48	\$80.48	\$12.88	\$1.61 0.84
2031	Frame Peaker	\$84.16	\$84.16	\$13.47	\$1.68 0.84
2032		\$84.16	\$84.16	\$13.47	\$1.68 0.84
2033		\$84.16	\$84.16	\$13.47	\$1.68 0.84
2034	Frame Peaker	\$88.31	\$88.31	\$14.13	\$1.77 0.88
2035		\$88.31	\$88.31	\$14.13	\$1.77 0.88
2036	Frame Peaker	\$91.09	\$91.09	\$14.57	\$1.82 0.91
2037		\$91.09	\$91.09	\$14.57	\$1.82 0.91