

PSE IRP - Draft 1/24/19

Generic Electric Resource Cost and Performance Comparison - PSE's 2017 IRP Final Costs, 2019 IRP Draft Costs, and 2019 IRP Final Costs

The 2017 IRP costs printed in the 2017 IRP as 2016 dollars and have been inflated to 2018 dollars for this table to be in the same year dollars as the 2019 IRP.

PSE IRP Modeling Assumptions ¹	Net Output ^{2,3}	Net Heat Rate (HHV) ^{2,3}	Capacity Factor ⁴	Capital Cost ⁵	Fixed O&M Cost	Variable O&M Cost	Notes
	MW	Btu/kWh	%	\$/kW	\$/kW-yr	\$/MWh	
F-Class CCCT 1x1							
2017 IRP Final	413	6,650	-	\$1,312	\$8.51	\$2.52	
2019 IRP Draft	355	6,724	-	\$1,167	\$13.44	\$2.45	
2019 IRP Final	355	6,724	-	\$1,167	\$13.44	\$2.45	
Frame Peaker DF 1x0 with Oil Back-up^{6,7,8}							
2017 IRP Final	239	9,823	-	\$665	\$11.80	\$1.00	Variable operations is \$1.00 only and does not include major maintenance. Major maintenance is included in the start-up cost.
2019 IRP Draft	217	10,056	-	\$825	\$3.93	\$6.56	\$6.56 includes major maintenance, the variable operations only is \$0.69.
2019 IRP Final	217	10,056	-	\$825	\$11.40	\$0.69	FOM cost includes \$3.93 plus \$7.47 for 48 hours of oil backup. VOM only includes variable operations, major maintenance is in
Recip Peaker DF 12x0 with Oil Back-up⁶							
2017 IRP Final	202	8,527	-	\$1,549	\$11.24	\$8.19	FOM cost includes \$4.42 for 48 hours of oil, FOM before oil is \$6.50.
2019 IRP Draft	201	8,582	-	\$1,357	\$4.12	\$5.80	
2019 IRP Final	201	8,582	-	\$1,357	\$11.59	\$5.80	FOM cost includes \$4.12 plus \$7.47 for 48 hours of oil backup
Recip Peaker NG Only 12x0							
2017 IRP Final	222	8,425	-	\$1,341	\$6.50	\$8.19	
2019 IRP Draft	219	8,445	-	\$1,192	\$3.74	\$5.30	
2019 IRP Final	219	8,445	-	\$1,192	\$3.74	\$5.30	
Wind Plant - Washington - 100 MW							
2017 IRP Final	100	-	30%	\$2,021	\$28.50	\$3.31	
2019 IRP Draft	100	-	32%	\$2,042	\$37.00	\$0.00	
2019 IRP Final	100	-	32%	\$1,749	\$37.00	\$0.00	Wind capital costs revisited based on latest market intelligence, price trends.
Wind Plant - Washington - 300 MW							
2017 IRP Final	-	-	-	-	-	-	
2019 IRP Draft	-	-	-	-	-	-	
2019 IRP Final	300	-	32%	\$1,633	\$37.00	\$0.00	Larger wind project introduced to investigate potential economies of scale as requested during 7/26/18 TAG meeting.
Wind Plant - Montana - 100 MW⁹							
2017 IRP Final	-	-	-	-	-	-	
2019 IRP Draft	100	-	36%-42%	\$2,016-\$2,744	\$37.00	\$0.00	For Final, additional site in Montana identified with improved wind resource (comment from Bill Pascoe).
2019 IRP Final	100	-	36%-46%	\$1,722-\$2,212	\$37.00	\$0.00	For Final, Montana interconnection cost assumptions revisited (comment from Bill Pascoe).
Wind Plant - Montana - 300 MW⁹							
2017 IRP Final	300	-	46%	\$2,065	\$35.50	\$3.68	
2019 IRP Draft	-	-	-	-	-	-	
2019 IRP Final	300	-	36%-46%	\$1,617-\$1,802	\$37.00	\$0.00	Larger wind project introduced to investigate potential economies of scale as requested during 7/26/18 TAG.
Offshore Wind - Washington Coast							
2017 IRP Final	100	-	35%	\$7,150	\$81.21	\$3.31	
2019 IRP Draft	300	-	31%-35%	\$6,547	\$120.00	\$0.00	
2019 IRP Final	300	-	31%-35%	\$6,547	\$120.00	\$0.00	
Central Station Solar Tracking PV - 25 MW							
2017 IRP Final	25	-	26%	\$1,946	\$10.51	\$0.00	
2019 IRP Draft	25	-	19%	\$1,922	\$27.19	\$0.00	
2019 IRP Final	25	-	24%	\$1,922	\$27.19	\$0.00	Site basis adjusted for solar resource (as discussed during 7/26/18 TAG meeting).
Central Station Solar Tracking PV - 100 MW							
2017 IRP Final	-	-	-	-	-	-	
2019 IRP Draft	-	-	-	-	-	-	

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	MW	Btu/kWh	%	\$/kW	\$/kW-yr	\$/MWh	
2019 IRP Final	100	-	24%	\$1,614	\$21.90	\$0.00	Larger solar project introduced to investigate potential economies of scale as requested during 7/26/18 TAG.
Biomass							
2017 IRP Final	15	13,500	85%	\$4,084	\$119.45	\$5.95	
2019 IRP Draft	15	14,599	85%	\$9,695	\$345.20	\$6.60	
2019 IRP Final	15	14,599	85%	\$9,695	\$345.20	\$6.60	
2-hour Lithium Ion Battery							
2017 IRP Final	25	-	-	\$1,583	\$24.88	\$0.00	
2019 IRP Draft	25	-	-	\$1,930	\$20.54	\$0.00	
2019 IRP Final	25	-	-	\$1,930	\$20.54	\$0.00	
4-hour Lithium Ion Battery							
2017 IRP Final	25	-	-	\$2,551	\$38.34	\$0.00	
2019 IRP Draft	25	-	-	\$3,059	\$32.16	\$0.00	
2019 IRP Final	25	-	-	\$3,059	\$32.16	\$0.00	
4-hour Flow Battery							
2017 IRP Final	25	-	-	\$2,431	\$28.18	\$0.00	
2019 IRP Draft	25	-	-	\$2,111	\$30.80	\$0.00	
2019 IRP Final	25	-	-	\$2,111	\$30.80	\$0.00	
6-hour Flow Battery							
2017 IRP Final	25	-	-	\$3,182	\$24.58	\$0.00	
2019 IRP Draft	25	-	-	\$2,758	\$40.27	\$0.00	
2019 IRP Final	25	-	-	\$2,758	\$40.27	\$0.00	
Pumped Storage Hydro¹⁰							
2017 IRP Final	25	-	-	\$2,503	\$15.76	\$0.00	
2019 IRP Draft	500	-	-	\$2,661	\$14.55	\$0.90	
2019 IRP Final	500	-	-	\$2,661	\$14.55	\$0.90	

General Notes:

1. Unless otherwise indicated, all project locations assume generic project sites in Washington State.
2. Thermal Performance provided at ISO conditions (59 deg F, 60% RH, 0 ft AMSL).
3. Combined cycle thermal performance includes supplementary HRSG duct firing.
4. Initial capacity factors assumed for dispatchable resources to estimate operating costs.
5. Capital costs for 2017 IRP includes EPC project costs and a general 30% allocation for Owner's costs (Owner's staff, AFUDC, utility interconnections, etc.). The 2019 IRP capital costs include EPC project costs, calculated AFUDC, general Owner's costs, and estimated interconnection costs based on the associated assumptions outlined in the summary report.
6. The performance for dual fuel alternatives is based on operations on natural gas fuel (primary fuel).
7. A single fuel F-class peaker was considered in the 2017 IRP but not considered in the 2019 IRP.
8. An aeroderivative peaker (single and dual fuel) was considered in the 2017 IRP and not considered in the 2019 IRP.
9. Three sites were reviewed in Montana based on various interconnections and wind regimes.
10. The 2019 IRP considers (separately) a 300 MW slice of a larger project and a 500 MW slice. The 300 MW slice possesses slightly higher O&M costs as compared to the 500 MW slice.