



Portland General Electric
121 SW Salmon Street · Portland, Ore. 97204

October 15, 2019

VIA ELECTRONIC FILING
puc.filingcenter@state.or.us

Public Utility Commission of Oregon
201 High Street S.E., Suite 100
Salem, OR 97308-1088

Attn: Filing Center

RE: UM 1893 – PGE’s Energy Efficiency Avoided Cost Submission

Portland General Electric Company (PGE) submits this filing for compliance with Oregon Administrative Rule (OAR) 860-030-0011. Please see the attached pages for PGE’s energy efficiency avoided cost submission. Included with this filing is an alternative submission with updated values from PGE’s 2019 Integrated Resource Plan.

PGE looks forward to stakeholder discussion at the upcoming workshop.

Please direct all formal correspondence and requests to the following email address pge.opuc.filings@pgn.com.

Sincerely,

PORTLAND GENERAL ELECTRIC COMPANY

A handwritten signature in blue ink that reads "Robert Macfarlane". The signature is written in a cursive style and is positioned above a horizontal line.

Robert Macfarlane
Manager, Pricing and Tariffs
121 SW Salmon Street, 1WTC0306
Portland, OR 97204

Energy Efficiency Avoided Cost Submission Template - Electric

Utility Name: **PGE**

Submission Date: **15-Oct-19**

Instructions and Definitions

- ◊ Please fill out this workbook completely and per the instructions and submit via electronic filing to docket UM 1893. Submissions are due October 15 of each year.
 - ◊ Inputs will be reviewed and approved by the OPUC before being sent to the Energy Trust of Oregon for use in Avoided Cost development
 - ◊ **Provide as much detail as possible when sourcing** data inputs, including the link to the source (if available), page number and table or graph number
This will increase the efficiency of this process and require less iteration during the OPUC review period
- Required pages 1,2,3,4 refer to data presented in the most recently acknowledged IRP, IRP Update, or General Rate Case unless otherwise noted.*

1) Global Inputs - IRP

- ◊ Most components of the avoided costs are input into this tab including inflation/discount rates, line losses, risk reduction values, T&D deferral values, and generation deferral values
- ◊ Identify the winter & summer peak periods for Transmission and Distribution. The Generation LOLP Map will be utilized for generation peak definitions.
- ◊ If necessary, Energy Trust will work with each utility about sector definitions for T&D for which values to provide for Res, Com, and Ind
- ◊ **Ensure that the dollar years of the data inputs match the source** - Energy Trust will inflate to the proper year
- ◊ Please provide the values in the most recently acknowledged IRP

2) Forward Market Prices - IRP

- ◊ Provide forward market price forecast by month for both high load hours and low load hours
- ◊ Please provide the dollar amount of these prices that is associated with carbon costs (or %). If it is a dollar value, this is a subset of the total prices provided - The total forward market prices should be the FULL price, including carbon
- ◊ **Indicate if the forecast is in nominal or real dollars (and what dollar year if real)**
- ◊ Please provide the values in the most recently acknowledged IRP

3) LOLP - IRP

- ◊ Input a 12x24 Loss of Load Probability heat map per the example in the worksheet
- ◊ These will be potentially utilized in future iterations of avoided cost updates pending outcome of UM1893
- ◊ Include heat maps for all days, weekdays only, and weekends only
- ◊ Please provide the values in the most recently acknowledged IRP

4) RPS Compliance - IRP

- ◊ Input RPS compliance costs by year
- ◊ Please provide the values in the most recently acknowledged IRP

1a, 2a, 3a, 4a) Alternative Submissions

- ◊ Use these worksheets to provide alternative values to the most recently acknowledged IRP values
- ◊ Provide a rationale for submitting the alternative values in the box provided at the top of each alternative worksheet
- ◊ If a second set of alternative values is submitted, simply copy the alt tabs necessary and rename to 1b, alt 2 in the tab name

Global Assumptions Inputs				SOURCING				
Provide as much detail as possible with sourcing including a link. Ensure that dollar years listed here are the same as the source.								
Avoided Cost Element	Units	Value	Dollar Year	Source	Source Page #	Table # (if applicable)	Source Link or File Name	Source Notes
Inflation Rate	Percent	2.00%	N/A	2016 IRP Update	29	8	https://www.portlandgeneral.com/-/media/public/our-company/energy-strategy/documents/pge-2016-irp-update.pdf?la=en	4th Quarter 2017 Global Insight long-term forecast
Real Discount Rate	Percent	4.48%	N/A	2016 IRP Update	29	8	https://www.portlandgeneral.com/-/media/public/our-company/energy-strategy/documents/pge-2016-irp-update.pdf?la=en	After-Tax Real Cost of Capital, calculated from Nominal Weighted After-Tax Cost of Capital and Long-Term General Inflation. $RealDiscountRate = ((1 + NominalWeightedAfterTaxCostofCapital) / (1 + Inflation)) - 1$
Regional Act Credit	Percent	10.00%	N/A					
Transmission Loss Factor	Percent	1.90%	N/A	BPA Open Access Transmission Tariff, Effective Date: October 1, 2019	143		https://www.bpa.gov/transmission/Doing%20Business/Tariff/Documents/bpa-oatt-TC-20-settlement-tariff-100119.pdf	Real Power Loss factor for one segment of BPA transmission. This factor is for the losses external to PGE's system for avoided energy purchases, generation capacity, and risk value. This factor does not apply to the PGE Transmission In the Transmission Deferral Credit.
Distribution Loss Factor, Commercial	Percent	4.15%	N/A	2015 GRC (UE 283) Line Loss Study (the most recent loss study)			Workpapers "LineLoss2015GRC_Dist_Commercial.xlsx", "2015 GRC losses.xlsx"	Internal loss factor for Commercial loads based on weighted average of primary and secondary losses from the 2015 GRC Line Loss Study.
Distribution Loss Factor, Industrial	Percent	1.45%	N/A	2015 GRC (UE 283) Line Loss Study (the most recent loss study)	1		"2015 GRC losses.pdf"	Internal loss factor from study for loads with subtransmission delivery voltage.
Distribution Loss Factor, Residential	Percent	4.74%	N/A	2015 GRC (UE 283) Line Loss Study (the most recent loss study)	1		"2015 GRC losses.pdf"	Internal loss factor for loads with secondary delivery voltage.
Risk Reduction Value	\$/MWh	\$4.78	2016	2016 IRP			"EE_RiskCalc_2016IRP.xlsx"	Calculated from values from the 2016 IRP, analysis not updated in 2016 IRP Update.
Transmission Deferral Credit	\$/kW-yr	\$9.38	2019	2019 GRC (UE 335)			Workpaper "T&D 2019.xlsx"	2019 GRC, most recently approved GRC filing. $TransmissionDeferralCredit = (TransmissionRevReq/TransmissionCO2Peak)$
Seasonal Capacity Split - Summer	Percent	0%	N/A	Per previous assumption.				
Seasonal Capacity Split - Winter	Percent	100%	N/A	Per previous assumption.				
Summer Peak Period Definition	Month/Day/Hour	N/A	N/A					Day is intended to be weekday or weekend
Winter Peak Period Definition	Month/Day/Hour	N/A	N/A					Day is intended to be weekday or weekend
Deficiency start year	Year	2021	N/A	See Source Note				The year 2021 reflects PGE's understanding of the default value being the first year of Energy Trust's EE calculations. PGE may calculate an alternative transmission deficiency start year for future filings, but did not for this filing.
Distribution Deferral Credit	\$/kW-yr	\$24.39	2019	2019 GRC (UE 335)			Workpaper "T&D 2019.xlsx"	2019 GRC, most recently approved GRC filing. $DistributionDeferralCredit = (SubtransmissionMarginalCostRevenues/SubtransmissionRateclassPeak) * (SubstationMarginalCostRevenues/SubstationRateclassPeak)$
Seasonal Capacity Split - Summer	Percent	0%	N/A	Per previous assumption.				
Seasonal Capacity Split - Winter	Percent	100%	N/A	Per previous assumption.				
Summer Peak Period Definition	Month/Day/Hour	N/A	N/A					Day is intended to be weekday or weekend
Winter Peak Period Definition	Month/Day/Hour	N/A	N/A					Day is intended to be weekday or weekend
Deficiency start year	Year	2021	N/A	See Source Note				The year 2021 reflects PGE's understanding of the default value being the first year of Energy Trust's EE calculations. PGE may calculate an alternative distribution deficiency start year for future filings, but did not for this filing.
Generation Capacity Credit	\$/kW-yr	\$120.67	2018	2016 IRP Update			"Capacity_RUNetCost_2016IRPUpdate.xlsx"	2016 IRP Update resource costs, parameters, market prices.
Seasonal Capacity Split - Summer	Percent	50.00%	N/A	Per previous assumption.				This is the seasonal capacity split used by Staff in the December 2018 process. PGE may calculate an alternative seasonal capacity split for future filings, but did not for this filing.
Seasonal Capacity Split - Winter	Percent	50.00%	N/A	Per previous assumption.				This is the seasonal capacity split used by Staff in the December 2018 process. PGE may calculate an alternative seasonal capacity split for future filings, but did not for this filing.
Deficiency start year	Year	2021	N/A	2016 IRP Update		1B	https://www.portlandgeneral.com/-/media/public/our-company/energy-strategy/documents/pge-2016-irp-update.pdf?la=en	
RPS Compliance Cost	\$/MWh	\$ -	2018	2016 IRP Update			"RPSIncCost_2016IRPUpdate_CONF.xlsx"	In the 2016 IRP Update, there was no incremental cost of PNW wind net of capacity value and energy value.
Avoided RPS Compliance Obligation	%	NA	N/A	See worksheet "4) RPS Compliance IRP"				

Forward Price Inputs

Real or Nominal?	Nominal
Dollar Year:	n/a
Carbon Prices Additive?	Embedded in Market Prices
Carbon Value Units (\$/MWh)	2015\$/short ton
Source and Pg #:	Wholesale market prices: 2016 IRP Update, Appendix G. Carbon prices: 2016 IRP, pg. 66-72.
Source Link or File Name:	https://www.portlandgeneral.com/-/media/public/our-company/energy-strategy/documents/2016-irp.pdf?la=en
Source Notes:	Reference Case wholesale market energy prices from the 2016 IRP Update. Reference Case carbon prices from the 2016 IRP. The same carbon prices were used in the 2016 IRP Update.

NOTES:
Please provide notes as to how this value relates to forward market prices. It can be expressed as a percentage of forward market prices, a set \$/MWh, or \$/ton. Please identify the units in the box to the left

Year	Date	MONTHLY		MONTHLY	MONTHLY	ANNUAL	
		Wholesale Market Energy HLH Total (\$/MWh)	Wholesale Market Energy LLH Total (\$/MWh)	HLH Carbon Cost (OR % of HLH Price that accounts for Carbon?)	LLH Carbon Cost (OR % of LLH Price that accounts for Carbon?)	Year	Carbon emissions price (2015\$ per short ton)
2021	1/1/2021	\$	24.58	\$	22.82	2021	\$0.00
2021	2/1/2021	\$	24.86	\$	22.12	2022	\$20.00
2021	3/1/2021	\$	22.31	\$	20.37	2023	\$20.75
2021	4/1/2021	\$	17.29	\$	15.52	2024	\$21.50
2021	5/1/2021	\$	15.78	\$	14.22	2025	\$22.25
2021	6/1/2021	\$	15.49	\$	12.24	2026	\$23.00
2021	7/1/2021	\$	20.83	\$	16.91	2027	\$23.75
2021	8/1/2021	\$	22.62	\$	18.88	2028	\$24.50
2021	9/1/2021	\$	23.44	\$	20.72	2029	\$25.25
2021	10/1/2021	\$	22.22	\$	20.68	2030	\$26.00
2021	11/1/2021	\$	24.18	\$	21.47	2031	\$29.00
2021	12/1/2021	\$	25.91	\$	23.56	2032	\$32.00
2022	1/1/2022	\$	40.34	\$	38.39	2033	\$35.00
2022	2/1/2022	\$	40.26	\$	37.24	2034	\$38.00
2022	3/1/2022	\$	36.58	\$	34.58	2035	\$41.00
2022	4/1/2022	\$	33.83	\$	31.58	2036	\$44.00
2022	5/1/2022	\$	30.50	\$	26.17	2037	\$47.00
2022	6/1/2022	\$	27.25	\$	24.31	2038	\$50.00
2022	7/1/2022	\$	36.58	\$	32.95	2039	\$53.00
2022	8/1/2022	\$	39.19	\$	35.39	2040	\$56.00
2022	9/1/2022	\$	40.97	\$	37.62	2041	\$58.50
2022	10/1/2022	\$	40.56	\$	38.36	2042	\$61.00
2022	11/1/2022	\$	40.09	\$	37.94	2043	\$63.50
2022	12/1/2022	\$	41.84	\$	39.33	2044	\$66.00
2023	1/1/2023	\$	42.79	\$	39.97	2045	\$68.50
2023	2/1/2023	\$	42.16	\$	39.30	2046	\$71.00
2023	3/1/2023	\$	38.78	\$	36.69	2047	\$73.50
2023	4/1/2023	\$	35.94	\$	33.37	2048	\$76.00
2023	5/1/2023	\$	33.41	\$	31.77	2049	\$78.50
2023	6/1/2023	\$	31.01	\$	29.68	2050	\$81.00
2023	7/1/2023	\$	37.70	\$	35.69		
2023	8/1/2023	\$	41.26	\$	37.84		
2023	9/1/2023	\$	42.83	\$	39.49		
2023	10/1/2023	\$	42.63	\$	39.57		
2023	11/1/2023	\$	42.16	\$	40.02		
2023	12/1/2023	\$	44.12	\$	41.20		
2024	1/1/2024	\$	44.13	\$	40.85		
2024	2/1/2024	\$	43.01	\$	39.71		
2024	3/1/2024	\$	40.48	\$	38.35		
2024	4/1/2024	\$	36.91	\$	35.37		
2024	5/1/2024	\$	32.62	\$	31.46		
2024	6/1/2024	\$	23.53	\$	21.72		
2024	7/1/2024	\$	38.11	\$	36.09		
2024	8/1/2024	\$	42.17	\$	39.50		
2024	9/1/2024	\$	45.16	\$	41.02		

2024	10/1/2024	\$	44.72	\$	41.36
2024	11/1/2024	\$	43.58	\$	42.06
2024	12/1/2024	\$	45.70	\$	42.84
2025	1/1/2025	\$	45.61	\$	42.72
2025	2/1/2025	\$	45.27	\$	42.00
2025	3/1/2025	\$	42.74	\$	40.13
2025	4/1/2025	\$	39.41	\$	36.90
2025	5/1/2025	\$	36.91	\$	34.47
2025	6/1/2025	\$	30.34	\$	29.11
2025	7/1/2025	\$	42.85	\$	38.13
2025	8/1/2025	\$	45.30	\$	42.08
2025	9/1/2025	\$	46.67	\$	43.43
2025	10/1/2025	\$	47.22	\$	44.05
2025	11/1/2025	\$	45.89	\$	44.10
2025	12/1/2025	\$	46.94	\$	43.92
2026	1/1/2026	\$	47.10	\$	44.80
2026	2/1/2026	\$	47.50	\$	45.13
2026	3/1/2026	\$	44.49	\$	42.10
2026	4/1/2026	\$	40.56	\$	39.57
2026	5/1/2026	\$	35.72	\$	33.98
2026	6/1/2026	\$	29.03	\$	24.45
2026	7/1/2026	\$	44.16	\$	40.74
2026	8/1/2026	\$	46.80	\$	43.82
2026	9/1/2026	\$	48.88	\$	46.03
2026	10/1/2026	\$	49.56	\$	46.14
2026	11/1/2026	\$	48.39	\$	45.58
2026	12/1/2026	\$	49.02	\$	46.02
2027	1/1/2027	\$	49.34	\$	46.77
2027	2/1/2027	\$	49.94	\$	46.69
2027	3/1/2027	\$	46.05	\$	43.89
2027	4/1/2027	\$	42.59	\$	41.15
2027	5/1/2027	\$	38.94	\$	37.37
2027	6/1/2027	\$	29.70	\$	29.97
2027	7/1/2027	\$	46.07	\$	42.19
2027	8/1/2027	\$	49.36	\$	45.76
2027	9/1/2027	\$	50.87	\$	47.95
2027	10/1/2027	\$	51.38	\$	48.81
2027	11/1/2027	\$	50.00	\$	47.74
2027	12/1/2027	\$	51.80	\$	48.97
2028	1/1/2028	\$	52.77	\$	49.89
2028	2/1/2028	\$	51.63	\$	49.23
2028	3/1/2028	\$	47.83	\$	46.05
2028	4/1/2028	\$	43.96	\$	42.32
2028	5/1/2028	\$	37.32	\$	37.86
2028	6/1/2028	\$	29.65	\$	29.43
2028	7/1/2028	\$	48.89	\$	46.40
2028	8/1/2028	\$	52.32	\$	49.19
2028	9/1/2028	\$	54.14	\$	50.59
2028	10/1/2028	\$	53.75	\$	50.85
2028	11/1/2028	\$	53.30	\$	50.82
2028	12/1/2028	\$	54.84	\$	51.34
2029	1/1/2029	\$	55.66	\$	52.26
2029	2/1/2029	\$	53.97	\$	50.97
2029	3/1/2029	\$	51.74	\$	50.13
2029	4/1/2029	\$	47.27	\$	43.73
2029	5/1/2029	\$	43.59	\$	43.75
2029	6/1/2029	\$	29.95	\$	26.59
2029	7/1/2029	\$	51.03	\$	47.04
2029	8/1/2029	\$	55.48	\$	52.09

2029	9/1/2029	\$	57.08	\$	54.50
2029	10/1/2029	\$	55.68	\$	53.21
2029	11/1/2029	\$	56.39	\$	54.76
2029	12/1/2029	\$	58.45	\$	54.51
2030	1/1/2030	\$	57.85	\$	55.62
2030	2/1/2030	\$	56.95	\$	54.52
2030	3/1/2030	\$	54.04	\$	52.42
2030	4/1/2030	\$	47.18	\$	45.00
2030	5/1/2030	\$	40.89	\$	42.28
2030	6/1/2030	\$	28.57	\$	28.60
2030	7/1/2030	\$	54.23	\$	51.85
2030	8/1/2030	\$	58.26	\$	55.20
2030	9/1/2030	\$	60.61	\$	57.35
2030	10/1/2030	\$	59.91	\$	57.10
2030	11/1/2030	\$	58.41	\$	57.61
2030	12/1/2030	\$	62.94	\$	58.03
2031	1/1/2031	\$	62.75	\$	61.04
2031	2/1/2031	\$	61.77	\$	59.90
2031	3/1/2031	\$	58.49	\$	55.94
2031	4/1/2031	\$	52.08	\$	51.90
2031	5/1/2031	\$	48.76	\$	50.19
2031	6/1/2031	\$	36.68	\$	36.70
2031	7/1/2031	\$	57.78	\$	55.84
2031	8/1/2031	\$	63.30	\$	59.67
2031	9/1/2031	\$	65.42	\$	62.38
2031	10/1/2031	\$	65.77	\$	63.04
2031	11/1/2031	\$	63.64	\$	62.58
2031	12/1/2031	\$	67.49	\$	63.92
2032	1/1/2032	\$	67.77	\$	65.58
2032	2/1/2032	\$	67.31	\$	65.04
2032	3/1/2032	\$	60.59	\$	60.66
2032	4/1/2032	\$	55.28	\$	54.91
2032	5/1/2032	\$	48.43	\$	41.72
2032	6/1/2032	\$	34.58	\$	33.45
2032	7/1/2032	\$	64.54	\$	63.65
2032	8/1/2032	\$	71.15	\$	63.94
2032	9/1/2032	\$	70.86	\$	67.32
2032	10/1/2032	\$	69.91	\$	66.47
2032	11/1/2032	\$	70.02	\$	68.35
2032	12/1/2032	\$	72.31	\$	69.71
2033	1/1/2033	\$	72.37	\$	70.39
2033	2/1/2033	\$	73.03	\$	70.65
2033	3/1/2033	\$	66.37	\$	66.31
2033	4/1/2033	\$	58.75	\$	58.60
2033	5/1/2033	\$	50.23	\$	53.09
2033	6/1/2033	\$	47.69	\$	43.33
2033	7/1/2033	\$	68.63	\$	66.64
2033	8/1/2033	\$	74.06	\$	69.39
2033	9/1/2033	\$	75.38	\$	73.57
2033	10/1/2033	\$	76.66	\$	73.41
2033	11/1/2033	\$	75.63	\$	73.27
2033	12/1/2033	\$	78.13	\$	76.01
2034	1/1/2034	\$	77.28	\$	75.13
2034	2/1/2034	\$	77.91	\$	74.89
2034	3/1/2034	\$	69.31	\$	67.82
2034	4/1/2034	\$	58.88	\$	57.72
2034	5/1/2034	\$	51.26	\$	48.82
2034	6/1/2034	\$	39.01	\$	37.32
2034	7/1/2034	\$	72.31	\$	69.22

2034	8/1/2034	\$	77.40	\$	73.77
2034	9/1/2034	\$	80.10	\$	77.59
2034	10/1/2034	\$	81.41	\$	78.36
2034	11/1/2034	\$	79.52	\$	79.29
2034	12/1/2034	\$	81.61	\$	78.50
2035	1/1/2035	\$	82.85	\$	79.21
2035	2/1/2035	\$	78.28	\$	77.10
2035	3/1/2035	\$	72.39	\$	73.53
2035	4/1/2035	\$	60.72	\$	60.96
2035	5/1/2035	\$	53.08	\$	56.06
2035	6/1/2035	\$	36.36	\$	47.97
2035	7/1/2035	\$	73.16	\$	71.18
2035	8/1/2035	\$	81.56	\$	79.80
2035	9/1/2035	\$	83.56	\$	82.10
2035	10/1/2035	\$	82.82	\$	80.29
2035	11/1/2035	\$	80.66	\$	79.50
2035	12/1/2035	\$	84.36	\$	80.59
2036	1/1/2036	\$	84.63	\$	84.18
2036	2/1/2036	\$	82.25	\$	82.13
2036	3/1/2036	\$	74.35	\$	74.66
2036	4/1/2036	\$	62.98	\$	62.98
2036	5/1/2036	\$	46.65	\$	52.67
2036	6/1/2036	\$	29.03	\$	34.29
2036	7/1/2036	\$	76.82	\$	72.11
2036	8/1/2036	\$	83.73	\$	80.73
2036	9/1/2036	\$	88.25	\$	85.18
2036	10/1/2036	\$	88.76	\$	85.99
2036	11/1/2036	\$	82.86	\$	83.57
2036	12/1/2036	\$	88.91	\$	86.87
2037	1/1/2037	\$	88.74	\$	88.39
2037	2/1/2037	\$	88.68	\$	87.82
2037	3/1/2037	\$	77.40	\$	76.89
2037	4/1/2037	\$	64.30	\$	66.34
2037	5/1/2037	\$	59.06	\$	59.22
2037	6/1/2037	\$	47.11	\$	44.42
2037	7/1/2037	\$	81.40	\$	79.10
2037	8/1/2037	\$	89.99	\$	87.41
2037	9/1/2037	\$	93.77	\$	91.41
2037	10/1/2037	\$	93.43	\$	92.03
2037	11/1/2037	\$	89.21	\$	88.10
2037	12/1/2037	\$	93.26	\$	90.50
2038	1/1/2038	\$	91.41	\$	92.34
2038	2/1/2038	\$	92.62	\$	92.62
2038	3/1/2038	\$	79.83	\$	81.84
2038	4/1/2038	\$	66.56	\$	70.84
2038	5/1/2038	\$	53.63	\$	55.48
2038	6/1/2038	\$	41.19	\$	41.46
2038	7/1/2038	\$	90.14	\$	83.91
2038	8/1/2038	\$	96.30	\$	91.72
2038	9/1/2038	\$	99.04	\$	95.68
2038	10/1/2038	\$	98.73	\$	93.36
2038	11/1/2038	\$	95.24	\$	94.68
2038	12/1/2038	\$	98.66	\$	95.56
2039	1/1/2039	\$	99.35	\$	98.07
2039	2/1/2039	\$	98.68	\$	97.93
2039	3/1/2039	\$	83.84	\$	85.49
2039	4/1/2039	\$	70.20	\$	79.07
2039	5/1/2039	\$	60.01	\$	57.73
2039	6/1/2039	\$	47.76	\$	62.71

2039	7/1/2039	\$	93.78	\$	91.61
2039	8/1/2039	\$	101.02	\$	96.33
2039	9/1/2039	\$	104.78	\$	102.27
2039	10/1/2039	\$	102.33	\$	101.76
2039	11/1/2039	\$	100.52	\$	99.66
2039	12/1/2039	\$	103.98	\$	102.56
2040	1/1/2040	\$	103.36	\$	101.39
2040	2/1/2040	\$	101.06	\$	101.55
2040	3/1/2040	\$	87.85	\$	88.27
2040	4/1/2040	\$	76.17	\$	78.66
2040	5/1/2040	\$	60.36	\$	65.16
2040	6/1/2040	\$	47.26	\$	52.30
2040	7/1/2040	\$	101.87	\$	99.42
2040	8/1/2040	\$	108.64	\$	105.23
2040	9/1/2040	\$	112.20	\$	107.05
2040	10/1/2040	\$	110.94	\$	109.05
2040	11/1/2040	\$	106.40	\$	106.17
2040	12/1/2040	\$	107.65	\$	105.65
2041	1/1/2041	\$	108.46	\$	107.59
2041	2/1/2041	\$	105.74	\$	105.34
2041	3/1/2041	\$	94.25	\$	97.28
2041	4/1/2041	\$	81.68	\$	87.82
2041	5/1/2041	\$	72.99	\$	70.32
2041	6/1/2041	\$	36.87	\$	48.46
2041	7/1/2041	\$	102.01	\$	100.19
2041	8/1/2041	\$	108.84	\$	106.45
2041	9/1/2041	\$	114.10	\$	113.61
2041	10/1/2041	\$	109.18	\$	109.40
2041	11/1/2041	\$	106.62	\$	109.55
2041	12/1/2041	\$	113.82	\$	108.28
2042	1/1/2042	\$	112.45	\$	110.20
2042	2/1/2042	\$	109.76	\$	109.40
2042	3/1/2042	\$	97.62	\$	102.34
2042	4/1/2042	\$	86.30	\$	88.82
2042	5/1/2042	\$	62.88	\$	67.78
2042	6/1/2042	\$	37.07	\$	51.61
2042	7/1/2042	\$	104.65	\$	113.79
2042	8/1/2042	\$	115.95	\$	114.10
2042	9/1/2042	\$	119.02	\$	119.92
2042	10/1/2042	\$	115.10	\$	117.87
2042	11/1/2042	\$	109.34	\$	112.59
2042	12/1/2042	\$	115.48	\$	115.67
2043	1/1/2043	\$	113.31	\$	117.16
2043	2/1/2043	\$	114.39	\$	115.14
2043	3/1/2043	\$	98.97	\$	103.18
2043	4/1/2043	\$	86.93	\$	91.37
2043	5/1/2043	\$	72.30	\$	84.37
2043	6/1/2043	\$	60.53	\$	67.52
2043	7/1/2043	\$	111.67	\$	103.32
2043	8/1/2043	\$	120.05	\$	116.02
2043	9/1/2043	\$	124.32	\$	123.58
2043	10/1/2043	\$	118.30	\$	121.26
2043	11/1/2043	\$	116.86	\$	113.56
2043	12/1/2043	\$	124.28	\$	119.41
2044	1/1/2044	\$	125.98	\$	120.55
2044	2/1/2044	\$	123.40	\$	124.50
2044	3/1/2044	\$	108.40	\$	109.11
2044	4/1/2044	\$	92.93	\$	98.11
2044	5/1/2044	\$	77.12	\$	77.17

2044	6/1/2044	\$	67.65	\$	60.86
2044	7/1/2044	\$	119.23	\$	124.34
2044	8/1/2044	\$	129.88	\$	124.95
2044	9/1/2044	\$	133.14	\$	131.52
2044	10/1/2044	\$	130.44	\$	124.52
2044	11/1/2044	\$	125.90	\$	126.97
2044	12/1/2044	\$	130.70	\$	128.74
2045	1/1/2045	\$	129.95	\$	127.22
2045	2/1/2045	\$	131.13	\$	128.23
2045	3/1/2045	\$	111.31	\$	112.57
2045	4/1/2045	\$	98.55	\$	106.79
2045	5/1/2045	\$	84.88	\$	87.52
2045	6/1/2045	\$	73.87	\$	68.11
2045	7/1/2045	\$	127.74	\$	127.95
2045	8/1/2045	\$	134.15	\$	132.93
2045	9/1/2045	\$	138.44	\$	136.63
2045	10/1/2045	\$	136.53	\$	133.38
2045	11/1/2045	\$	131.86	\$	132.32
2045	12/1/2045	\$	136.17	\$	135.35
2046	1/1/2046	\$	139.63	\$	136.35
2046	2/1/2046	\$	134.58	\$	133.42
2046	3/1/2046	\$	122.26	\$	123.99
2046	4/1/2046	\$	103.98	\$	102.99
2046	5/1/2046	\$	87.52	\$	93.32
2046	6/1/2046	\$	74.20	\$	69.01
2046	7/1/2046	\$	132.07	\$	133.17
2046	8/1/2046	\$	145.54	\$	136.96
2046	9/1/2046	\$	149.33	\$	144.29
2046	10/1/2046	\$	144.39	\$	138.72
2046	11/1/2046	\$	136.06	\$	137.03
2046	12/1/2046	\$	142.93	\$	139.30
2047	1/1/2047	\$	142.26	\$	139.93
2047	2/1/2047	\$	138.05	\$	138.57
2047	3/1/2047	\$	126.77	\$	127.95
2047	4/1/2047	\$	112.47	\$	112.34
2047	5/1/2047	\$	94.33	\$	99.39
2047	6/1/2047	\$	75.48	\$	74.81
2047	7/1/2047	\$	137.75	\$	139.29
2047	8/1/2047	\$	148.26	\$	147.23
2047	9/1/2047	\$	154.93	\$	148.88
2047	10/1/2047	\$	146.75	\$	144.48
2047	11/1/2047	\$	139.55	\$	138.76
2047	12/1/2047	\$	147.78	\$	144.32
2048	1/1/2048	\$	145.81	\$	142.49
2048	2/1/2048	\$	142.77	\$	142.63
2048	3/1/2048	\$	126.13	\$	127.70
2048	4/1/2048	\$	110.82	\$	112.70
2048	5/1/2048	\$	89.64	\$	100.24
2048	6/1/2048	\$	75.98	\$	87.66
2048	7/1/2048	\$	141.98	\$	138.92
2048	8/1/2048	\$	151.37	\$	148.81
2048	9/1/2048	\$	158.78	\$	155.38
2048	10/1/2048	\$	151.59	\$	148.69
2048	11/1/2048	\$	145.92	\$	143.39
2048	12/1/2048	\$	152.76	\$	150.12
2049	1/1/2049	\$	148.73	\$	147.86
2049	2/1/2049	\$	150.37	\$	148.45
2049	3/1/2049	\$	130.07	\$	132.34
2049	4/1/2049	\$	116.54	\$	122.53

2049	5/1/2049	\$	99.84	\$	103.89
2049	6/1/2049	\$	88.62	\$	80.00
2049	7/1/2049	\$	150.85	\$	145.17
2049	8/1/2049	\$	159.04	\$	151.80
2049	9/1/2049	\$	161.63	\$	158.95
2049	10/1/2049	\$	156.26	\$	150.80
2049	11/1/2049	\$	151.34	\$	147.46
2049	12/1/2049	\$	159.32	\$	154.14
2050	1/1/2050	\$	156.06	\$	152.15
2050	2/1/2050	\$	155.77	\$	153.53
2050	3/1/2050	\$	134.51	\$	136.88
2050	4/1/2050	\$	119.77	\$	121.18
2050	5/1/2050	\$	106.27	\$	98.79
2050	6/1/2050	\$	90.29	\$	98.48
2050	7/1/2050	\$	151.30	\$	148.96
2050	8/1/2050	\$	166.54	\$	158.44
2050	9/1/2050	\$	170.48	\$	166.22
2050	10/1/2050	\$	164.96	\$	160.43
2050	11/1/2050	\$	158.25	\$	159.22
2050	12/1/2050	\$	163.51	\$	163.71

RPS Compliance Inputs IRP

Real or Nominal?	Real
Dollar Year:	2018
Source and Pg #:	2016 IRP Update
Source Link or File Name:	"RPSIncCost_2016IRPUpdate_CONF.xlsx"
Source Notes:	In the 2016 IRP Update, there was no incremental cost of PNW wind net of capacity value and energy value.

	RPS Compliance Cost (\$/MWh)	Avoided RPS Compliance Obligation (%)
2021	\$ -	20.00%
2022	\$ -	20.00%
2023	\$ -	20.00%
2024	\$ -	20.00%
2025	\$ -	27.00%
2026	\$ -	27.00%
2027	\$ -	27.00%
2028	\$ -	27.00%
2029	\$ -	27.00%
2030	\$ -	35.00%
2031	\$ -	35.00%
2032	\$ -	35.00%
2033	\$ -	35.00%
2034	\$ -	35.00%
2035	\$ -	45.00%
2036	\$ -	45.00%
2037	\$ -	45.00%
2038	\$ -	45.00%
2039	\$ -	45.00%
2040	\$ -	50.00%
2041	\$ -	50.00%
2042	\$ -	50.00%
2043	\$ -	50.00%
2044	\$ -	50.00%
2045	\$ -	50.00%
2046	\$ -	50.00%
2047	\$ -	50.00%
2048	\$ -	50.00%
2049	\$ -	50.00%
2050	\$ -	50.00%

Alternative Submissions	Rationale for alternative submission: The updated values are shaded in green. These values reflect a more current assessment of customer value and are primarily based on PGE's most recently filed IRP (2019 IRP).
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Global Assumptions Inputs				SOURCING					Update Status
				Provide as much detail as possible with sourcing including a link. Ensure that dollar years listed here are the same as the source.					
Avoided Cost Element	Units	Value	Dollar Year	Source	Source Page #	Table # (if applicable)	Source Link or File Name	Source Notes	
Inflation Rate	Percent	2.05%	N/A	2019 IRP	341	I-4	https://www.portlandgeneral.com/-/media/public/our-company/energy-strategy/documents/2019-integrated-resource-plan.pdf?la=en	Second Quarter 2018 Global Insight long-term forecast	Update
Real Discount Rate	Percent	4.41%	N/A	2019 IRP	341	I-4	https://www.portlandgeneral.com/-/media/public/our-company/energy-strategy/documents/2019-integrated-resource-plan.pdf?la=en	After-Tax Real Cost of Capital, calculated from Nominal Weighted After-Tax Cost of Capital and Long-Term General Inflation.	Update
Regional Act Credit	Percent	10.00%	N/A						No change
Transmission Loss Factor	Percent	1.90%	N/A	BPA Open Access Transmission Tariff, Effective Date: October 1, 2019	143		https://www.bpa.gov/transmission/Doing%20Business/Tariff/Documents/bpa-oatt-TC-20-settlement-tariff-100119.pdf	Real Power Loss factor for one segment of BPA transmission. This factor is for the losses external to PGE's system for avoided energy purchases, generation capacity, and risk value. This factor does not apply to the PGE Transmission in the Transmission Deferral Credit.	No change
Distribution Loss Factor, Commercial	Percent	4.15%	N/A	2015 GRC (UE 283) Line Loss Study (the most recent loss study)			Workpaper "LineLoss2015GRC_Dist_Commercial.xlsx"	Internal loss factor for Commercial loads based on weighted average of primary and secondary losses from the 2015 GRC Line Loss Study.	No change
Distribution Loss Factor, Industrial	Percent	1.45%	N/A	2015 GRC (UE 283) Line Loss Study (the most recent loss study)	1		"2015 GRC losses.pdf"	Internal loss factor from study for loads with subtransmission delivery voltage.	No change
Distribution Loss Factor, Residential	Percent	4.74%	N/A	2015 GRC (UE 283) Line Loss Study (the most recent loss study)	1		"2015 GRC losses.pdf"	Internal loss factor for loads with secondary delivery voltage.	No change
Risk Reduction Value	\$/MWh	\$3.00	2020	2019 IRP			Workpaper "EE_RiskCalc_2019IRP.xlsx"	Risk reduction value calculated from 2019 IRP values.	Update
Transmission Deferral Credit	\$/kW-yr	\$9.38	2019	2019 GRC (UE 335)			Workpaper "T&D 2019.xlsx"	2019 GRC, most recently approved GRC filing. TransmissionDeferralCredit = (TransmissionRevRea/TransmissionCOSPeak)	No change
Seasonal Capacity Split - Summer	Percent	50.00%	N/A					Capacity is more constrained in summer due to heat. 50/50 split is based on 2018 system load shape.	Update
Seasonal Capacity Split - Winter	Percent	50.00%	N/A					Day is intended to be weekday or weekend	Update
Summer Peak Period Definition	Month/Day/Hour	N/A	N/A					Day is intended to be weekday or weekend	No change
Winter Peak Period Definition	Month/Day/Hour	N/A	N/A					Day is intended to be weekday or weekend	No change
Deficiency start year	Year	2021	N/A	See Source Note				The year 2021 reflects PGE's understanding of the default value being the first year of Energy Trust's EE calculations. PGE may calculate an alternative transmission deficiency start year for future filings, but did not for this filing.	No change
Distribution Deferral Credit	\$/kW-yr	\$24.39	2019	2019 GRC (UE 335)			Workpaper "T&D 2019.xlsx"	2019 GRC, most recently approved GRC filing. DistributionDeferralCredit = (SubtransmissionMarginalCostRevenues/SubtransmissionRateclassPeak)+(SubstationMarginalCostRevenues/SubstationRateclassPeak)	No change
Seasonal Capacity Split - Summer	Percent	50.00%	N/A					Capacity is more constrained in summer due to heat. 50/50 split is based on 2018 system load shape.	Update
Seasonal Capacity Split - Winter	Percent	50.00%	N/A					Day is intended to be weekday or weekend	Update
Summer Peak Period Definition	Month/Day/Hour	N/A	N/A					Day is intended to be weekday or weekend	No change
Winter Peak Period Definition	Month/Day/Hour	N/A	N/A					Day is intended to be weekday or weekend	No change
Deficiency start year	Year	2021	N/A	See Source Note				The year 2021 reflects PGE's understanding of the default value being the first year of Energy Trust's EE calculations. PGE may calculate an alternative distribution deficiency start year for future filings, but did not for this filing.	No change
Generation Capacity Credit	\$/kW-yr	\$103.33	2020	2019 IRP	166			2019 IRP net cost of capacity.	Update
Seasonal Capacity Split - Summer	Percent	50.00%	N/A	Per previous assumption.				This is the seasonal capacity split used by Staff in the December 2018 process. PGE may calculate an alternative seasonal capacity split for future filings, but did not for this filing.	No change
Seasonal Capacity Split - Winter	Percent	50.00%	N/A	Per previous assumption.				This is the seasonal capacity split used by Staff in the December 2018 process. PGE may calculate an alternative seasonal capacity split for future filings, but did not for this filing.	No change
Deficiency start year	Year	2021	N/A	2019 IRP	288	Table G-2		2019 IRP Reference Case	Update to Source, no change to value
RPS Compliance Cost	\$/MWh	\$ -	2020	2019 IRP Errata Filing	5	Figure E5-3		In the 2019 IRP, there was no incremental cost of wind (SE Washington) net of capacity value and energy value. Figure E5-3 is a correction to Figure E-8 (2019 IRP, pg. 169).	Update to Source, no change to value
Avoided RPS Compliance Obligation	%	0.00%	N/A						No change

Alternative Submissions	Rationale for alternative submission: This aligns with the most recently filed IRP.
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Forward Price Inputs

Real or Nominal?	Nominal
Dollar Year:	n/a
Carbon Prices Additive?	Embedded in Market Prices
Carbon Value Units (\$/MWh)	2016\$/metric ton
Source and Pg #:	Wholesale market energy prices: 2019 IRP, pg 80-81. Carbon prices: 2019 IRP, pg 75-76.
Source Link or File Name:	https://www.portlandgeneral.com/-/media/public/our-company/energy-strategy/documents/2019-integrated-resource-plan.pdf?la=en
Source Notes:	Reference Case wholesale market energy prices. Reference Case carbon prices based on revised 2017 IEPR GHG Price Projections published 1-16-18.

NOTES:
 Please provide notes as to how this value relates to forward market prices. It can be expressed as a percentage of forward market prices, a set \$/MWh, or \$/ton. Please identify the units in the box to the left

Year	Date	MONTHLY		MONTHLY		Year	ANNUAL		ANNUAL		Carbon emissions price (2016\$ per metric ton)
		Wholesale Market Energy HLH Total (\$/MWh)	Wholesale Market Energy LLH Total (\$/MWh)	HLH Carbon Cost (\$/MWh) (OR % of HLH Price that accounts for Carbon?)	LLH Carbon Cost (\$/MWh) (OR % of LLH Price that accounts for Carbon?)		Wholesale Market Energy HLH Total (\$/MWh)	Wholesale Market Energy LLH Total (\$/MWh)			
2021	1/1/2021	See annual values in column J.	See annual values in column K.	See annual values in column L.	See annual values in column L.	2021	\$ 25.18	\$ 23.32	\$ 19.23		
2021	2/1/2021					2022	\$ 26.17	\$ 24.19	\$ 21.54		
2021	3/1/2021					2023	\$ 28.37	\$ 26.16	\$ 24.12		
2021	4/1/2021					2024	\$ 32.03	\$ 29.87	\$ 27.00		
2021	5/1/2021					2025	\$ 37.26	\$ 34.85	\$ 30.23		
2021	6/1/2021					2026	\$ 40.17	\$ 37.96	\$ 33.85		
2021	7/1/2021					2027	\$ 43.23	\$ 41.57	\$ 37.89		
2021	8/1/2021					2028	\$ 46.92	\$ 44.46	\$ 42.41		
2021	9/1/2021					2029	\$ 52.26	\$ 49.90	\$ 47.47		
2021	10/1/2021					2030	\$ 56.40	\$ 53.88	\$ 53.16		
2021	11/1/2021					2031	\$ 59.62	\$ 56.83	\$ 53.16		
2021	12/1/2021					2032	\$ 61.70	\$ 59.26	\$ 53.16		
2022	1/1/2022					2033	\$ 67.08	\$ 64.61	\$ 53.16		
2022	2/1/2022					2034	\$ 69.56	\$ 67.30	\$ 53.16		
2022	3/1/2022					2035	\$ 72.12	\$ 70.08	\$ 53.16		
2022	4/1/2022					2036	\$ 73.74	\$ 70.34	\$ 53.16		
2022	5/1/2022					2037	\$ 76.75	\$ 74.18	\$ 53.16		
2022	6/1/2022					2038	\$ 78.41	\$ 75.58	\$ 53.16		
2022	7/1/2022					2039	\$ 82.75	\$ 79.63	\$ 53.16		
2022	8/1/2022					2040	\$ 84.93	\$ 81.90	\$ 53.16		
2022	9/1/2022					2041	\$ 87.69	\$ 85.35	\$ 53.16		
2022	10/1/2022					2042	\$ 88.79	\$ 86.36	\$ 53.16		
2022	11/1/2022					2043	\$ 91.51	\$ 88.70	\$ 53.16		
2022	12/1/2022					2044	\$ 92.28	\$ 89.03	\$ 53.16		
2023	1/1/2023					2045	\$ 95.25	\$ 92.61	\$ 53.16		
2023	2/1/2023					2046	\$ 96.48	\$ 93.83	\$ 53.16		
2023	3/1/2023					2047	\$ 99.45	\$ 95.71	\$ 53.16		
2023	4/1/2023					2048	\$ 99.44	\$ 97.38	\$ 53.16		
2023	5/1/2023					2049	\$ 103.25	\$ 101.08	\$ 53.16		
2023	6/1/2023					2050	\$ 104.93	\$ 101.18	\$ 53.16		

Alternative Submissions	Rationale for alternative submission: This aligns with the most recently filed IRP. (No change to the input value.)
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RPS Compliance Inputs IRP

Real or Nominal?	Real
Dollar Year:	2020
Source and Pg #:	2019 IRP Errata Filing, pg 5, Figure ES-3. This is a correction to Figure 6-8 in the 2019 IRP (pg 169).
Source Link or File Name:	https://www.portlandgeneral.com/-/media/public/our-company/energy-strategy/documents/2019-integrated-resource-plan.pdf?la=en
Source Notes:	In the 2019 IRP, there was no incremental cost of wind (SE Washington) net of capacity value and energy value.

	RPS Compliance Cost (\$/MWh)	Avoided RPS Compliance Obligation (%)
2021 \$	-	20.00%
2022 \$	-	20.00%
2023 \$	-	20.00%
2024 \$	-	20.00%
2025 \$	-	27.00%
2026 \$	-	27.00%
2027 \$	-	27.00%
2028 \$	-	27.00%
2029 \$	-	27.00%
2030 \$	-	35.00%
2031 \$	-	35.00%
2032 \$	-	35.00%
2033 \$	-	35.00%
2034 \$	-	35.00%
2035 \$	-	45.00%
2036 \$	-	45.00%
2037 \$	-	45.00%
2038 \$	-	45.00%
2039 \$	-	45.00%
2040 \$	-	50.00%
2041 \$	-	50.00%
2042 \$	-	50.00%
2043 \$	-	50.00%
2044 \$	-	50.00%
2045 \$	-	50.00%
2046 \$	-	50.00%
2047 \$	-	50.00%
2048 \$	-	50.00%
2049 \$	-	50.00%
2050 \$	-	50.00%

