



e-FILING REPORT COVER SHEET

Send completed Cover Sheet and the Report in an email addressed to: PUC.FilingCenter@state.or.us

REPORT NAME: OAR 860-084-0370(1), Solar Photovoltaic Pilot Program Resource Value Estimate and OAR 860-084-0380(2), Solar Photovoltaic Pilot Programs Rate Impact Estimate

COMPANY NAME: Portland General Electric

DOES REPORT CONTAIN CONFIDENTIAL INFORMATION? No Yes

If yes, please submit only the cover letter electronically. Submit confidential information as directed in OAR 860-001-0070 or the terms of an applicable protective order.

If known, please select designation: RE (Electric) RG (Gas) RW (Water) RO (Other)

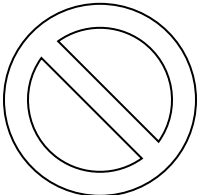
Report is required by: OAR
Statute
Order No. 12-396
Other

Is this report associated with a specific docket/case? No Yes

If yes, enter docket number: UM 1559

List applicable Key Words for this report to facilitate electronic search:

DO NOT electronically file with the PUC Filing Center:



- Annual Fee Statement form and payment remittance or
- OUS or RSPF Surcharge form or surcharge remittance or
- Any other Telecommunications Reporting or
- Any daily safety or safety incident reports or
- Accident reports required by ORS 654.715

Please file the above reports according to their individual instructions.



Portland General Electric Company
121 SW Salmon Street • Portland, Oregon 97204
PortlandGeneral.com

January 22, 2014

Filing Center
Public Utility Commission of Oregon
3930 Fairview Industrial Dr. SE
PO Box 1088
Salem, OR 97308-1088

**Re: UM 1559 – PGE Supplemental Compliance Filing per Commission Order
No. 12-396 – Energy and Capacity Value of Solar**

Attn. Filing Center:

In compliance with Commission Order No. 12-396 (Order), PGE filed estimates of the Solar Photovoltaic Pilot Program resource value using the standard and renewable avoided cost methods on November 1, 2012¹. The Order also requires PGE to provide an Integrated Resource Plan (IRP) modeling methodology to calculate the energy and capacity value of solar according to specific criteria.

When PGE provided estimates of the solar resource value using the standard and renewable avoided cost methodologies in its November 1, 2012 filing, we requested additional time to perform the IRP methodology calculations in order for it to be developed within PGE's IRP process and thus correspond with PGE's recently distributed Draft IRP. PGE now provides the following information in this Supplemental filing:

1. The calculated energy value of Portland-area distributed solar systems based on the incremental addition of 20 megawatts of solar capacity (showing system cost differences hourly and monthly on- and off-peak), using our IRP methodology, and the corresponding capacity value using the Effective Load Carrying Capability (ELCC) method.
2. The 15-year nominal levelized energy and capacity value of solar using the IRP methodology.
3. Updated solar resource values using the standard and renewable avoided costs approved by the Commission in Order No. 13-378.

¹ OAR 860-084-0370(1), November 1, 2012 Informational Filing

Below are updated estimates of the solar resource value using standard and renewable avoided cost methodologies since the November 1, 2012 filing. Also provided is the solar resource value using the IRP methodology.

15-year nominal levelized solar resource values

Standard Avoided Cost	\$67.03 in 2014\$
Renewable Avoided Cost	\$66.65 in 2014\$
IRP Methodology	\$55.19 in 2014\$

One fundamental difference between the avoided cost values and IRP-based values shown above is that the avoided cost values are based on a wholesale market-based price curve through 2020, during the sufficiency period. From 2021 onward, in the deficiency period, the values substantially increase because they are based on the fully allocated costs of a generic combined cycle combustion turbine which includes both fixed and variable costs.

The values in the IRP methodology are based on output from PGE's AURORAxmp planning model. PGE uses the AURORAxmp to assess western electricity supply and demand as well as resource dispatch costs and resulting fundamentals-based market prices on an hourly basis for the entire Western Electricity Coordinating Council region over the planning horizon. In this solar resource value context, the prices gradually increase over the term; however, such prices generally remain below fully-allocated cost. For further information about the AURORAxmp modeling methodology, see Chapter 9 of PGE's recently filed Draft IRP².

Attachment A provides general information about how PGE derived a Portland-area distributed solar photovoltaic (PV) capacity value using the ELCC methodology. Generally, the ELCC represents the amount of incremental load that can be met with a given amount (assumed at 20 MW for this analysis) of incremental distributed solar PV while maintaining the same expected level of reliability, as measured by Expected Unserved Energy over all 8,760 hours of the year. PGE determined the annual average capacity value of Portland-area distributed generation solar using the ELCC methodology is 5.7 percent of the nameplate solar PV. Looking seasonally, the solar ELCC will be greater than 5.7 percent in the summer and nearly zero percent in the winter. PGE will gradually transition from winter peaking to dual peaking, at normal weather, by the end of the current planning horizon. In the IRP-based solar resource value calculation of the capacity payment, PGE uses a five percent capacity value.

Attachment B provides a table with the estimated energy and capacity values separately as well as a combined total using the IRP methodology. The energy resource value is derived from PGE's AURORAxmp planning model where the 15-year levelized nominal energy cost is estimated at \$51.10 MWh. The estimated capacity resource value is \$4.09 MWh and is based on fixed costs of a simple cycle combustion turbine. When the energy and capacity estimated resource values are combined the total 15-year nominal

² http://www.portlandgeneral.com/our_company/energy_strategy/resource_planning/irp.aspx

levelized solar resource value is estimated to be \$55.19 MWh. The estimate: 1) removes the assumption of a future carbon tax, 2) increases revenues to account for avoided line losses, and 3) subtracts integration costs.

Attachment B also provides annual and monthly on- and off-peak system cost estimates. For the cost differences, the assumption is that the 20 MW of distributed solar displaces market purchases. This means that PGE would have to procure the same energy on the spot market in lieu of solar. The cost to procure solar is determined by a weighted average of the prices paid to customer with solar systems and capacity and its integration cost. Other costs may also apply, but PGE has not assessed any other additional costs in this filing. The estimated system cost difference is the cost to purchase solar minus the net variable power costs associated to it (lower market purchases net of integration costs). PGE will provide the hourly system cost differences on request.

Attachment C provides updated 15-year levelized solar resource values for standard and renewable avoided costs based upon PGE Schedules 201 and 211. Schedule 201 is based on PGE's currently approved avoided costs to be effective February 20, 2014 in Order No. 13-378. The monthly prices are shaped into an annual figure using an updated solar shape for a Portland PV system. On-peak prices account for a 6/7th weighting and off-peak prices account for a 1/7th weighting. These weightings assume solar production occurs during on-peak hours, Monday through Saturday, while Sunday is off-peak. The annual prices are then levelized over 15 years starting January 1, 2014. To that levelized value, PGE adds our full internal line loss factor, from transmission to secondary voltage.

If you have any questions regarding this filing, please contact Bonnie Gariety at (503) 464-7470.

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

Sincerely,



Karla Wenzel
Manager, Pricing & Tariffs

KW/sp

cc: Internal Distribution List
Aster Adams, OPUC
Adam Bless, OPUC

Encls:

ELCC: Deriving Expected Unserved Energy

- Methodology:
 - Use stochastic inputs for PGE load, wind, hydro and generating plant forced outages.
 - Spot electricity market prices are set to be very high in order to force all PGE resources (owned & contracted) to be dispatched before resorting to “outside” supply.
 - Run AURORAxmp dispatch model hourly for the year of interest for 100 iterations.

- Expected Unserved Energy (EUE): measures the **magnitude** of total annual energy needed to fill customer needs beyond available supply:

$$EUE \text{ (MWa)} = \frac{1}{100} * \left(\sum_1^{100} \frac{\text{amount of power to purchase (MWh)}}{\# \text{ Hours in year}} \right)$$

- More detail is found in the slides from PGE’s fourth public meeting and in the Draft IRP filing.

Capacity Contribution of Distributed Solar: ELCC Approach

- Perform a reliability analysis using a reference case that doesn't include incremental Portland-area distributed solar in the resource portfolio.
- Calculate total annual MWh of Expected (i.e., mean, or 1-in-2 probability) Unserved Energy (EUE ref. case).
- Make the following two changes:
 1. Add 20 MW of distributed solar to PGE's resource portfolio based on Portland-area hourly solar generation profiles.
 2. Increase all hourly loads by a constant percentage (P), such that the same expected unserved energy is achieved, i.e. maintains EUE ref. case.
- Multiply PGE's annual average load by P, i.e. Load average * P. Call this result Delta annual average load.
- Then ELCC is equal to Delta annual average load / 20.

Distributed Solar ELCC Result

- Base case EUE is 0.759 MWa.
- Make two changes:
 1. Add 20 MW of distributed solar to PGE resource portfolio.
 2. Augment all hourly loads by 0.0503 percent.
- Verify that, with both changes, EUE remains 0.759 MWa, i.e. the 20 MW of distributed solar just offsets a 0.0503 percent hourly load increase.
- Calculate the average load increase, which is PGE's annual average load (approximately 2,250 MWa), multiplied by the 0.0503 percent factor, i.e. $2250 * 0.0503\%$, which equals 1.13 MWa.
- This establishes that the 20 MW of distributed solar can carry 1.13 MWa of additional load, while maintaining EUE at 0.759 MWa.
- Then the distributed solar ELCC is $1.13 / 20$, or 5.7 percent.

Distributed Solar ELCC Discussion

- For context for the 5.7% ELCC result, the annual capacity factor for fixed-mount Portland area solar PV is 12-13% (DC to AC).
- This solar ELCC result measures a 50% probability capacity contribution when looking at the entire year (8760 hours).
- Looking seasonally, the solar ELCC will be greater than 5.7% in the summer, and nearly 0% in the winter. PGE will remain winter-peaking for at least the next decade (at normal weather).
- The effect of solar generation for PGE (absent load increases) is to improve reliability in the summer while providing no appreciable improvement in the more constrained winter.

Portland General Electric
Docket No. UM 1559 - Solar Resource Value
IRP Methodology
15-Year Nominal Levelized Solar Resource Value
December 1, 2013

Year	Total Revenues w/o CO2 Tax Nominal \$ in 2014	Total Revenues with line losses (MWh)	Generation (MWh)	(Revenues / Generation) \$/MWh	Integration Cost (\$/MWh)	Energy Payment (Variable Cost) (\$/MWh)	Capacity Payment (Fixed Cost) (\$/MWh)	Total Payment (Energy\$ + Capacity\$) (\$/MWh)
2014	\$866,256	\$ 937,289	22,935	\$40.87	\$2.62	\$38.25	\$0.00	\$38.25
2015	\$880,482	\$ 952,681	22,935	\$41.54	\$2.62	\$38.92	\$0.00	\$38.92
2016	\$900,187	\$ 974,002	22,935	\$42.47	\$2.62	\$39.85	\$0.00	\$39.85
2017	\$988,010	\$ 1,069,027	22,935	\$46.61	\$2.62	\$43.99	\$0.00	\$43.99
2018	\$1,078,233	\$ 1,166,648	22,935	\$50.87	\$2.62	\$48.25	\$0.00	\$48.25
2019	\$1,158,762	\$ 1,253,781	22,935	\$54.67	\$2.62	\$52.05	\$0.00	\$52.05
2020	\$1,172,026	\$ 1,268,132	22,935	\$55.29	\$2.62	\$52.68	\$0.00	\$52.68
2021	\$1,175,726	\$ 1,272,135	22,935	\$55.47	\$2.62	\$52.85	\$9.49	\$62.34
2022	\$1,221,997	\$ 1,322,201	22,935	\$57.65	\$2.62	\$55.03	\$9.66	\$64.70
2023	\$1,375,982	\$ 1,488,812	22,935	\$64.91	\$2.62	\$62.30	\$9.84	\$72.14
2024	\$1,425,879	\$ 1,542,801	22,935	\$67.27	\$2.62	\$64.65	\$10.02	\$74.67
2025	\$1,437,590	\$ 1,555,473	22,935	\$67.82	\$2.62	\$65.20	\$10.21	\$75.41
2026	\$1,450,800	\$ 1,569,766	22,935	\$68.44	\$2.62	\$65.83	\$10.39	\$76.22
2027	\$1,445,699	\$ 1,564,247	22,935	\$68.20	\$2.62	\$65.59	\$10.59	\$76.17
2028	\$1,416,681	\$ 1,532,849	22,935	\$66.83	\$2.62	\$64.22	\$10.78	\$75.00
15-Year Nominal Levelized =>						\$51.10	\$4.09	\$55.19

IRP Sufficiency Period

- After tax nominal cost of capital 7.11%
- Secondary line losses 8.20%
- Inflation rate 1.84%
- IRP capacity value 5.00%
- Capacity factor - based on generic distributed generation solar resource 15.4%

IRP typically assumes carbon regulation starting in 2023 and the CO2 tax is not included in the stream of energy payments shown above.

Portland Generation Electric
Docket No. UM 1559
Estimate of Annual System Cost Difference

	a	b	c	(b - a) d	(c x d)
Year	Energy Payment (Variable Cost) \$/MWh	Estimated Payment to Procure Solar \$/MWh	Solar Generation (MWh)	Estimated System Cost Difference \$/MWh	Nominal \$
2014	(\$38.25)	\$174	22,935	\$136	\$3,120,121
2015	(\$38.92)	\$178	22,935	\$139	\$3,181,917
2016	(\$39.85)	\$181	22,935	\$141	\$3,239,274
2017	(\$43.99)	\$185	22,935	\$141	\$3,224,447
2018	(\$48.25)	\$188	22,935	\$140	\$3,208,571
2019	(\$52.05)	\$192	22,935	\$140	\$3,204,763
2020	(\$52.68)	\$195	22,935	\$143	\$3,275,344
2021	(\$52.85)	\$199	22,935	\$146	\$3,357,915
2022	(\$55.03)	\$203	22,935	\$148	\$3,396,093
2023	(\$62.30)	\$207	22,935	\$145	\$3,319,431
2024	(\$64.65)	\$211	22,935	\$146	\$3,357,128
2025	(\$65.20)	\$215	22,935	\$150	\$3,437,913
2026	(\$65.83)	\$219	22,935	\$153	\$3,518,880
2027	(\$65.59)	\$223	22,935	\$158	\$3,621,499
2028	(\$64.22)	\$228	22,935	\$164	\$3,751,872
	(\$51.10)			\$144	

Legend:

Net Power Cost: Variable cost - Revenues

System Cost: Net power cost + Fixed and Capital Costs

Solar procurement cost is equal net metering and solar payment option rates.

Costs 2015 and forward are escalated at inflation

Financial Assumptions

Inflation	1.93%
Nominal cost of capital	7.11%

Distributed Generation Solar System Price and Capacity Assumptions

SPO Average Price (2014-2025)	\$0.35	per kWh
NEM Approximate Retail Rate	\$0.10	per kWh
SPO Approximate Capacity in 2012	9.6	MW AC
NEM Approximate Capacity in 2012	22.7	MW AC
Total SPO and NEM	32.3	MW AC
Percent of SPO Capacity	30%	
Percent of NEM Capacity	70%	
Solar Capacity Factor	0.12	

Monthly System Cost Difference, Nominal \$ (This is the difference between the total cost of distributed solar and the cost of market purchases for the same MWh)

On-Peak	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
1	\$118,284	\$121,795	\$116,152	\$109,778	\$106,224	\$116,941	\$128,204	\$123,748	\$119,053	\$116,027	\$110,100	\$132,350	\$136,130	\$131,415	\$128,215
2	\$122,658	\$125,068	\$130,991	\$135,659	\$143,663	\$130,948	\$131,687	\$140,551	\$149,597	\$142,789	\$149,571	\$136,741	\$140,816	\$148,270	\$161,391
3	\$219,415	\$228,783	\$237,144	\$236,897	\$238,782	\$223,951	\$245,019	\$254,888	\$257,853	\$251,818	\$236,329	\$255,978	\$266,657	\$274,483	\$282,307
4	\$254,749	\$263,301	\$274,071	\$263,632	\$270,403	\$264,017	\$275,172	\$297,091	\$291,556	\$273,258	\$283,039	\$291,854	\$301,964	\$324,750	\$311,352
5	\$346,672	\$336,238	\$342,001	\$350,763	\$359,965	\$358,022	\$357,012	\$365,906	\$360,293	\$366,920	\$378,950	\$392,411	\$384,773	\$402,951	\$413,521
6	\$333,606	\$347,816	\$336,020	\$332,313	\$337,747	\$322,882	\$359,851	\$364,441	\$357,253	\$347,749	\$341,405	\$369,553	\$386,574	\$392,564	\$385,487
7	\$349,232	\$356,173	\$360,728	\$341,270	\$328,497	\$350,140	\$353,497	\$373,495	\$375,088	\$348,828	\$368,589	\$374,993	\$379,134	\$402,263	\$398,895
8	\$288,132	\$303,300	\$312,895	\$297,306	\$293,422	\$290,568	\$293,811	\$290,922	\$309,492	\$292,044	\$291,845	\$290,549	\$308,546	\$309,080	\$332,787
9	\$261,340	\$288,848	\$276,789	\$259,069	\$254,515	\$243,426	\$290,503	\$287,180	\$284,466	\$260,850	\$252,959	\$276,698	\$311,184	\$308,836	\$298,016
10	\$191,968	\$194,110	\$216,366	\$210,449	\$214,197	\$210,510	\$197,636	\$223,638	\$224,631	\$214,587	\$224,709	\$211,175	\$216,230	\$244,743	\$247,981
11	\$95,816	\$97,053	\$110,397	\$103,950	\$103,128	\$91,885	\$100,658	\$107,134	\$115,503	\$105,581	\$96,829	\$108,278	\$108,020	\$114,620	\$120,175
12	\$67,884	\$67,553	\$72,959	\$66,389	\$76,190	\$73,819	\$70,187	\$69,323	\$74,493	\$66,518	\$74,251	\$74,782	\$73,022	\$73,386	\$75,872

Off-Peak	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
1	\$10,919	\$10,331	\$18,480	\$25,492	\$28,852	\$19,632	\$11,822	\$19,532	\$26,458	\$26,922	\$29,675	\$12,161	\$11,631	\$20,799	\$28,614
2	\$28,576	\$27,780	\$24,409	\$20,484	\$12,464	\$27,511	\$30,776	\$26,373	\$19,574	\$21,370	\$12,913	\$32,124	\$31,608	\$28,124	\$21,372
3	\$42,614	\$38,532	\$35,022	\$37,626	\$36,569	\$56,209	\$40,488	\$38,756	\$37,786	\$38,969	\$59,158	\$48,955	\$43,914	\$41,700	\$43,657
4	\$48,901	\$46,249	\$42,496	\$54,612	\$47,748	\$51,717	\$48,596	\$34,663	\$45,021	\$56,754	\$54,647	\$54,889	\$52,909	\$37,699	\$64,250
5	\$51,266	\$66,554	\$71,448	\$62,108	\$51,107	\$58,053	\$69,657	\$64,772	\$75,889	\$64,710	\$60,854	\$56,105	\$75,864	\$70,605	\$71,851
6	\$55,059	\$43,203	\$61,139	\$64,571	\$66,494	\$81,546	\$45,247	\$49,289	\$64,456	\$67,369	\$85,916	\$61,640	\$48,448	\$52,205	\$75,005
7	\$54,618	\$58,805	\$60,382	\$72,079	\$80,299	\$52,326	\$59,662	\$53,777	\$62,361	\$72,709	\$55,956	\$58,953	\$63,795	\$58,095	\$82,028
8	\$58,662	\$53,538	\$49,688	\$55,410	\$46,863	\$49,038	\$54,165	\$66,087	\$50,674	\$55,031	\$49,860	\$63,194	\$57,853	\$70,551	\$63,317
9	\$42,924	\$22,054	\$42,879	\$58,671	\$59,020	\$62,761	\$22,653	\$38,604	\$45,734	\$61,045	\$66,977	\$48,438	\$24,532	\$41,974	\$69,614
10	\$47,328	\$48,805	\$29,422	\$34,259	\$30,513	\$32,121	\$50,835	\$32,648	\$31,083	\$35,781	\$34,092	\$52,829	\$55,077	\$35,054	\$40,249
11	\$18,454	\$21,115	\$6,462	\$15,079	\$16,416	\$27,508	\$22,416	\$17,612	\$6,644	\$15,168	\$28,804	\$20,935	\$23,618	\$18,838	\$17,163
12	\$11,044	\$14,914	\$10,931	\$16,582	\$5,495	\$9,232	\$15,790	\$17,485	\$11,136	\$16,633	\$9,700	\$12,324	\$16,580	\$18,495	\$18,752

Portland General Electric
15-Year Levelized Resource Value Estimate from PGE's 2012 Renewable Avoided Cost Filing

Year	On-peak Prices (nominal)												Annual*
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2014	30.54	28.11	24.25	25.08	20.15	16.81	30.82	36.66	33.77	29.68	31.54	33.91	27.65
2015	32.98	30.39	26.25	27.14	21.86	18.31	33.27	39.53	36.43	32.06	34.05	36.59	29.89
2016	36.05	33.25	28.78	29.73	24.04	20.18	36.37	43.13	39.78	35.06	37.20	39.95	32.71
2017	39.11	36.09	31.29	32.32	26.20	22.06	39.45	46.71	43.11	38.04	40.34	43.30	35.52
2018	41.62	38.44	33.37	34.45	27.97	23.59	41.99	49.67	45.87	40.50	42.93	46.05	37.84
2019	42.35	39.11	33.95	35.05	28.45	23.99	42.73	50.55	46.68	41.21	43.69	46.86	38.49
2020	95.21	95.50	94.20	97.38	113.90	118.54	96.77	100.57	96.61	95.91	96.46	96.89	101.49
2021	96.50	96.95	96.49	99.13	112.84	121.08	98.52	103.20	98.79	97.75	97.78	98.05	103.12
2022	98.37	98.65	97.65	100.67	118.26	121.70	99.66	103.65	100.00	99.41	99.41	99.56	104.81
2023	99.79	99.70	98.53	100.82	118.12	123.44	99.83	103.63	101.04	100.70	99.85	100.56	105.46
2024	101.95	102.04	101.02	101.83	114.19	122.94	102.83	106.58	104.04	102.16	101.15	103.18	106.71
2025	103.15	102.99	102.15	103.35	116.02	124.72	103.76	109.37	104.74	104.15	102.79	104.64	108.26
2026	104.58	105.05	103.22	104.93	116.38	125.08	105.00	111.39	106.76	105.01	105.26	106.03	109.54
2027	106.58	106.91	104.65	106.95	118.15	125.95	107.40	113.38	108.23	106.50	106.10	106.85	111.21
2028	107.70	107.71	105.99	108.77	118.19	127.59	108.99	113.65	109.71	108.93	107.07	108.85	112.45
2029	110.22	109.71	107.92	109.75	117.98	128.89	110.94	115.90	112.31	109.72	108.87	110.51	113.99
2030	110.94	110.15	109.25	111.64	118.51	130.91	111.89	116.91	113.88	110.90	109.89	111.80	115.20
2031	112.35	111.10	111.07	113.11	120.04	131.74	114.09	120.16	114.66	112.70	111.58	113.03	116.87
2032	114.11	113.44	112.17	115.30	121.93	131.83	116.79	122.50	116.41	114.31	113.40	114.03	118.63
2033	116.30	114.39	113.63	116.61	122.52	130.93	117.63	123.05	118.20	115.44	115.08	115.59	119.53
2034	118.44	116.49	115.72	119.24	123.98	133.34	119.79	125.31	120.37	117.57	117.20	118.14	121.68

**Portland General Electric
 15-Year Levelized Resource Value Estimate from PGE's 2012 Renewable Avoided Cost Filing**

Year	Off-peak Prices (nominal)												Annual*
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2014	24.33	23.19	21.38	9.68	6.74	3.06	15.56	23.54	25.46	24.66	26.18	28.25	17.05
2015	26.72	25.49	23.52	10.88	7.69	3.71	17.24	25.87	27.93	27.08	28.72	30.95	18.84
2016	28.98	27.65	25.55	11.99	8.58	4.32	18.81	28.05	30.27	29.35	31.12	33.51	20.53
2017	31.53	30.10	27.84	13.27	9.60	5.01	20.59	30.53	32.92	31.93	33.82	36.40	22.45
2018	34.07	32.55	30.14	14.53	10.61	5.71	22.38	33.01	35.57	34.51	36.53	39.29	24.36
2019	34.66	33.11	30.66	14.76	10.77	5.78	22.76	33.58	36.19	35.11	37.17	39.98	24.77
2020	71.67	71.61	74.10	68.86	49.11	39.90	69.51	66.02	69.92	70.69	71.43	69.34	63.85
2021	74.74	73.52	73.64	70.18	54.02	40.14	70.83	66.25	70.65	73.16	72.03	71.48	65.33
2022	75.99	74.99	75.85	71.87	50.77	43.08	74.36	67.54	72.78	74.67	73.59	73.20	66.80
2023	77.89	77.39	78.51	76.78	51.39	44.55	77.84	71.45	75.21	76.73	76.84	76.92	69.48
2024	77.72	77.95	80.09	78.06	60.79	52.87	76.52	71.31	76.49	77.44	79.00	77.36	71.96
2025	80.10	80.81	82.49	79.99	62.28	54.44	79.26	73.33	78.08	78.71	81.84	78.03	73.93
2026	82.22	82.07	85.04	81.89	68.35	54.31	81.64	74.67	79.38	81.63	82.63	80.21	76.11
2027	84.75	83.69	86.30	83.27	70.08	57.28	82.50	76.12	81.53	84.85	84.45	83.25	77.99
2028	87.38	86.61	88.69	86.20	71.80	59.26	85.74	78.09	83.72	85.81	87.34	85.91	80.30
2029	87.18	88.35	90.36	89.06	76.42	61.78	87.38	79.31	85.86	87.87	89.18	87.93	82.50
2030	90.59	92.08	93.73	89.77	80.10	66.78	89.27	82.32	88.07	90.65	92.16	90.49	85.43
2031	93.12	95.21	95.68	92.22	82.48	69.98	90.73	84.16	90.09	92.64	95.18	92.19	87.67
2032	95.27	96.44	97.96	93.77	86.27	71.14	91.55	85.55	92.25	95.93	96.37	95.38	89.63
2033	97.84	99.86	100.59	96.61	89.95	77.01	96.16	87.55	94.43	98.93	98.69	97.87	92.98
2034	99.64	101.70	102.44	98.79	91.01	78.43	97.93	89.16	96.17	100.75	100.51	100.03	94.67

**Portland General Electric
15-Year Levelized Resource Value Estimate from PGE's 2012 Renewable Avoided Cost Filing**

Year	Weighted (nominal)												Annual*
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2014	29.65	27.40	23.84	22.88	18.23	14.84	28.64	34.78	32.58	28.96	30.77	33.10	26.13
2015	32.08	29.69	25.86	24.82	19.83	16.22	30.98	37.58	35.21	31.35	33.29	35.78	28.31
2016	35.04	32.45	28.32	27.19	21.83	17.91	33.86	40.97	38.42	34.24	36.33	39.03	30.97
2017	38.03	35.24	30.80	29.60	23.83	19.63	36.76	44.40	41.66	37.17	39.41	42.32	33.65
2018	40.55	37.60	32.91	31.61	25.49	21.04	39.19	47.29	44.40	39.65	42.02	45.09	35.91
2019	41.25	38.26	33.48	32.15	25.92	21.39	39.88	48.13	45.18	40.34	42.75	45.88	36.53
2020	91.84	92.08	91.32	93.30	104.65	107.31	92.87	95.63	92.79	92.31	92.89	92.96	96.11
2021	93.39	93.60	93.22	95.00	104.43	109.52	94.57	97.92	94.77	94.23	94.10	94.26	97.72
2022	95.18	95.27	94.53	96.55	108.62	110.47	96.05	98.49	96.11	95.88	95.72	95.79	99.38
2023	96.66	96.51	95.67	97.39	108.59	112.17	96.69	99.03	97.35	97.28	96.56	97.18	100.32
2024	98.49	98.60	98.03	98.43	106.56	112.93	99.07	101.55	100.10	98.63	97.98	99.49	101.75
2025	99.86	99.82	99.34	100.01	108.34	114.68	100.26	104.22	100.93	100.52	99.80	100.84	103.35
2026	101.39	101.77	100.62	101.64	109.52	114.97	101.66	106.15	102.85	101.67	102.03	102.34	104.77
2027	103.46	103.59	102.03	103.57	111.28	116.14	103.84	108.06	104.41	103.40	103.00	103.48	106.47
2028	104.79	104.70	103.52	105.55	111.57	117.83	105.67	108.57	106.00	105.63	104.25	105.57	107.86
2029	106.92	106.66	105.41	106.79	112.05	119.30	107.58	110.67	108.53	106.59	106.06	107.29	109.49
2030	108.03	107.57	107.03	108.51	113.03	121.75	108.66	111.97	110.19	108.01	107.36	108.75	110.95
2031	109.61	108.83	108.88	110.12	114.68	122.91	110.75	115.02	111.15	109.84	109.23	110.05	112.70

* Weighted for expected monthly solar output for Portland, OR from NREL	15-year Real Levelized (2014-2028; 2014\$) Avoided T&D Line Losses from PGE Trans. System to Meter Grossed-up for Line Losses	\$55.01 N/A 6.14% \$58.61
	15-year Nominal Levelized (2014-2028; 2014\$) Avoided T&D Line Losses from PGE Trans. System to Meter Grossed-up for Line Losses	\$62.55 N/A 6.14% \$66.65

**Portland General Electric
15-Year Levelized Resource Value Estimate from PGE's 2013 Avoided Cost Filing with Sufficiency Period Price Update**

Year	On-peak Prices (nominal)												Annual*
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2014	39.69	37.26	33.40	34.23	29.30	25.96	39.97	45.81	42.92	38.83	40.69	43.06	36.80
2015	42.51	39.92	35.78	36.67	31.39	27.84	42.80	49.06	45.96	41.59	43.58	46.12	39.42
2016	45.84	43.04	38.57	39.52	33.83	29.97	46.16	52.92	49.57	44.85	46.99	49.74	42.50
2017	49.18	46.16	41.36	42.39	36.27	32.13	49.52	56.78	53.18	48.11	50.41	53.37	45.59
2018	51.97	48.79	43.72	44.80	38.32	33.94	52.34	60.02	56.22	50.85	53.28	56.40	48.18
2019	52.98	49.74	44.58	45.68	39.08	34.62	53.36	61.18	57.31	51.84	54.31	57.49	49.12
2020	54.01	50.71	45.46	46.58	39.86	35.31	54.40	62.36	58.42	52.85	55.37	58.61	50.08
2021	94.39	94.07	93.13	92.04	92.10	92.10	92.61	92.75	92.68	93.20	94.11	95.55	92.83
2022	96.83	97.06	96.81	95.64	95.53	95.47	96.00	96.22	96.53	97.24	99.22	101.56	96.45
2023	103.96	104.17	104.47	103.28	103.17	103.39	103.72	103.81	103.94	104.91	106.61	107.00	103.99
2024	107.88	107.12	105.18	103.63	103.57	103.63	103.94	104.20	104.42	105.38	106.99	107.67	104.66
2025	108.72	107.70	107.13	105.71	105.48	105.57	106.05	106.07	106.51	107.25	108.55	109.32	106.50
2026	109.48	108.65	107.97	106.68	106.30	106.57	106.84	107.02	107.11	108.23	109.56	110.38	107.37
2027	110.46	110.28	109.19	108.17	107.74	108.15	108.43	108.69	108.78	109.42	111.30	111.85	108.87
2028	111.58	111.33	109.75	108.58	108.13	108.54	108.81	109.08	109.41	110.05	112.10	112.59	109.40
2029	113.60	113.53	113.37	111.97	111.57	111.91	112.20	112.48	112.95	113.59	115.25	115.81	112.71
2030	117.21	116.96	116.10	114.77	114.45	114.89	115.18	115.48	115.96	116.65	118.74	119.27	115.74
2031	119.39	119.54	118.61	117.13	116.85	117.55	117.87	118.18	118.85	119.90	122.68	126.78	118.56
2032	121.58	121.74	120.79	119.28	118.99	119.71	120.03	120.35	121.04	122.10	124.94	129.11	120.73
2033	123.82	123.98	123.01	121.47	121.18	121.91	122.24	122.56	123.26	124.34	127.23	131.48	122.95
2034	125.65	125.82	124.83	123.27	122.97	123.71	124.05	124.38	125.09	126.19	129.13	133.46	124.78

Portland General Electric

15-Year Levelized Resource Value Estimate from PGE's 2013 Avoided Cost Filing with Sufficiency Period Price Update

Year	Off-peak Prices (nominal)												Annual*
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2014	33.48	32.34	30.53	18.83	15.89	12.21	24.71	32.69	34.61	33.81	35.33	37.40	26.20
2015	36.25	35.02	33.05	20.41	17.22	13.24	26.77	35.40	37.46	36.61	38.25	40.48	28.37
2016	38.77	37.44	35.34	21.78	18.37	14.11	28.60	37.84	40.06	39.14	40.91	43.30	30.32
2017	41.60	40.17	37.91	23.34	19.67	15.08	30.66	40.60	42.99	42.00	43.89	46.47	32.51
2018	44.42	42.90	40.49	24.88	20.96	16.06	32.73	43.36	45.92	44.86	46.88	49.64	34.71
2019	45.29	43.74	41.29	25.39	21.40	16.41	33.39	44.21	46.82	45.74	47.80	50.61	35.40
2020	46.18	44.61	42.11	25.92	21.85	16.77	34.06	45.08	47.74	46.64	48.73	51.60	36.11
2021	38.36	38.05	37.10	36.01	36.08	36.07	36.58	36.73	36.66	37.17	38.09	39.52	36.80
2022	39.96	40.19	39.93	38.77	38.66	38.59	39.13	39.35	39.65	40.37	42.34	44.69	39.57
2023	45.85	46.06	46.36	45.17	45.07	45.29	45.61	45.71	45.83	46.81	48.50	48.89	45.88
2024	48.71	47.94	46.01	44.45	44.39	44.45	44.77	45.02	45.25	46.21	47.81	48.49	45.48
2025	48.26	47.24	46.68	45.26	45.03	45.12	45.59	45.61	46.05	46.80	48.09	48.86	46.04
2026	48.31	47.47	46.79	45.51	45.12	45.39	45.66	45.84	45.93	47.05	48.39	49.20	46.19
2027	47.96	47.78	46.68	45.67	45.24	45.65	45.93	46.19	46.28	46.91	48.80	49.35	46.37
2028	47.93	47.68	46.10	44.92	44.48	44.88	45.16	45.43	45.76	46.40	48.44	48.94	45.75
2029	48.78	48.70	48.54	47.14	46.74	47.09	47.37	47.66	48.13	48.77	50.43	50.99	47.89
2030	51.19	50.95	50.08	48.76	48.43	48.87	49.17	49.47	49.94	50.63	52.72	53.25	49.72
2031	52.16	52.31	51.38	49.90	49.61	50.31	50.64	50.94	51.62	52.67	55.45	59.54	51.32
2032	53.11	53.27	52.32	50.81	50.53	51.24	51.57	51.88	52.57	53.63	56.47	60.64	52.27
2033	54.09	54.25	53.28	51.75	51.45	52.18	52.51	52.83	53.53	54.62	57.50	61.75	53.23
2034	55.09	55.26	54.27	52.71	52.41	53.15	53.49	53.82	54.53	55.63	58.57	62.90	54.22

**Portland General Electric
15-Year Levelized Resource Value Estimate from PGE's 2013 Avoided Cost Filing with Sufficiency Period Price Update**

Year	Weighted (nominal)												Annual*
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2014	38.80	36.55	32.99	32.03	27.38	23.99	37.79	43.93	41.73	38.11	39.92	42.25	35.28
2015	41.62	39.22	35.39	34.35	29.37	25.75	40.51	47.11	44.75	40.88	42.82	45.31	37.84
2016	44.83	42.24	38.11	36.99	31.62	27.71	43.65	50.77	48.21	44.04	46.12	48.82	40.76
2017	48.10	45.30	40.87	39.67	33.90	29.69	46.82	54.47	51.72	47.24	49.48	52.38	43.72
2018	50.89	47.95	43.26	41.95	35.84	31.38	49.54	57.64	54.75	49.99	52.36	55.43	46.25
2019	51.88	48.88	44.11	42.78	36.55	32.02	50.50	58.75	55.81	50.97	53.38	56.51	47.16
2020	52.89	49.84	44.98	43.62	37.28	32.66	51.49	59.89	56.89	51.96	54.42	57.61	48.09
2021	86.38	86.07	85.12	84.04	84.10	84.10	84.61	84.75	84.68	85.19	86.11	87.55	84.82
2022	88.71	88.94	88.68	87.52	87.41	87.34	87.88	88.10	88.40	89.12	91.09	93.44	88.32
2023	95.66	95.87	96.16	94.97	94.87	95.09	95.42	95.51	95.64	96.61	98.31	98.70	95.69
2024	99.43	98.67	96.73	95.17	95.11	95.18	95.49	95.75	95.97	96.93	98.54	99.22	96.20
2025	100.09	99.06	98.50	97.08	96.85	96.94	97.41	97.43	97.87	98.62	99.91	100.68	97.86
2026	100.74	99.91	99.23	97.94	97.56	97.83	98.10	98.28	98.37	99.49	100.83	101.64	98.63
2027	101.53	101.35	100.26	99.24	98.81	99.22	99.50	99.77	99.86	100.49	102.37	102.93	99.94
2028	102.49	102.24	100.66	99.48	99.04	99.44	99.72	99.99	100.32	100.96	103.00	103.50	100.31
2029	104.34	104.26	104.11	102.71	102.31	102.65	102.94	103.22	103.69	104.33	105.99	106.55	103.45
2030	107.78	107.53	106.67	105.34	105.02	105.46	105.75	106.05	106.53	107.22	109.31	109.84	106.31
2031	109.78	109.94	109.01	107.52	107.24	107.94	108.26	108.57	109.25	110.29	113.08	117.17	108.95
2032	111.80	111.96	111.01	109.50	109.21	109.93	110.25	110.57	111.25	112.32	115.15	119.32	110.95
2033	113.85	114.01	113.05	111.51	111.22	111.95	112.28	112.60	113.30	114.38	117.27	121.52	112.99
2034	115.57	115.74	114.75	113.19	112.89	113.63	113.97	114.30	115.01	116.11	119.05	123.38	114.70

* Weighted for expected monthly solar output for Portland, OR from NREL	15-year Real Levelized (2014-2028; 2014\$)	\$55.33
	Avoided T&D	N/A
	Line Losses from PGE Trans. System to Meter	6.14%
	Grossed-up for Line Losses	\$58.95
	15-year Nominal Levelized (2014-2028; 2014\$)	\$62.92
	Avoided T&D	N/A
	Line Losses from PGE Trans. System to Meter	6.14%
	Grossed-up for Line Losses	\$67.03