

ITEM NO. CA11

**PUBLIC UTILITY COMMISSION OF OREGON
STAFF REPORT
PUBLIC MEETING DATE: December 16, 2014**

REGULAR _____ CONSENT X EFFECTIVE DATE January 1, 2015

DATE: December 3, 2014

TO: Public Utility Commission

FROM: John Crider 

THROUGH: Jason Eisdorfer and Aster Adams 

SUBJECT: OREGON PUBLIC UTILITY COMMISSION STAFF: (Docket No. UM 1505) Adoption of Oregon Solar Photovoltaic Volumetric Incentive Program 2015 Legislative Report as required by HB 3039 (2009) to be delivered to the Legislature by 1/1/2015.

STAFF RECOMMENDATION:

Staff recommends that the draft 2015 biennial Legislature report on the Solar Photovoltaic Volumetric Incentive Program be revised for delivery to the Oregon Legislature on January 1, 2015.

DISCUSSION:

The 2009 Legislature enacted House Bill 3039 to establish a pilot program to examine the effectiveness of a production-based incentive in the development of solar photovoltaic (PV) systems. The bill allows customers in the Portland General Electric (PGE), PacifiCorp and Idaho Power service territories to be paid directly for energy produced from their solar systems at a rate defined by the Commission. The bill requires three biennial reports on the program, to be delivered to the Legislature on January 1 of 2011, 2013 and 2015.

Docket No. UM1452 was established in 2009 to develop the Volumetric Incentive Rate (VIR) program parameters and to allow input from parties interested in the program design. Several candidate designs were discussed before the Commission resolved to implement a net-metering and competitive-bidding based solution. Order No. 10-198 established the pilot program design. Docket No. UM 1505 was opened to present the draft legislative reports and provide an opportunity for parties to offer comments for

inclusion in the final reports. The first two biennial reports were delivered to the legislature as required in 2011 and 2013.

The 2013 Oregon Legislature passed House Bill 2893 directing the Oregon Public Utility Commission to study the effectiveness of the state's solar energy incentive programs and report to the Legislature on its findings. This comprehensive report included an in-depth analysis of both the VIR program and its predecessor incentive programs. The final report from this study was delivered to the Legislature in July, 2014 (July 2014 Report).

In the interim six months since the delivery of the July report, there have been no substantial changes in the VIR program attributes or results. The analysis and conclusions of the July 2014 Report remain current and valid, and accurately reflect the present state of the VIR program. Therefore, in order to avoid duplicative effort, the 2015 biennial report to the legislature on the VIR represents a synopsis and summary of the July 2014 Report findings as they pertain to the VIR program.

PROPOSED COMMISSION MOTION:

The 2015 biennial Legislature report on the Solar Photovoltaic Volumetric Incentive Program be revised for delivery to the Oregon Legislature on January 1, 2015.

Solar Photovoltaic Volumetric Incentive Program

*2015 Report to the Legislative Assembly
(Draft)*

Prepared by:

Oregon Public Utility Commission

January 1, 2015

Executive Summary

ORS 757.365 (13) requires the Commission to provide a report on the Volumetric Incentive Rate (VIR) program to the Legislature on January 1 of each odd numbered calendar year. By statute, the report must:

1. Evaluate the effectiveness of the pilot program compared to existing incentives for promoting the use of solar energy and reducing system costs;
2. Evaluate the estimated cost of the program to ratepayers; and
3. Estimate the resource value of solar energy.

HB 2893, adopted in May 2013, mandated that the Commission report to the Legislature in July 2014 on the comparative effectiveness of all Oregon solar incentive programs at achieving various goals. The conclusions and recommendations in that July 2014 report remain valid. Therefore, in order to avoid duplicative effort but also fulfill the requirements of ORS 757.365 (13), the Commission provides a review of the pertinent evaluation and findings from the July 1 report regarding the solar VIR pilot.

Background

Legislative History

The 2009 Oregon Assembly directed the Public Utility Commission to establish a VIR Pilot Program in the service territories of Portland General Electric Company (PGE), PacifiCorp, and Idaho Power Company (Idaho Power). The purpose of the pilot is to demonstrate the use and effectiveness of paying a fixed price, in cents per kilowatt-hour, for solar electricity produced by retail customers.¹ The fixed price (incentive rate) established by the Commission is set to recover the system's total installation cost over time and attract customer and solar developer interest. Systems less than 500 kilowatts are eligible for the program. Participants in this pilot are not eligible for state tax credits or Energy Trust rebates.

The Legislature originally set a cap of 25 megawatt of installed capacity for the program.² In 2013, it raised the cap to 27.5 megawatts.³

Seventy five percent of the program capacity is allocated to "residential qualifying systems and small commercial qualifying systems." A "residential qualifying system" has a nameplate capacity of 10 kilowatts or less. A "small commercial" system has a nameplate capacity between 10 kilowatts and 100 kilowatts. The remaining program is allocated to systems between 100 kilowatts and 500 kilowatts.

¹ ORS 757.365(1).

² Former ORS 757.365(1).

³ ORS 757.265.(1)

Under the VIR Pilot Program, the customer executes a 15-year agreement with their utility and is paid the approved incentive rate for each kWh of solar power they generate. However, each customer will receive the rate in effect at the time they execute their contract for the duration of the contract. After 15 years, the utility may pay its prevailing avoided cost price for solar power generated by the customer.

Program Design and Commission Action

The Commission adopted rules to implement the VIR Pilot Program starting July 1, 2010. Since that time, the Commission has monitored the program and refined the program design when needed.

- The Commission allocated the original 25 MW total program capacity to the three electric companies based on retail sales in Oregon: PGE 14.9 MW; PacifiCorp 9.8 MW, and Idaho Power 0.4 MW. HB 2893 authorized an additional 2.5 MW of capacity bringing the company totals to: PGE 16.3 MW, PacifiCorp 10.8 MW and Idaho Power 0.45 MW.
- The Commission established eight capacity allocation windows over the four-year pilot period for small-scale systems (under 10 kilowatts) and medium-scale systems (between 10 kilowatts and 100 kilowatts). The capacity for large-scale systems (between 100 kilowatts and 500 kilowatts) is allocated once a year over the four-year period. HB 2893 provided for an additional “clean-up” window in starting May 1, 2015,⁴ to allocate all remaining capacity.
- Initially, capacity was allocated to small and medium sized systems on a first-come, first-served basis. Currently, capacity is allocated to small systems by lottery and to medium systems by competitive bid.
- Table 1 below shows the rates for small-scale, medium-scale, and large-scale systems for each year during the course of the pilot.
 - The Commission sets the rates for small-scale and medium-scale systems using an automatic rate adjustment mechanism that adjusts the rates based on program participation and the speed of uptake of the eligible capacity. As can be seen in Table 1, rates for small-scale systems have steadily declined from \$0.65 per kWh in July 2010 to \$0.39 per kWh in April 2014. Rates for medium-scale systems have realized a similar decline.
 - The Commission uses competitive bidding to set the rates for large-scale systems and has started to test this method for medium-scale systems. The highest winning bid for PGE dropped from nearly \$0.40 per kWh in the first enrollment window in 2010 to \$0.175 per kWh in the latest enrollment window. The

⁴ Order No. 14-025 in UM 1452, p. 2.

winning bid for large-scale systems for PacifiCorp dropped from 24 cents/kWh in 2010 to 11 cents/kWh in the last enrollment window in 2013.

Table 1 - History of VIR Rate
Small systems (<10kW) -- \$/kWh

Enrollment Period	Rate Class 1	Rate Class 2	Rate Class 3	Rate Class 4
Jul 2010	\$0.65	\$0.60	\$0.60	\$0.55
Oct 2010	\$0.585	\$0.54	\$0.54	\$0.495
Apr 2011	\$0.468	\$0.432	\$0.432	\$0.396
Oct 2011	\$0.374	\$0.346	\$0.346	\$0.317
Apr 2012	\$0.411	\$0.346	\$0.346	\$0.317
Oct 2012	\$0.411	\$0.346	\$0.346	\$0.317
Apr 2013	\$0.390	\$0.311	\$0.311	\$0.285
Oct 2013	\$0.390	\$0.280	\$0.280	\$0.256
Apr 2014	\$0.390	\$0.252	\$0.252	\$0.230

Medium systems (>10kw and <100kW)

Enrollment Period	Rate Class 1	Rate Class 2	Rate Class 3	Rate Class 4
Jul 2010	\$0.55	\$0.55	\$0.55	\$0.55
Oct 2010	\$0.495	\$0.495	\$0.495	\$0.495
Apr 2011	\$0.396	\$0.396	\$0.396	\$0.396
Oct 2011	\$0.317	\$0.317	\$0.317	\$0.317
Apr 2012	\$0.285	\$0.25	\$0.25	\$0.25
Oct 2012	\$0.285	\$0.25	\$0.25	\$0.25
Apr 2013	\$0.230	\$0.181	\$0.181	\$0.181
Oct 2013	\$0.175	\$0.16	\$0.16	\$0.16
Apr 2014	\$0.175	\$0.16	\$0.16	\$0.16

Large systems (100kW to 500kW)

	2010	2011	2012	2013
PGE	39	22.5	21	17
PacifiCorp	24	23	17	11

As of July 2014, the VIR Pilot Program had resulted in over 23 MW of installed solar capacity in Oregon (out of 27.5 MW mandated by the legislature). Participants installed 13.5 MW of solar capacity in PGE’s service territory; 9.2 MW in PacifiCorp’s service territory; and 0.4 MW in Idaho

Power’s service territory. The Pilot Program is on target to achieve the goal of 27.5 MW of installed capacity with most of the additional capacity already assigned to projects in progress.

Comparative Effectiveness of Alternative Incentive Options

The July report provided an extensive analysis comparing the effectiveness of the VIR Pilot Program to that of the combined use of state tax credits and Energy Trust incentives (herein referred to as the “legacy programs”). The report utilized five measures to assess effectiveness: the number of projects completed annually; the capacity of solar generation installed annually; the levelized cost of energy over the lifetime of the projects; the cost of the incentive itself to ratepayers and/or taxpayers; and the effect on project installed cost over time.

Number and Capacity of Installed Projects

Based on numbers of projects and capacity installed each year (see Table 2), it is clear that the Pilot Program did not diminish the popularity of legacy incentives in promoting the development of solar PV systems in Oregon. From 2010 through the end of 2012, nearly 40 MW of solar capacity was installed in Oregon with assistance from the legacy programs, compared to just 20 MW in the three years 2007-2009. Both the number of projects and the total installed capacity under the legacy programs have increased steadily during the course of the VIR pilot.

Table 2⁵ – Solar Projects Completed Under ETO Rebate/ Tax Credit Programs

Year	No. Projects	Capacity (kW)
PRE VIR		
2007	220	1,069
2008	256	3,959
2009	482	5,900
POST VIR		
2010	1205	9,732
2011	1331	11,114
2012	1244	19,186

By comparison, for each of the eight allocation windows held for the VIR Pilot Program, all available capacity was reserved and to date, all of the allocated capacity is either installed or expected to be installed by the end of the Pilot Program. This shows that both the VIR Pilot Program and the legacy solar incentive programs continue to show strong demand among customers, and neither has negatively affected the other.

⁵ “Investigation into the Effectiveness of Solar Programs in Oregon”, PUC report to the Oregon Assembly, July 1, 2014, Appendix 1

For another view, Table 3 compares the number of projects and installed capacity under the legacy programs for 2009 (before the VIR was offered) and 2013 (the fourth year of the VIR Pilot Program).

Table 3 - Number of Projects and Installed Capacity by Program

Program	Number of Projects (2009)	Number of Projects (2013)	Capacity (kW) (2009)	Capacity (kW) (2013)
ETO plus Tax Credit (Residential)	507	838	1595	4323
ETO plus Tax Credit (Commercial)	159	42	3499	1479
VIR Pilot (Small)	-	342	-	2589
VIR Pilot (Med & Large)	-	17	-	2143

Despite the alternative incentive offered to customers through the VIR Pilot Program, the data shows no appreciable slowing in the demand for residential solar programs assisted by the legacy programs. As can be seen in Table 3, demand for residential installations with the ETO/tax incentive program continued to increase during the years of the VIR.

Table 3 also reflects a drop in demand for business incentives through the legacy programs in 2013 compared to 2009. This drop is most likely due to the severe decrease in funding for the Business Energy Tax Credit (BETC) program during this time period, and not reflective of a general disinclination for businesses to invest in solar.⁶

In conclusion it does not appear that the offering of the VIR Pilot Program as an alternative incentive program had any dampening effect on the demand for solar through the ETO rebate/tax incentive program.

Comparison of Energy and Incentive Cost

Table 4 below compares the levelized cost of solar energy⁷ over a 20-year period of the VIR Pilot Program with a similar cost calculation for the legacy solar incentive programs. The table also shows the cost of these programs to ratepayers and taxpayers. All cost values shown are averages.

⁶ The BETC program expired in 2012 for projects not under construction by April 2011.

⁷ “Levelized cost” for solar projects is calculated by spreading the installation cost of the project equally over all energy generated during the lifetime of the project, on a discounted present value basis. The result is the average cost per kilowatt-hour.

Table 4 - Average Levelized Cost⁸ of Energy and Average Levelized Cost to Ratepayers and Taxpayers under Oregon programs

Program	Levelized Cost of Energy	Levelized Incentive Cost to Ratepayers	Levelized Incentive Cost to Taxpayers	Incentive Percentage of Cost
ETO plus Tax Credit (Residential)	43	6.4	9	35%
ETO plus Tax Credit (Commercial)	33	6.4	14.6	63%
VIR Pilot (Small)	39	21	0	53%
VIR Pilot (Large)	20	16.5	0	82%

The costs of energy from these programs are ultimately a function of the size and vintage of the projects supported by the program. By far the primary cost driver is the cost of the solar panels themselves, followed by the cost of the electrical inverter. Labor, permitting, and other so-called “soft costs” make up roughly one quarter to one third⁹ of the total system cost, depending on system size.

Table 4 shows that the average cost of energy per kilowatt hour declines with a larger system size, demonstrating an economy of scale. The cost of energy for commercial systems under both incentive programs is lower than that for residential projects.

One reason for this is that solar panels can be cheaper on a per unit basis when bought in larger quantities. In addition, the incremental labor cost to install a large solar project vs. a residential size system is relatively small; once the installation crew and equipment is onsite, the cost to install additional panels is minimized.

The way the programs are funded dictates the split in costs between ratepayers and taxpayers. The legacy program incentives are funded from two sources – 1) a direct rebate from the Energy Trust of Oregon funded from the three percent public purpose charge applied to every ratepayer’s bill; and 2) tax credits offered by the state.

⁸ All costs expressed in cents per kilowatt-hour (c/kWh).

⁹ “Investigation into the Effectiveness of Solar Programs in Oregon”, PUC report to the Oregon Assembly, July 1, 2014, p. 35

In comparison, the Solar VIR Pilot Program incentive is completely funded by utility ratepayers. The VIR Pilot Program is, in effect, a set of power contracts between the customers and the utility in which the utility pays the customer directly for their solar generation. The funds for these contracts are collected from ratepayers through normal utility ratemaking. No taxpayer money is used to fund the program.

Comparison of Installation Cost

The following table compares the average installation cost of solar generating equipment as reported by the installers for the legacy and VIR pilot programs.

Table 5 - Cost of Solar Installation by Program

Program	Cost in 2010 (\$/Watt)	Cost in 2013 (\$/Watt)	Decrease %
ETO plus Tax Credit (Residential)	\$6.88	\$4.62	32
ETO plus Tax Credit (Commercial)	\$6.74	\$5.23	22
VIR Pilot (Small)	\$6.48	\$4.57	29
VIR Pilot (Large)	\$3.71	\$2.31	38

Figures 1 and 2 show, by year, the average of panel costs and non-equipment costs for systems installed for the VIR Pilot Program. On average, panel costs have dropped from \$3.00 per watt in 2010 to \$1.25 per watt in 2013. Non-equipment costs have come down but not as fast. On average, non-equipment costs dropped from about \$3.50 per watt in 2010 to a little more than \$2.50 per watt in 2013.

Figure 1: Cost of PV Panels Used in the VIR Pilot

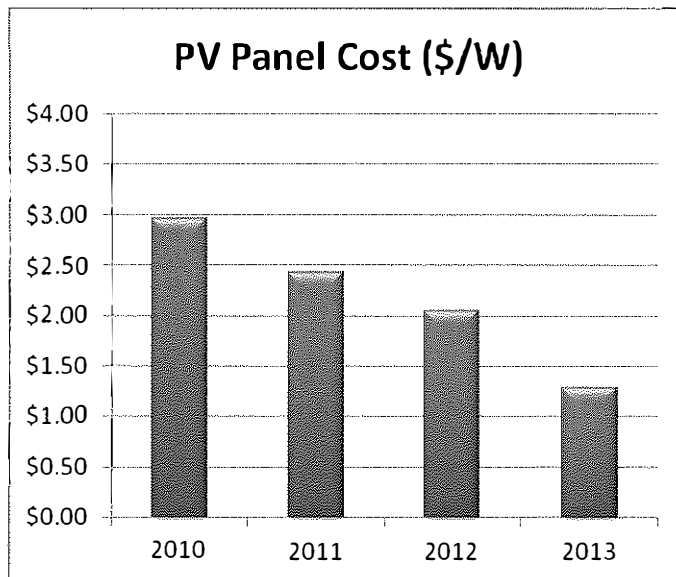


Figure 2: Trend in Solar Installation Non-Equipment Costs

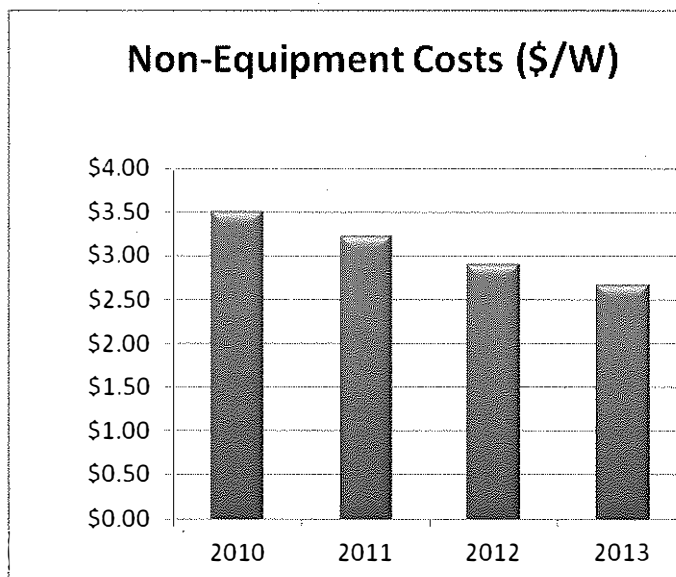


Table 5 and Figures 1 and 2 show that the installed cost of solar equipment decreased substantially over time under both the legacy solar incentive programs and the VIR Pilot Program. From 2010 to 2013, the cost for solar panels dropped by more than half internationally. This industry cost trend was the most prominent driver pushing installation costs lower for both programs. Besides the industry drop in panel costs, it is not clear from the data that any of the particular program elements for the two incentive programs were instrumental in driving the costs down. Since the decreases in costs are relatively comparable

for the two programs, we conclude that the cost decreases were not primarily attributable to program design but due instead to market forces.

However, the very low price reached under the VIR Pilot Program for large systems may be a result of the “reverse auction” mechanism used to determine winning bids. In theory, the market competition of the reverse auction method is expected to bring the lowest expected price to the purchaser. From the data, it appears this has proven to be true for the bid portion of the VIR Pilot Program.

Resource Value of Solar Energy

Under the VIR Pilot Program, Oregon’s utilities must report the solar resource value every two years. Resource value is defined in ORS 757.360(5), as:

- a) The avoided cost of energy, including the avoided fuel price volatility, minus the cost of firming and shaping the electricity generated from the facility; and
- b) Avoided distribution and transmission cost.

The resource value will be used to determine payments to VIR Pilot Program participants at the end of the 15-year pilot program.

Because of stakeholder concerns over the values reported early in the VIR Pilot Program, the Commission opened an investigation¹⁰ into the appropriate method of calculating resource value. At the conclusion of that investigation, the Commission determined that although precise calculation of the solar resource value was still an issue among parties, the resource value was not greater than the incentive rates. That finding was not disputed.¹¹

The Commission directed utilities to estimate the benefits of avoided energy, avoided investments in capacity, and avoided transmission line losses. The Commission chose to not require calculations of avoided transmission and distribution investments, firming and shaping costs, fuel price hedging, or carbon costs. The Commission stated that a certain threshold level of solar penetration in Oregon is needed before these costs and benefits become measurable and need to be considered.

Utilities were required to estimate the value of avoided energy benefits using three methods:

- i. The “Standard” method used to set the Avoided Cost Price under the Public Utility Regulatory Policy Act (PURPA),
- ii. A “Renewable” method, also used to set the Avoided Cost under PURPA, and
- iii. An “IRP” method, which uses computer models to compare the utility’s total cost to serve its loads with and without the solar generation. The Commission also directed utilities to calculate

¹⁰ Oregon Public Utility Commission Docket No. UM 1559.

¹¹ Order No. 12-396; *In the Matter of the Public Utility Commission of Oregon Investigation into the Appropriate Calculation of Resource Value for Solar Photovoltaic Systems*, Docket No. UM 1559.

the capacity contribution of solar using the “Effective Load Carrying Capacity” or “ELCC” method, a computer based method recommended by ODOE and Commission staff.¹²

The table below shows the resource values reported by utilities as of July 2014.

Table 6: Solar Resource Value cents/kWh Reported by Oregon IOUs¹³

Solar Value (Cents/kWh) Reported by Utilities under OAR 860-084-0370			
Calculation Method	PGE	Idaho	PAC
Standard	6.7	6.5	6.3
Renewable	6.7	N/A *	5.9
IRP	5.5	5.0	5.5

*Idaho Power does not provide a Renewable Method calculation since they are not required to do so by the Oregon PUC.

Conclusions

1. The legacy incentive programs and the VIR Pilot Program are effective at promoting the development of Solar PV systems in Oregon. Different individuals are likely to find the different incentive programs to be more advantageous to their decision to install a solar PV system. Neither incentive regime will prove superior in all situations. Both programs act as effective incentives to install solar generation.
2. System installation costs and levelized energy costs have steadily declined under both the VIR Pilot Program and the legacy incentive programs. The primary driver for this cost reduction is the worldwide decline in solar panel prices. Analysis of the data has not provided a clear indication that any particular program design criteria has resulted in significant cost savings, with one exception: the reverse auction mechanism for large systems under the VIR pilot has consistently provided the lowest energy and installation costs among the programs.
3. Costs borne by ratepayers and taxpayers varies between 35 percent and 82 percent of the total cost, before federal incentives. However, it is difficult to draw conclusions when comparing these costs across incentive offerings because they are a direct result of program design. The VIR rate calculation methodology is designed to provide a positive return on investment for customers and therefore more of the system cost is absorbed by the program; the legacy incentives are determined using different criteria. In other words, the VIR Pilot Program is more costly to ratepayers than the legacy programs *by design*, and a higher cost ratio cannot be considered a measure of comparative program performance.

¹² In our review of solar value studies outside Oregon, we found several that also used the ELCC method for this purpose.

¹³ Values for all utilities were adjusted to 2014 dollars using the Oregon Consumer Price Index reported by the Oregon Office of Economic Analysis.

Program Design Recommendations and Legislative Recommendations

The Commission does not recommend any legislative changes to the VIR Pilot Program at this time.

Regulatory Policy Considerations and Recommendations

The Commission does not recommend changes to regulatory policies at this time.

The Commission will continue to consider potential legislative or regulatory changes to further facilitate solar photovoltaic energy generation as additional information is obtained from the VIR Pilot Program.