BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON
UM 1673

In the Matter of OREGON PUBLIC UTILITY COMMISSION Staff Questions for Parties on the Solar Incentive Program Report under HB 2893.	Comments from the City of Portland in response to Staff Questions for Parties on Solar Incentive Program Report under HB 2893

Introduction

The City of Portland appreciates the opportunity to engage in this proceeding and provide input with regard to the development of the Solar Incentive Program Report. The following informal responses to Public Utility Commission staff questions are presented as broad answers and perspectives to the specified topics, and do not constitute a full exploration of the issues under discussion. Some questions have been left intentionally unanswered at this point. The City of Portland appreciates the opportunity to further develop and provide comment on all topics under consideration as part of the UM 1673 proceeding. Generally the responses follow the structure posed by PUC staff, with divergence as noted.

General Questions

1. What is the primary goal in promoting solar?

Promoting solar encourages production of carbon-free electricity from a renewable resource that is available to nearly everyone mostly everywhere. Solar energy is the most equally distributed energy resource on our planet. In a carbon-constrained world, we need to develop and support all forms of low-carbon energy resources.

2. What is the proper role of the utility in developing solar?

This question might be more usefully framed if we consider the different aspects of utilities encompassed in the vertically integrated, regulated monopoly model. The generation side of the utility business has different concerns and interests regarding solar than does the transmission and distribution side. The distribution utility most closely interfaces with customer-generated resources like solar. This so-called "distribution edge" is going to change rapidly as customers demand and install more distributed generation and active energy management systems. Oregon would be wise to consider and explore new business models that deliver value to both customers and the distribution utility. The Rocky Mountain Institute published a thought-provoking study on this topic which may be informative to the conversation[1]:

[1] http://www.rmi.org/Knowledge-Center/Library/2013-06_eLabNewBusinessModels

Vertically-integrated utilities (VIUs) seem to be understandably conflicted about distributed generation and solar energy in particular. On one hand, their customers want it and the climate situation demands it. On the other, solar is still a more expensive resource to acquire. If net metered solar reaches penetrations of 20-30%, VIUs fear the potential loss of revenue to cover fixed costs, which could remain a problem as long as utilities continue to use volumetric rates to recover fixed costs. A recent study by the Regulatory Assistance Project (RAP) provides some good information regarding effective rate design for distributed generation that may be useful to the proceeding. [2]

3. What are the solar incentive programs under evaluation?

    a. Programs currently in place in Oregon?

    The main incentive programs under evaluation should include the Oregon Volumetric Incentive Rate Program, Energy Trust of Oregon solar incentives, the Residential Energy Tax Credit programs, and the Renewable Energy Development Grant program. To the extent that net metering is a key component of many of these programs, it should be considered as a separate topic, and should not be framed in the report as an incentive. Further expansion of the report could also include the State Energy Loan Program, While it does provide a financing tool for some solar developments, not a direct incentive, it may be out of the scope of this report.

    b. Programs outside of Oregon that may be worth examining?

    There are numerous programs outside of Oregon that have merit and have demonstrated success in driving solar adoption and integrating distributed renewables into utility planning. In comparing effectiveness of the VIR program, OPUC should look regionally and nationally in other regulated marketplaces. States with high market development of solar and seeking market innovation should be looked at as comparative models, including programs in the following states:

    - California : California Solar Incentive, Multifamily Affordable Housing Program, Feed-In-Tariff program

    - Massachusetts : SREC program, Commonwealth Solar Rebates

    - Minnesota : Value of Solar Tariff

    - Colorado : Solar Rewards program, Community Net-Metering

4. How should solar incentive programs be evaluated?

    a. What evaluation criteria should be used (e.g. cost per kwh, cost per installed KW, cost per unit of carbon displaced, other)?

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[2] http://www.raponline.org/document/download/id/6898

As the benefits of solar are largely tied to generation output rather than capacity value, the primary evaluation of solar incentive programs effectiveness should be in cost per kWh. This metric is useful only when also compared regionally, however, as generation is dependent on climate, and solar irradiance variables. As a measure of success in the deployment of PV and market development, new capacity in MW installed per year and total cumulative MW of PV installed is a useful evaluation metric. In evaluating social and environmental benefits, cost per unit ton of carbon displacement or production is a useful metric, as utility emissions are modeled based on regional power mixes, and regularly reported to regulators at a state and national level.

b. How can the evaluation criteria be selected so that different programs are compared on an apples to apples basis?

Using a levelized cost of energy model may provide useful comparison, normalized for the generation, time, incentive, and production variables when comparing different programs in Oregon and between other states. Selecting adequate methodology for discount rates and expected operational life, operational variables, and maintenance costs is critical for a consistent and meaningful evaluation.

c. What data is needed and how should it be gathered?

Utilities and Energy Trust of Oregon hold and sometimes provide data about the annual generation from PV systems, the costs of integrating solar resources, the levelized cost of acquiring specific resources, fuel price volatility modeling, and the distribution and transmission values that may feed into a comprehensive SRV valuation. Oregon Department of Energy also maintains data based on the annual reports of tax filings related to the Residential and Business Energy Tax Credit programs, as well as the RED grants.

The Solar Resource Value should be calibrated regionally, and may vary based on balances in load and generation in various parts of the state. There is an overall need for greater transparency and granularity in evaluating data from utilities. Much of the data provided in the Integrated Resource Plans are combined and reported for the entire service area. While this may be helpful in setting consistent rates across a service territory and customer class, a greater resolution is necessary in order to determine the value of solar.

Specific regions could be defined similarly to the existing incentive tiers for the VIR. Information related to solar generation potential, market penetration, transmission constraints, and local distribution challenges will vary regionally. There are also other aspects of PV system costs which are also regionally dependent, such as engineering and permit costs vary according to jurisdiction and local market conditions. For the purposes of this report, however, generalized market and PV system costs can be used.

Questions related to Resource Value (HB 2893 (4)(1)(a))

5. In UM 1559, the Commission chose not to require utilities to report certain elements of Resource Value, such as avoided CO_2, fuel price volatility, integration, and transmission and distribution costs.[3] Should we calculate them now? If so, how should we do so with the data available?

Yes, each element of SRV should be quantified, or a methodology determined, in order to obtain a range of value for the benefits of solar energy to both the utility grid and customers. The limited Commission definition of SRV creates guidelines for the report, but does not create hard boundaries for consideration of other benefits and costs associated with solar. It should be made clear in the report that the Commission directive for utility reporting does not fully capture the total net benefits or costs, but merely provides a basis for evaluation of some of the most tightly bounded components of SRV.

This "basic" SRV range should be contrasted with a "comprehensive" SRV or value of solar calculation which does take into account greater transmission, distribution, fuel hedging, environmental aspects, potential carbon compliance, and social benefits and costs associated with the development of solar energy. Numerous studies in the past few years seek to define some of the benefits of PV to both utilities and customers. The following comprises a partial list of the potential cost and benefit components that should factor into a comprehensive evaluation of SRV:

• Energy Value : Avoided Energy, System Losses

• Capacity Value : Generation Capacity, Transmission and Distribution Capacity

• Financial Risk Value : Fuel Price Hedge, Market Price Response

• Security Value : Back-up Power, Grid Diversification

• Environmental Value : Carbon Emmissions, Criteria Air Pollution, Water Use, Land Footprint, Avoided RPS Costs

• Social Value : Job Creation, Local Economic Development, Tax Revenue

Focusing narrowly on the avoided generation costs does not adequately capture the benefits of solar to either utilities or their customers. In the draft proposed 2013 PGE Integrated Resource Plan (IRP), PGE states that "Distributed generation can provide advantages over central-station generation, including: enhanced localized reliability; improved efficiency due to avoided transmission losses; and for customers who have installed distributed generation, it can provide a partial hedge against changing future power costs."[4]

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[3] See Order 12-396 at 5.
[4] Portland General Electric Company Draft Integrated Resource Plan 2013, November 22, 2013, page 129

In the definition of resource value in ORS § 757.360(5), the following aspects of are to be considered :

(a) The avoided cost of energy, including avoided fuel price volatility, minus the costs of firming and shaping the electricity generated from the facility; and

(b) Avoided distribution and transmission cost.

While the UM 1559 docket explored some of these factors associated with costs and benefits of distributed solar generation, and found that there were numerous unquantified factors with potential merit, the Commission did not choose to make reporting of most factors mandatory, focusing instead on the avoided generation costs.

Below is a partial list of studies that may be useful in defining the scope and determinants of a truly useful SRV evaluation in Oregon:

- Norris, B., Jones, N. The Value of Distributed Solar Electric Generation to SanAntonio. Clean Power Research & Solar San Antonio, March 2013.
- Perez, R., Norris, B., Hoff, T., *The Value of Distributed Solar Electric Generation to New Jersey and Pennsylvania.* Clean Power Research, 2012.
- Beach, R., McGuire, P., *Evaluating the Benefits and Costs of Net Energy Metering for Residential Customers in California.* Crossborder Energy, Jan. 2013.
- Mills, A., Wiser, R., *Changes in the Economic Value of Variable Generation at High Penetration Levels: A Pilot Case Study of California*. Lawrence Berkeley National
- Rocky Mountain Institute – A *Review of Solar PV Benefit and Cost Studies, 2nd Edition*

6. How does the resource value of distributed solar compare with utility scale solar? To make this comparison, what factors do we take into account, and what data would be needed?

As noted above and generally accepted, there are advantages to distributed generation to both the utility and to customers. The SRV of PV does have a component to be determined by proximity to customer load, transmission infrastructure, and adequacy of surrounding substations. Existing evaluation in the 2013 PGE draft IRP does indicate that the value to the utility may be higher for distributed solar compared to utility-scale solar. A more thorough exploration of this topic is necessary in order to quantify this benefit in terms of avoided transmission losses, transmission capacity improvements, and distribution system impacts.

Questions related to Costs and Benefits of Programs and their Distribution among retail electricity customers (HB 2893 (4)(1)(b))

An exploration of distribution of benefits and potential cross-subsidization cannot be made until a quantitative analysis of the solar resource value is completed. The question of whether incentive programs create cross-subsidies between and within customer classes is dependent on the differentials between rates paid, incentives delivered, and

the SRV including volumetric and non-volumetric charges for those particular customer classes. While there may be value in considering some of the individual questions in this section, City of Portland provides the following exploratory narrative to present some perspective on these topics.

Transitioning to a clean energy future will require investments in new infrastructure and assets. A narrow definition of cost-effectiveness as traditionally used in the utility sector may not serve in a carbon-constrained world. Until the costs of fossil fuel-based power sources remain externalized, comparatively more expensive renewables will be hard pressed to gain an equal or better footing to fossil fuels. Ratepayers and the utility system, collectively carbon polluters, must bear a substantial portion of the costs of the transition to a carbon-free or low-carbon economy.

The distribution of benefits (in monetary terms) of a given incentive program is often dependent on a number of factors, including individual qualifications with regard to tax-status, customer capital, real estate ownership, and customer class. A demographic study would need to be conducted to determine what percentage of retail customers have access to various incentive programs, but generally incentive programs tend to accrue benefits to owners of real property with tax liability. Below is a brief summary of various Oregon solar-related incentive programs and which retail customers are generally included or excluded from participating directly in their financial benefits:

Volumetric Incentive Rate program. Includes all retail customers who own or have authorization to improve their property, and through the VIR-assignment option, all customers and non-customers could theoretically receive the stream of payments.

Energy Trust of Oregon rebates. Includes businesses and residents who generally own their property and are also the primary account holder for the property. Municipal entities can receive incentives through either direct or third-party ownership. Excludes renters or tenants in buildings or facilities.

Residential Energy Tax Credit. Includes Oregon residential customers who own real property, have personal Oregon tax liability annually and have capital to invest in solar or credit-qualified access to a third-party financing option. Excludes renters and property owners lacking access to capital or credit or with low personal tax liability.

Renewable Development Grant. Includes business and municipal entities with capacity to provide incentive review funding up front for speculative projects. Excludes Individual residential customers and organizations without the financial capacity to provide review funding.

By nature of the current utility model, some degree of cross-subsidization related to infrastructure costs is always present for customers, as system operation and maintenance charges are paid by volumetric charges. Customers with consistently low annual energy usage may be contributing proportionally less to maintaining infrastructure than other customers of the same class who also benefit from the transmission and distribution networks. This is the case even disregarding the presence of distributed generation. The concept of separating fixed costs from the volumetric energy consumption charges ought to be among the considerations.

Overall, solar penetration levels are very low in Oregon compared to other US states with more developed markets. While there may be local constraints and impacts, lessons can be learned from markets in Europe and California, where solar generation can frequently reach upwards of 40% of load in certain conditions and utilities.

Distinctions should be made between aspects of high-penetration solar that present physical and electrical interconnection issues versus aspects that are primarily related to utility revenue recovery. Studies by Rocky Mountain Institute evaluate scenarios for various US states with solar penetration between 10-40% of total annual and/or peak generation. The future requires a bold vision with renewable resources playing a key role, and Oregon should not unnecessarily constrain our efforts in evaluating and planning for that future by setting thresholds for maximum solar penetration levels.

7. How does cost effectiveness match up with the overall goal of promoting solar energy in question 1?

8. How are the benefits of incentive programs distributed among non-participating retail customers?

9. Can those benefits be quantified? If so, how? What studies would need to be done and what data would be needed?

10. What available studies on benefits of SPV (national or from other states) might be applicable to Oregon, and how would the results be adjusted so that the dollar value of the benefits is realistic for Oregon?

11. Do incentive programs create cross subsidies? .

    a. Who pays them?

    b. Are some ratepayer classes more affected than others?

    c. How are low income ratepayers protected?

    d. Do some types of programs create less of a cross subsidy than others? .

12. Do VIR and Net Metering participants pay their full share of the fixed costs of maintaining the grid? How are fixed costs recovered, and how should they be recovered?

13. At what level of penetration does the impact on utility revenue become a significant factor?

Questions about Forecast Costs associated with solar photovoltaic systems in Oregon (HB 2893 (4)(1)(c))

14. What are sources of forecasts of solar panel prices? How big is the range of estimates?

A number of entities provide forecasting of PV market trends and module prices. Examples include: NPD Solarbuzz, GreenTech Media, and Clean Power Research, all of whom provide market analysis and studies, some on a fee basis. National Renewable Energy Lab

(NREL) produces market reports on a regular basis that may be useful in tracking generalized trends in modules.[5]

15. How much of SPV system costs are soft costs (interconnection, permitting, code compliance, other)?

Included in soft costs are a number of factors that break into two primary components, those denominated purely in dollars (permit fees, interconnection, profit margin, etc.), and those which have a time-based value component (labor hours, time to permit, engineering, inspections). As a general trend, the proportion of total costs compared to total system costs have been increasing, as rapid declines in equipment costs work their way through the market at a faster rate than soft costs are reduced. Studies by NREL put the current percentage of soft costs at 50-60% of total installed costs for residential-scale systems, but there is great variance dependent on local jurisdictions, supply chains, and labor markets.

16. What initiatives are underway to lower soft costs? Is the trend in soft costs going down at the same pace as panel costs? Do soft costs create a "floor"?

On a practical level, there will be a floor to soft cost reduction. Since 2007, the City of Portland has worked to standardize and streamline processes for permitting, and reduce the time and uncertainty in solar permit issuance. The City was very active in the development of the Oregon Solar Installation Specialty Code, which brought standardization in solar installation to jurisdictions throughout the state, indirectly reducing soft costs. The US DOE Sunshot program has issued a grant to the Northwest Solar Partnership, which includes the City of Portland, several other jurisdictions as well as ODOE and Building Codes Division, to work on regional issues of permitting, interconnection, financing, and zoning for solar with the goal of reducing soft costs and doubling the amount of PV installed in the Washington and Oregon. This effort promises to bring further incremental reductions in costs for solar installers and customers.

However,even if there are vastly reduced permit fees and issuance timelines, there still is a need for labor to install the system, sales and design staff, and a minimum profit margin for the contractor to remain a going concern. There will be a practical minimum to the level of reduction that can be achieved.

Questions about Barriers within the programs to providing incentives (HB 2893 (4)(1)(d)

17. List perceived barriers within the incentive programs in Oregon.

The exact nature of barriers varies slightly based on the incentive program, but there are some overarching issues inherent to the current structures. Upfront costs are a primary barrier to almost all solar energy incentive programs, as potential customers must have access to capital in order to build a PV system.

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[5] http://www.nrel.gov/analysis/market_re_data.html

Specific barriers in the VIR incentive system include: limited windows of opportunity for registration, constrained capacity, uncertainty in allocation, and fixed timelines for intermediate deadlines in the process. For non-tax paying entities such as the City of Portland, the system size restrictions pose a significant barrier to development of effective PV projects. Since there is no taxable liability to monetize the Federal incentives, the financial viability of PV projects is realized only at the smaller residential scale of systems where the VIR is paid at a comparatively higher rate.

For the Energy Trust of Oregon and tax credit-based incentives, similar upfront financing barriers exist, with many of the rebates and credits coming after system completion. Point-of-sale or instant rebates are typically understood to provide much stronger motivation for consumers to purchase. The development of third-party ownership models has provided innovative ways of overcoming these barriers for many customers, with particular success in residential solar leases and energy contracting services.

For a more comprehensive policy to overcome barriers to solar adoption, many states and countries have turned towards programs that offer opportunities for broad participation by any customer or citizen. When most successful, these incentive programs provide a stream of incentives that is independent of property ownership or tax liability, and offer stable recovery of investment, which can be made in smaller increments. Generally described as Community or Shared Solar, these policies should be explored in Oregon to bring the benefits of solar to all customers regardless of property ownership or income level. Additionally, many of these programs offer opportunity for new community-based business models, including cooperatives, and group crowdfunding-oriented investment.

1. Barriers that could be reduced by modifying the incentive program.

   Pertaining specifically to the VIR, rolling registration based on capacity allocation and reducing tiers of payments is a potential solution to the allocation barriers. Further exploration of the program design and administration is necessary if it is to be a model for future solar policy.

2. "Barriers" that are really measures intended to minimize cost shifting or abuse

18. List "other" barriers unrelated to incentive programs (e.g. local permitting, building codes, other)

Questions about Future Development of Solar Energy

19. At what penetration does solar generation affect local distribution reliability?

This question is best answered by having comprehensive and open access to information about the utilities' local distribution system, and comparing with other systems and their integration of renewables. The current penetration of solar and distributed generation in Oregon is very low, even compared to neighboring states such as California. It is difficult to quantify exact factors without greater public insight into utility networks, transmission constraints, and operational utility management activities.

20. What initiatives are in place to prepare for greater solar penetration, and what initiatives might be considered?

The initiatives in place to integrate solar should be broken into two categories: market initiatives and infrastructure initiatives, which may or may not have overlapping goals. Pertaining to market initiatives, the Energy Imbalance Market (EIM) partnership between regional utilities and ISOs provides a framework for potential solutions to meeting constraints related to variable demand.

Related to infrastructure, a number of initiatives offer promise towards offering better integration of variable, distributed renewables with the existing and planned distribution network. Energy storage, electric vehicle and Smart Grid initiatives at the local and national level promise to offer better load management and decreased output variability of renewable resources. From the power electronics manufacturers, efforts are underway to make solar inverters more useful in grid operation, and potentially modifying standards of operation. For example, in addition to power conversion and fault protection, solar inverters are being designed to offer the following grid reliability services:

- Remote dispatch and power curtailment
- Frequency response management
- Power factor and reactive power control
- Fault ride-through services

While some of the perceived barriers to integration are based on technological limitations, others are based on market factors and entrenched assumptions about the future demand and supply of electricity. Utilities globally are exploring opportunities to change the relationship between customers and utilities to provide communication of both price signals and energy availability in ways that encourage and incentivize active customer participation. Oregon should seek to be a leader in innovation and market development in new energy sources and technology, and the regulatory framework plays a critical role in fostering these opportunities.

21. Looking forward, what initiatives are in place to reduce solar integration costs, and what initiatives should be considered?

22. What business models would best meet the overall goals in Questions 1 and 2?

Other utility models are effectively working in other markets, and serving to develop renewables in ways that meet customer expectations for carbon reduction, cost burdens, market competiton, and reliable service. A comprehensive evaluation of these other markets may be outside the scope of this report, but it would be valuable for the Commission to recognize and identify alternate market models which may be delivering. As previously referenced, the Rocky Mountain Institute Report on New Models for the Distribution Edge provides useful context for this discussion.[6]

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[6] http://www.rmi.org/New_Business_Models

City of Portland is grateful for the opportunity to provide this input on the development of the Solar Incentive Program Report under HB 2893. We forward to working with all interested parties in creating policies to increase the development of clean, renewable solar energy systems in our state. We support additional resources, studies and research as necessary to assist the Commission in developing a comprehensive determination of the solar resource value.

RESPECTFULLY SUBMITTED this 19th day of December, 2013

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