**BEFORE THE PUBLIC UTILITY COMMISSION**

**OF OREGON**

**UM 1716**

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| In the Matter of<br><br>PUBLIC UTILITY COMMISSION OF OREGON,<br><br>Investigation to Determine the Resource Value of Solar. | Reply Brief of Renewable Northwest, the NW Energy Coalition, Northwest Sustainable Energy for Economic Development and the Oregon Solar Energy Industries Association |

## I. INTRODUCTION

Renewable Northwest, the NW Energy Coalition, Northwest Sustainable Energy for Economic Development, and the Oregon Solar Energy Industries Association (together, the "Joint Parties") submit this Reply Brief in response to the August 26, 2016 Initial Briefs filed by Commission Staff ("Staff"), PacifiCorp, Idaho Power Company, and Portland General Electric. We recommend that the Commission adopt Staff's proposed Resource Value of Solar ("RVOS") methodology and elements, plus the elements "Security, Reliability, Resilience" and "Ancillary Services." Additionally, we recommend that Investigation #2 include a discussion on the value of Distributed Resource Plans in terms of gathering the data required to calculate the RVOS.

## II. ARGUMENT

### 1. An RVOS Methodology Without "Security, Reliability, Resiliency" and "Ancillary Services" Would Fail to Capture Some of the RVOS.

The Joint Parties recommend inclusion of the elements "Security, Reliability, Resiliency" and "Ancillary Services" in the RVOS methodology so that the methodology offers a more accurate estimate of the RVOS. Staff and the utilities oppose inclusion of both elements on the grounds that the methodology should not include values that are not currently provided by existing, "mass-market" systems.[1] For example, Staff asserts that "if the RVOS methodology is to have a broad application, the benefits that a few solar systems may provide to ratepayers in very particular circumstances should not be valued in the methodology."[2]

We respectfully disagree with Staff and the utilities, and reiterate our recommendation that the Commission adopt an RVOS methodology that includes "Security, Reliability, Resiliency" and "Ancillary Services." Both elements should be part of the RVOS methodology because they meet the threshold that the Commission articulated in Order 15-296 since both elements "could directly impact the cost of service to utility customers." In fact, both elements capture benefits offered today by existing, "mass-market" systems, as well as benefits offered by solar systems that will likely be widespread in Oregon in the near future.

The aim of the UM 1716 investigation is to determine the Resource Value of Solar, not to design a broadly applicable value of solar tariff. While we acknowledge Staff's general concern about an RVOS of broad applicability, we disagree with the idea that

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[1] *See* Idaho Power Company's Initial Brief at 13; Staff Opening Brief at 13-15; PGE's Opening Brief at 4;
[2] Staff Opening Brief at 14.

such concern warrants exclusion of the two elements. First, in Order 15-296 the Commission expressly declined to pre-judge the use of the RVOS.[3] Second, as Staff acknowledged, the RVOS methodology can produce several resource values of solar for each utility.[4] If, at some point, this methodology is used to calculate an RVOS applicable only to mass-market systems (i.e. for the purpose of compensation), at that point, adding a value of zero for non-applicable elements should address Staff's concern.

### 1.1 The elements "Security, Reliability, Resiliency" and "Ancillary Services" have a value today.

We recommend inclusion of "Security, Reliability, Resiliency" and "Ancillary Services" in the RVOS methodology because without them any estimates of the RVOS would not include benefits that solar systems currently provide. As we explain below, solar systems currently provide benefits in terms of "Security, Reliability, Resiliency" and "Ancillary Services" that the proposed RVOS methodology fails to capture. Hence, a methodology that includes both elements would produce an estimate of the RVOS closer to the actual RVOS.

We reiterate our recommendation that the Commission include the element "Security, Reliability, Resiliency," as defined in Staff's July 2015 Comments,[5] because this element would capture benefits to ratepayers that solar systems currently offer. Such benefits include "1) reduction in outages by reducing [transmission and distribution] network congestion [and] 2) minimization of outages resulting from a more diverse and dispersed

[3] *In the Matter of Investigation to Determine the Resource Value of Solar*, Docket No. UM 1716, Order No. 15-296 at 2 (Sep. 28 2015).
[4] Staff Opening Brief at 5.
[5] *In the Matter of Investigation to Determine the Resource Value of Solar*, Docket No. UM 1716, STAFF's Comments at 6 (Jul. 20 2015).

electricity supply."[6] In contrast, the definition of the element that Staff now proposes, along with the proposed exclusion of the element, would lead to a methodology that fails to capture the benefits included in Staff's July 2015 definition. Therefore, we recommend that the Commission include in the RVOS methodology the element "Security, Reliability, Resiliency" as defined in Staff's July 2015 comments.

We also reiterate our recommendation that the Commission include "Ancillary Services" as a distinct element in order to capture, among others, benefits that solar systems currently offer to ratepayers. Staff proposes inclusion of "Integration and Ancillary Services" with a definition that includes "any change in ancillary service procurement due to a reduction in metered load."[7] However, the methodology that Staff proposes to calculate "Integration and Ancillary Services" does not appear to capture change in ancillary service procurement due to a reduction in metered load.[8] Hence, we recommend that the Commission include "Ancillary Services" in the RVOS methodology to capture both the changes in ancillary service procurement and the value of the ancillary services that solar systems will provide to the grid.[9]

1.2 <u>Including "Security, Reliability, Resiliency" and "Ancillary Services" in the RVOS methodology will lead to a more accurate Investigation #2.</u>

We recommend that the Commission adopt an RVOS methodology with "Security, Reliability, Resiliency" and "Ancillary Services" because such a methodology can better

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[6] *Id*.
[7] Staff/200 Olson/22
[8] Staff Opening Brief at 9 ("Solar system inverters can provide grid support through voltage support and frequency regulation.").
[9] *See* Joint Parties Initial Brief at 10-12; *In the Matter of Investigation to Determine the Resource Value of Solar*, Docket No. UM 1716, STAFF's Comments at 6 (Jul. 20 2015) (offering the following perspective for the element "Ancillary Services and Grid Support": "Solar system inverters can provide grid support through voltage support and frequency regulation.").

inform Investigation #2. This RVOS methodology will inform Investigation #2's inquiry into the degree, if any, of cost-shifting from net-metering participants to non-participants, or vice-versa. Accordingly, this RVOS methodology should aim to produce an estimate of the RVOS as close to the actual RVOS as possible. As we indicate above, an RVOS methodology without "Security, Reliability, Resiliency" and "Ancillary Services" fails to capture some of the benefits that solar systems currently provide to utility customers. As a result, an RVOS methodology without these elements would lead to a less accurate estimate of the RVOS and may impact the accuracy of Investigation #2. Therefore, we recommend that the Commission include the elements "Security, Reliability, Resiliency" and "Ancillary Services" in the RVOS methodology.

1.3 <u>The elements "Security, Reliability, Resiliency" and "Ancillary Services" capture benefits that will be widespread in Oregon in the near future.</u>

We recommend inclusion of "Security, Reliability, Resiliency" and "Ancillary Services" in the RVOS methodology because they could directly impact the cost of service to utility customers and therefore meet the Commission's threshold. In addition to capturing the widespread benefits that solar systems currently provide to utility customers that we mentioned above, both elements can capture grid benefits offered by solar systems that will likely become widespread in Oregon in the near future.

We respectfully disagree with Staff's recommendation that "Security, Reliability, Resiliency" should not be part of the RVOS methodology because it is only associated with advanced and uncommon infrastructure.[10] Even under Staff's narrow definition of

[10] Staff Opening Brief at 15.

"Security, Reliability, Resiliency,"[11] some solar systems in Oregon currently provide value that the element would capture since they provide "backup energy or microgrid islanding capabilities during a loss of service from the utility."[12] According to data prepared by the Energy Trust of Oregon ("ETO"), 7% of the total number of installed ETO systems in Oregon are microgrids.[13] The ETO data also shows that the portion of ETO solar microgrid systems in Oregon is increasing, since 13% of ETO applications currently in progress are for solar microgrids.[14] As the ETO data indicates, microgrids are becoming more common in Oregon, providing further support for the inclusion of "Security, Reliability, Resiliency" in the RVOS methodology.

We also respectfully disagree with Staff's recommendation that "Ancillary Services" should not be part of the RVOS methodology because it is only associated with advanced and uncommon infrastructure.[15] The advanced inverters that will allow solar systems to realize additional benefits in terms of "Ancillary Services" are becoming increasingly common in Oregon. According to ETO data, 22% of the total number of existing ETO solar projects include smart inverter models that can provide grid services.[16] The ETO data also indicates that this infrastructure is becoming increasingly common in Oregon year by year. For example, while only 10% of ETO systems had smart inverters in 2011, by 2013 this had increased to 25%.[17] This upward trend continues with 42% of all ETO

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[11] Staff /200 Olson/23 ("The potential capability of solar, when deployed in combination with other technologies, to provide backup energy or microgrid islanding capabilities during a loss of service from the utility.")
[12] *Id*.
[13] Appendix A at 2.
[14] *Id*.
[15] Staff Opening Brief at 15.
[16] Appendix A at 3.
[17] *Id*.

systems installed so far in 2016 possessing smart inverters.[18] Advanced inverters that allow the realization of additional value that solar systems can provide in terms of "Ancillary Services" are becoming more common, providing further support for the inclusion of the elements in the RVOS methodology.

### 2. Distributed Resource Plans Would Likely Be Helpful Tools in Oregon.

While discussing the elements "Security, Reliability, Resiliency" and "Ancillary Services, Staff points to Distributed Resource Plans ("DRPs") and to the experience that other states have had with these tools.[19] As Staff indicated, many of the issues discussed throughout this investigation point to the value of DRPs. As we move into the second phase of this investigation we recommend discussing the extent to which DRPs would be useful in terms of gathering the data required for the RVOS methodology.

## III. CONCLUSION

For the reasons stated above, we recommend that the Commission adopt Staff's proposed RVOS methodology with the elements "Security, Reliability, Resilience" and "Ancillary Services" in addition to the ten elements that Staff originally recommended.

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[18] *Id*.
[19] Staff Opening Brief at 14.

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RESPECTFULLY SUBMITTED this 19th day of September, 2016,

*/s/ Silvia Tanner*
Silvia Tanner
Staff Counsel
Renewable Northwest

*/s/ Michael H. O'Brien*
Michael H. O'Brien
Senior Policy Analyst
Renewable Northwest

*/s/ Jeff Bissonnette*
Jeff Bissonnette
Executive Director
Oregon Solar Energy Industries Association

*/s/ Jaimes Valdez*
Jaimes Valdez
Policy Manager
Northwest Sustainable Energy for Economic Development

*/s/ Fred Heutte*
Fred Heutte
Senior Policy Associate
NW Energy Coalition

**BEFORE THE PUBLIC UTILITY COMMISSION**

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**APPENDIX A**

**Microgrid and Smart Inverter Installations In Oregon**

**September 19, 2016**

1.866.368.7878
503.546.6862 ***fax***
energytrust.org

# Microgrid and Smart Inverter Installations in Oregon
**September 16, 2016**

Energy Trust of Oregon received informal data requests from parties involved in the Oregon Public Utility Commission's Docket UM 1716, Investigation to Determine the Resource Value of Solar (RVOS), regarding smart inverters and microgrid installations in Oregon. As this information may be pertinent to all parties involved in the RVOS docket, we respectfully provide the following response about the current status and near-term potential for microgrids and solar inverters with capabilities to provide ancillary services to the utility grid.

## Current and near-term microgrid installations in Oregon

The proposed RVOS element "Security, Reliability, Resiliency" is defined by E3 as "the potential capability of solar, when deployed in combination with other technologies, to provide backup energy or microgrid islanding capabilities during a loss of service from the utility." From incentive application records, we have identified the total number of solar microgrids - projects capable of providing backup energy or islanding during a loss of service - that are installed or currently in progress in Oregon. We divide these into three categories:

**1) Solar plus storage for backup only:** A solar installation paired with batteries, capable of islanding the site to provide the customer with power during utility outage.
**2) Advanced solar plus storage:** A solar installation paired with batteries, capable of both islanding the site to provide the customer with power during utility outage and operating in parallel with the utility to optimize onsite solar energy usage, limiting the amount of electricity that is fed back to the grid and/or shifting peak demand. Additionally, some projects in this group have potential to communicate with a utility to provide grid services.
**3) Solar backup without storage:** A solar installation paired with an inverter that is capable of islanding and powering a secure power outlet during power outage.

Installed microgrid systems are shown in Table 1, and in-progress systems are shown in Table 2, below.

**Table 1. Installed Energy Trust solar microgrid systems in Oregon as of September 15, 2015.**

| | Pacific Power | | PGE | | TOTAL |
|---|---|---|---|---|---|
| **Category** | Residential | Commercial | Residential | Commercial | |
| Solar + Storage | 31 | 6 | 11 | 3 | 51 |
| Advanced Solar + Storage | 18 | - | 3 | 4 | 25 |
| Solar Backup Capable | 446 | 32 | 164 | 15 | 657 |
| **Microgrids Installed** | **495** | **38** | **178** | **22** | **733** |
| Total Installations | 3,451 | 522 | 5,817 | 464 | 10,254 |
| **% of Total** | **14%** | **7%** | **3%** | **5%** | **7%** |

**Table 2. In-progress Energy Trust solar microgrid systems in Oregon as of September 15, 2016**

| | Pacific Power | | PGE | | TOTAL |
|---|---|---|---|---|---|
| **Category** | Residential | Commercial | Residential | Commercial | |
| Solar + Storage | 2 | - | - | - | 3 |
| Advanced Solar + Storage | 3 | 1 | 3 | - | 6 |
| Solar Backup Capable | 34 | 10 | 27 | 6 | 77 |
| **Microgrids In-Progress** | **39** | **11** | **30** | **6** | **86** |
| Total Applications In-Progress | 198 | 50 | 369 | 43 | 660 |
| **% of Total** | **20%** | **22%** | **8%** | **14%** | **13%** |

## Current and near-term smart inverter installations in Oregon

Most inverter manufacturers have begun to produce smart inverter models with autonomous grid-support functions. Certain manufacturers have the ability to use a firmware update to activate these functions on inverters installed in the field. This may require either an onsite visit or a remote update, depending on the model and presence of an internet connection.

Adoption of smart inverter functions is being driven by new requirements recently developed in California. The California Public Utility Commission (CPUC) convened the California Smart Inverter Working Group (SIWG) in January 2013 to discuss emerging distributed energy resource (DER) systems, develop functionality requirements, and establish an implementation plan to bring these developments into California's Rule 21 requirements for interconnection. The SIWG developed a phased approach to addressing DER functionality: 1) passive functions that the DER is capable of automatically performing once programmed, 2) active functions requiring utility communication, and 3) additional DER functions.

The SIWG effort triggered an update of the IEEE 1547 standard for inverters to include seven critical passive or autonomous functions, and the UL 1741 SA testing standard was recently finalized as a result. These autonomous functions include voltage ride-through, frequency ride-through, Volt/VAR control, "soft-start" reconnection, fixed power factor, and ramp rate. California amended Rule 21 and said it will require all inverters to be capable of these passive advanced or smart functions by September 8 , 2017. More information on the SIWG and the implementation plan in CA can be found in Attachment E of the recent Rule 21 proceeding. More work will be required by the SIWG on the Phase 2 and Phase 3 DER functionality and requirements.

Based on conversations with inverter manufacturers, Energy Trust has identified inverter models on the market that could be updated to meet the California requirements. Our incentive application records show increasing adoption of these inverters. Table 3, below, shows that these inverters that can be updated for autonomous grid-support capabilities make up 21% of the current installed base of Energy Trust solar projects. Table 4, below, shows that the adoption of these inverters is increasing, with 41% of applications including a smart inverter model in 2016.

**Table 3. Installed Energy Trust solar projects including smart inverter models that can be updated to provide grid services as of September 15, 2016**

| | Pacific Power | | PGE | | TOTAL |
|---|---|---|---|---|---|
| Inverter Manufacturer | Residential | Commercial | Residential | Commercial | |
| ABB | - | - | 3 | - | 3 |
| Enphase Energy | 439 | 52 | 592 | 31 | 1,114 |
| SMA America | 446 | 32 | 164 | 15 | 657 |
| SolarEdge | 150 | 9 | 305 | 12 | 476 |
| **Smart Inverter Systems** | **1,035** | **93** | **1,064** | **58** | **2,250** |
| Total Installations | 3,451 | 522 | 5,817 | 464 | 10,254 |
| **% of Total** | **30%** | **18%** | **18%** | **13%** | **22%** |

**Table 4. Installed and in-progress solar systems with smart inverters by Energy Trust application date through September 15, 2016**

| | Smart inverters by manufacturer | | | | Total Smart Inverters | Total Applications | % of Total |
|---|---|---|---|---|---|---|---|
| | SolarEdge | SMA | Enphase | ABB | | | |
| 2010 | - | - | - | - | **-** | 1,139 | **0%** |
| 2011 | 5 | - | 143 | - | **148** | 1,445 | **10%** |
| 2012 | 23 | 2 | 299 | - | **324** | 1,024 | **32%** |
| 2013 | 16 | 65 | 146 | - | **227** | 924 | **25%** |
| 2014 | 95 | 201 | 213 | 1 | **510** | 1,457 | **35%** |
| 2015 | 231 | 296 | 257 | 2 | **786** | 1,958 | **40%** |
| 2016, YTD | 235 | 169 | 121 | 5 | **530** | 1,256 | **42%** |