September 1, 2015

Sent Via Electronic Mail

Rep. Keith Regier, Chairman
Energy and Telecommunications Interim Committee
P.O. Box 201706
Helena, MT 59620-1706

Rep. Keith Regier,

The Alliance for Solar Choice (TASC) appreciates the opportunity to provide information that will assist the 2015-2016 Energy and Telecommunications Interim Committee (ETIC) with its policy work related to Senate Joint Resolution No. 12. TASC advocates for establishing and maintaining successful distributed solar-energy policies throughout the United States. TASC's members represent the majority of the nation's rooftop solar market. They include Demeter Power, Geostellar, Inc., Silveo, SolarCity, Solar Universe, Sunrun, Verengo and ZEP Solar. These companies are important stakeholders with regard to solar policy at both the state and national levels, and they are responsible for tens of thousands of residential, school, government and commercial solar installations across the United States.

TASC has a strong interest in maintaining the right of consumers in Montana, including homeowners and small businesses, to generate energy for their own on-site use through solar photovoltaic (PV) systems. One of the key components of a successful state policy framework that encourages the use and growth of distributed PV is net metering. Net metering is a widely used, easily understood accounting mechanism for electricity generated and used at a customer's premises. It is an effective policy tool that has driven the adoption of distributed PV and other forms of customer-sited renewables across the United States.

Accordingly, TASC is pleased to provide the following responses to the 11 questions included in the ETIC's June 12, 2015 letter mailed to Ben Brouwer, Policy Director of the Montana Renewable Energy Association.

Respectfully,

Grace Walovich
The Alliance for Solar Choice

cc:

Rep. Christopher Pope (Rep.Christopher.Pope@mt.gov)
Rep. Tom Steenberg (tom.a.steenberg@gmail.com)
Rep. Daniel Zolnikov (Rep.Danel.Zolnikov@mt.gov)
Senator Duane Ankney (goodwind1.duane@gmail.com)
Senator Pat Connell (connell4sd43@yahoo.com)
Senator Robyn Driscoll (Sen.Robyn.Driscoll@mt.gov)
Senator Cliff Larsen (cliff@larsenusa.com)
Sonja Nowakowski (snowakowski@mt.gov)

1. Currently, what are the installed costs for typical net-metered solar PV systems of 5 KW, 10 KW, 50 KW, 100 KW, 500 KW, 1,000 KW, and 5,000 KW?

The installed cost of a customer-sited PV system in the United States can vary significantly based on many factors. These factors include the state and utility service territory in which a PV system is installed, the type of PV system and the existence of certain system accessories (such as tracking equipment), the PV system's capacity (as acknowledged by Question 1), the availability and applicability of financial incentives (including tax incentives), the type of building construction (new or existing) on which the system is installed, the installation company, applicable interconnection procedures (if any), and local permitting practices.

Studies that address the installed costs of distributed PV systems tend to analyze *distributed* or *customer-sited* PV systems in general, rather than *net-metered* systems specifically. However, it is reasonable to assume that an overwhelming majority of customer-sited PV systems installed in the United States are net-metered.

A report published in August 2015 by Lawrence Berkeley National Laboratory (LBNL) provides a wealth of useful data on the installed prices of residential and small non-residential PV systems in the United States in 2014. The following findings[1] of the report are relevant to this discussion:

- Nationally, there was significant variability in the prices of PV systems installed in 2014. Among residential PV systems, 20% sold for less than \$3.50/W, while another 20% sold for more than \$5.30/W. Similar variability exists among non-residential PV systems.
- The median price of an installed residential PV system was \$4.30/W.
- Across all PV systems in the data sample, the median installed price was \$4.30/W for residential systems, \$3.90/W for non-residential systems up to 500 kW, and \$2.8/W for non-residential systems greater than 500 kW.
- Economies of scale occur among both residential and non-residential systems. For residential systems installed in 2014, median prices for systems in the 8-kW to 10-kW range were roughly 15% lower than for systems in the 2-kW to 4-kW range. Among non-residential systems, median installed prices for systems greater than 1,000 kW were 36% lower than for non-residential systems up to 10 kW.
- Installed PV system prices differ among states, with relatively high prices in some large state markets. For residential systems installed in 2014, median installed prices range from a low of \$3.40/W in Delaware and Texas to a high of \$4.80/W in New York.
- Installed PV system prices are higher for systems at tax-exempt customer sites than at for-profit commercial sites.
- Installed prices are substantially higher for systems with high-efficiency PV modules.

[1] *Tracking the Sun VIII: The Installed Price of Residential and Non-Residential Photovoltaic Systems in the United States*. Published by Lawrence Berkeley National Laboratory in August

The LBNL report includes tables of the median installed prices of residential and non-residential PV systems by size, over time.[2] Those two tables are reproduced immediately below.

Table B-2. Median Installed Price of Residential Systems by Size over Time (2014\$/W_{dc})

System Size (kW_{DC})	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
≤2 kW	11.6	11.7	11.9	11.0	10.3	9.8	10.3	10.2	9.8	10.0	9.8	7.5	6.1	4.7	4.3
2-4 kW	11.6	11.2	11.5	10.1	9.4	9.0	9.2	9.4	9.0	8.8	7.6	6.8	5.7	4.9	4.7
4-6 kW	9.1	10.5	10.8	10.0	9.3	8.9	9.1	9.1	8.8	8.3	7.0	6.3	5.5	4.9	4.5
6-8 kW	6.6	11.4	10.7	9.8	9.1	8.7	8.7	8.9	8.6	8.1	6.9	6.1	5.2	4.6	4.2
8-10 kW	-	10.6	10.5	9.6	9.0	9.0	8.9	9.0	8.7	8.2	6.9	6.0	5.1	4.4	4.0
10-12 kW	-	10.8	10.8	9.8	8.9	8.9	8.7	8.9	8.5	8.2	6.8	5.9	5.1	4.3	4.0
12-14 kW	-	-	-	9.6	8.9	8.5	8.3	8.8	8.5	7.8	6.7	5.8	5.1	4.3	3.9
14-16 kW	-	-	-	-	8.5	8.4	8.5	8.8	8.4	7.8	6.7	5.9	5.0	4.2	3.9
16-18 kW	-	-	-	-	9.2	8.5	8.4	8.8	8.5	8.0	6.7	5.8	5.1	4.3	3.9
18-20 kW	-	-	-	-	-	8.3	8.3	8.4	8.6	8.0	6.9	5.9	5.3	4.3	3.9
>20 kW	-	-	-	-	-	-	-	9.2	8.6	7.9	6.9	5.8	5.3	4.6	4.0

Notes: Median installed price data omitted if fewer than 20 observations available. Although not presented here, large variation exists around these median values.

Table B-3. Median Installed Price of Non-Residential Systems by Size over Time (2014\$/W_{dc})

System Size (kW_{DC})	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
≤10 kW	-	-	-	10.5	9.8	9.5	9.8	9.5	9.1	9.2	7.6	6.3	5.1	4.4	4.2
10-20 kW	-	-	-	-	-	9.5	9.3	9.0	8.9	8.7	7.3	6.1	5.1	4.3	3.8
20-50 kW	-	-	10.7	9.6	9.1	8.5	8.6	8.8	8.5	8.3	6.8	5.9	5.1	4.4	3.8
50-100 kW	-	-	-	9.5	9.1	8.8	8.5	8.5	8.3	8.3	6.5	5.7	5.0	4.1	3.7
100-250 kW	-	-	-	8.5	8.5	8.4	8.5	8.2	8.2	8.1	6.1	5.2	4.7	4.1	3.6
250-500 kW	-	-	-	-	-	8.4	8.3	7.4	7.5	7.7	5.9	5.1	4.7	4.1	3.4
500-1000 kW	-	-	-	-	-	-	-	7.7	7.3	7.6	5.8	4.8	4.5	3.8	2.9
>1000 kW	-	-	-	-	-	-	-	-	7.5	7.6	5.5	4.6	4.1	3.4	2.7

Notes: Median installed price data omitted if fewer than 20 observations available. Although not presented here, large variation exists around these median values.

2. If the net-metered systems in question 1 were required to have separate production meters, what would be the incremental installed cost for each project size?

The incremental installed cost of a separate production meter for a customer-sited PV system appears to vary widely, largely depending on the type of meter (and related equipment), the functionalities it is designed to provide or accommodate, and geography. Evidence suggests that the incremental installed cost of a separate production meter in the United States can be as high as \$900.00.[3] In Montana, this cost would be specific to each of the utilities operating in the State. It is possible that relevant data exists in documents filed by one or more utilities at the Montana Public Service Commission.

3. Nationally, what percentage of total net metered systems fall into the size ranges in question 1 (0-5 KW, 5-10 KW, 10-50 KW, etc.)?

Comprehensive, detailed, national-level data on net-metered PV systems is not available. However, the U.S. Energy Information Administration collects and provides data for most electric utilities, including electric cooperatives, which could be useful for the ETIC

---

[2] *Ibid.,* p. 50.

[3] See http://www.njcleanenergy.com/renewable-energy/programs/metering-requirements/production-meter-requirements-solar-projects-srecs.

to review.[4] For each individual utility, the data provided is broken down into the number of net-metered customers by sector and system type, and the aggregate capacity of net-metered customers by sector and system type. For example, EIA's July 2015 dataset indicates a total of only 1,309 net-metered PV customers in Northwestern Energy's service territory, with an aggregate PV system capacity of 5.2 MW. Similar data does not appear to be available for Montana's other investor-owned electric utility, Montana-Dakota Utilities.

In addition, most individual U.S. states require utilities that offer net metering to file periodic reports (typically quarterly or annually) that describe the status of their programs. A small number of states provide net-metering data that includes details on the types and capacity of individual systems. Using this information, it is possible to compile datasets for one or more individual states.

Otherwise, recent industry data published by GTM Research and the Solar Energy Industries Association (SEIA) indicate that more than 600,000 homes and businesses had on-site PV systems at the end of 2014; of these systems, nearly 200,000 were completed in 2014.[5] In addition, 2014 marked the third consecutive year of greater than 50% annual growth in the residential PV sector, with more than 186,000 systems -- totaling 1,231 MW DC -- completed in 2014.[6] GTM Research and SEIA have also published a chart depicting the capacity of annual U.S. PV installations since 2000, broken down by sector.[7] That chart is reproduced immediately below:

---

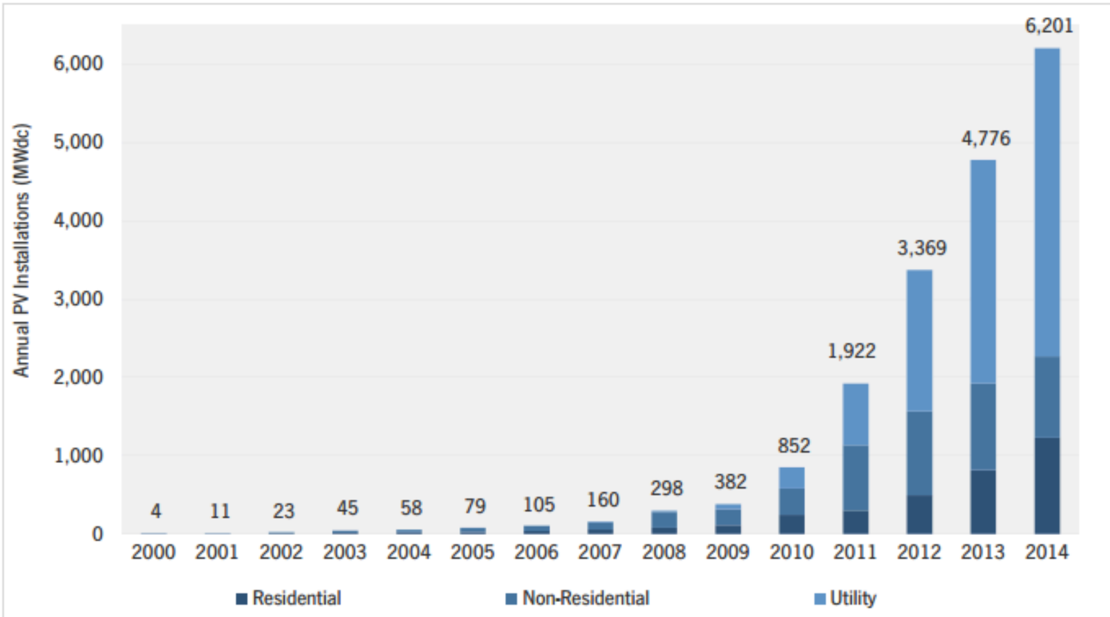
[4] Available at http://www.eia.gov/electricity/data/eia861 and http://www.eia.gov/electricity/data/eia826.

[5] *U.S. Solar Market Insight Report: 2014 Year in Review (Executive Summary).* Published by GTM Research and Solar Energy Industries Association in 2015. Available at http://www.seia.org/sites/default/files/HOlFT6ym3i.pdf. See p. 3.

[6] *Ibid.,* p. 9.

[7] *Ibid.,* p. 3.

Figure 1.1 Annual U.S. Solar PV Installations, 2000-2014



4. Is there a reasonable generator size threshold above which production meters should be required and payments made based on utility avoided costs? If so, identify a reasonable size threshold and describe the basis for determining it.

Net metering is designed to encourage the growth of distributed renewables and allow customers to self-generate electricity to serve their own needs. It would be counterproductive to establish an arbitrary system capacity threshold above which a production meter would be required and the value of a customer's excess kilowatt-hour credits would be eroded. It is important to recognize that distributed PV systems provide considerably more value than a utility's avoided-cost rate. These additional forms of value include ancillary services and grid support, enhanced grid security and resiliency, environmental and public health benefits, avoided environmental and safety costs, and economic development benefits, among others. (Please see our response to Question 7 for additional information regarding the numerous forms of value provided by distributed PV systems.)

TASC is intimately familiar with the 44 state-level net-metering policies currently in effect, and how variations and details of these policies can impact the economic appeal of customer-sited PV systems. A required production meter and reduced compensation for net-metering customers are not consistent with national best practices. Such impositions would lead Montana two steps in the wrong direction.

5. Is there a reasonable threshold or saturation point for requiring the use of smart inverters?

TASC agrees that it is important for policymakers to contemplate the potential roles of certain emerging technologies, including smart inverters, and how they might benefit distributed renewables and the grid. However, smart inverters are a nascent technology that is not yet widely available, and Montana's distributed renewables industry is also nascent. Therefore, TASC believes it would be more appropriate for Montana's policymakers to consider the potential uses and benefits of smart inverters at a future time, after smart-inverter technologies and Montana's distributed renewables industry have had adequate time to mature. In the interim, it is likely that other U.S. states with robust distributed renewables industries will explore the use of smart inverters more thoroughly. When Montana is in a better position to revisit the potential role of smart inverters, the State can benefit from the experiences and lessons learned in other states.

6. Is there a reasonable generator size threshold above which distributed generators should be subject to the same resource planning and procurement processes a regulated utility uses to procure other resources? If so, identify a reasonable size threshold and describe the basis for determining it.

Net-metered PV systems and other renewables should not be subject to burdensome resource planning and procurement processes that apply to regulated electric utilities. As stated above, net metering is designed to allow customers to self-generate electricity to serve their own needs. Thus, net-metered systems generally have little to no impact on the greater grid because they are limited in size to serving the customer's load. Each net-metered system must be interconnected to the grid according to specific procedures adopted by the Montana Public Service Commission and administered by individual utilities.[8] Given the nascent state of Montana's customer-sited renewable DG industry, there is no readily identifiable justification for requiring individual net-metered customers to participate in complex processes designated for large utilities. Rather, such a requirement would erect a significant barrier to customer self-generation and the growth of Montana's distributed renewables industry. Moreover, TASC is not aware of any U.S. states that subject customer-sited renewables systems to the same resource planning and procurement processes that apply to regulated utilities.

However, TASC believes that customer-sited PV growth should be forecast and incorporated into utility planning. To ensure ratepayers receive the benefit of reduced utility investment, utilities should be required to incorporate customer-sited PV adoption rates into their planning processes and adjust investments accordingly. The Federal Energy Regulatory Commission's (FERC) Order 1000 requires FERC-jurisdictional entities to provide comparable consideration of non-transmission alternatives in transmission planning. TASC believes the same should be done with utility resource planning, to ensure ratepayers exposed to the cost of utility investment are only committed to paying for what they need.

7. Identify the benefits of net metering that are shared between net metering customers and customers that do not net meter.

Questions 7, 8 and 9 are related and can be addressed simultaneously. With very few exceptions, net-metered systems are customer-sited and distributed. Distributed PV systems provide numerous forms of value not only to customers who install them, but also to the grid, other customers and broader society. These benefits include:

[8] Mont. Admin. R. 38.5.84 ("Small Generator Interconnection").

- Various ancillary services and grid support (including reactive supply, voltage control, and frequency regulation)
- Enhanced grid security and resiliency
- Avoided energy costs
- Avoided energy losses (including line losses)
- Avoided capacity costs for generation
- Avoided and deferred capacity costs for transmission and distribution
- Avoided costs of fuel hedging
- Avoided market price mitigation (reduction of wholesale market clearing prices for natural gas and electricity)
- Avoided costs related to Montana's Renewable Resource Standard[9]
- Health benefits (reduction in societal costs from health risks, including reduced morbidity and mortality, related to air pollution from fossil-fuel production, transportation and generation)
- Environmental benefits (savings realized from reduced air emission control or allowance costs, including those related to carbon, criteria air pollutants and reduced water use)
- Avoided environmental and safety costs (including reduced land-use impacts, and savings realized from avoided accidents, pollution and economic loss associated with fossil-fuel extraction, transportation, distribution and processing)
- Economic development and job creation
- Expanded state and local tax revenue

As for quantifying the benefits of distributed PV systems, including customer-sited PV systems, the Interstate Renewable Energy Council, Inc. (IREC) has published a leading report[10] that offers lessons from 16 regional and utility-specific distributed PV studies, and proposes a standardized valuation methodology for states to consider implementing in future studies. This report and its recommendations are helpful to consider. In addition, a recent regulatory proceeding in Minnesota offers a useful example of a stakeholder process that was used to develop a methodology to analyze the costs and benefits of distributed PV systems over a 25-year period.[11]

While TASC agrees that is appropriate to fully analyze all of the costs and benefits of net metering prior to the consideration of any changes that would undermine an existing net metering policy, Montana's distributed PV industry is still very much in its infancy. For this reason, TASC strongly believes that it is premature for Montana to devote the resources necessary to develop a methodology to rigorously analyze the benefits and costs of net metering at this time.

---

[9] Mont. Code Ann. § 69-3-2001 et seq.

[10] *A Regulator's Guidebook: Calculating the Benefits and Costs of Distributed Solar Generation.* Published by the Interstate Renewable Energy Council, Inc. in 2013. Available at http://votesolar.org/wp-content/uploads/2013/09/IREC_Rabago_Regulators-Guidebook-to-Assessing-Benefits-and-Costs-of-DSG1.pdf.

[11] Minnesota Public Utilities Commission, Order Approving Distributed Solar Value Methodology, Docket No. E-999/M-14-65. Issued April 1, 2014.

After Montana's distributed PV industry and other distributed renewables industries have matured, TASC believes a rigorous examination requires an unbiased analysis conducted either by the Public Service Commission's Staff or an outside consultant with the following qualifications:

- Prior experience in conducting cost-benefit evaluations of demand-side programs, preferably prior experience conducting distributed renewables benefit-cost or benefit-alone studies;
- A deep knowledge of the technological, operational and policy elements of customer-sited generation; and
- A significant track record of consulting for state regulatory commissions on complex public policy issues.

The most crucial qualification for a consultant is independence. When an analysis is eventually warranted, the State should ensure that any third-party consultant it chooses has no current or planned projects, or other business relationship, with any jurisdictional utilities, or those utilities' affiliates, subsidiaries or parent companies. Montana also should maximize transparency and stakeholder participation, allowing the public to comment on the study's scope, inputs, assumptions, and methodology. Moreover, the study's authors should submit a draft of the completed analysis for full stakeholder review. Such procedural safeguards will ensure that a benefit-cost study, when it is warranted, will uphold the democratic traditions of transparency and broad stakeholder input.

8. Identify additional net metering benefits (employment, taxes, societal, environmental, etc.) and explain, in the industry's opinion, how best to account for those benefits.

Please see our response to Question 7.

9. Identify one or more methods for quantifying the benefits of net metering. In your opinion, what are the advantages and disadvantages of each method?

Please see our response to Question 7.

10. In your opinion, is all or part of the utility or cooperative revenue impact or customer bill impact of net metering a subsidy? If so, describe the basis for determining that the impact is a subsidy.

TASC does not believe that net metering constitutes a subsidy, and there is no credible, unbiased evidence that supports this conclusion in Montana. In fact, nearly every independent benefit-cost study of net metering conducted recently in other states has concluded that the benefits provided by net-metering customers are worth more than the compensation received by net-metering customers through net metering, or are approximately equal. For example, a study issued by the Public Utilities Commission of Nevada in 2014 found that grid benefits of rooftop-distributed energy installed through

2016 exceed costs by approximately $36 million .[12] Studies were also recently completed in Maine and Mississippi. Maine's value of solar study,[13] which was mandated by legislation enacted in 2014, found that the value of solar energy produced in Maine is $0.33/kWh, which is approximately $0.20/kWh more than the average net-metering credit on PV customers' bills.[14] Mississippi's net-metering study was completed to help the Mississippi Public Service Commission in its investigation to establish and implement net metering and interconnection standards for that state, as Mississippi is one of the few states that do not currently have a net-metering policy.[15] Overall, the analysis showed that the policy has the potential to provide net benefits to the state in nearly every scenario and sensitivity analyzed.[16] Additional studies completed in Vermont[17] and Missouri[18] also concluded that the benefits outweigh the costs.

However, TASC re-emphasizes that a benefit-cost study, such as those discussed above, is premature at this time in Montana, due to the apparently very low penetration rate of distributed generation and net metering in the State.

Lastly, on a related note, it is useful to consider that customer self-generation can reduce utility sales, which can bias utilities against a full recognition of the benefits of distributed PV and other forms of distributed generation.[19] It is important to recognize that under net metering, the effects of a customer's on-site energy generation and use ("behind the meter") are no different to a utility or other customers than improved energy conservation or enhanced energy-efficiency measures undertaken at the customer's home or other facility. Customers have a right to self-generate energy under Federal law; net

---

[12] Nevada Net Energy Metering Impacts Evaluation. Published by Nevada Public Utilities Commission in 2014. Available at http://puc.nv.gov/About/Media_Outreach/Announcements/Announcements/7/2014_-_Net_Metering_Study. At 7-8.

[13] *Maine Distributed Solar Valuation Study*. Conducted by Clean Power Research, March 2015. Available at https://mpuc-cms.maine.gov/CQM.Public.WebUI/Common/CaseMaster.aspx?CaseNumber=2014-00171.

[14] Per Natural Resources Council of Maine, March 3, 2015. Available at: http://www.nrcm.org/news/nrcm-news-releases/maine-puc-solar-power-study.

[15] *Net Metering in Mississippi: Costs, Benefits and Policy Considerations*. Published by Synapse Energy Economics, Inc. in September 2014. Available at http://www.psc.state.ms.us/InsiteConnect/InSiteView.aspx?model=INSITE_CONNECT&queue=CTS_ARCHIVEQ&docid=337867.

[16] *Ibid.,* at 49.

[17] *Evaluation of Net Metering in Vermont Conducted Pursuant to Act 125 of 2012*. Published by Vermont Department of Public Service in January 2013. Available at http://publicservice.vermont.gov/sites/psd/files/Topics/Renewable_Energy/Net_Metering/Act%20125%20Study%2020130115%20Final.pdf.

[18] *Net Metering in Missouri: The Benefits and The Costs*, Missouri Energy Initiative, Winter 2015. Available at http://moenergy.org/images/Net%20Metering%20%20in%20Missouri%202015%201.pdf

[19] See, e.g., *Disruptive Challenges: Financial Implications and Strategic Responses to a Changing Retail Electric Business* (describing growth in small-scale solar systems as the "largest near-term threat" to the electric utility industry). Published by Edison Electric Institute in January 2013. Available at http://www.eei.org/ourissues/finance/documents/disruptivechallenges.pdf. At 4-5.

metering simply sets a fair rate for any energy that is exported by self-generating customers.

11. What are the pros and cons of extending Montana's net metering policy to apply to rural electric cooperatives and all regulated utilities? Is it appropriate to treat rural electric cooperatives and certain regulated utilities differently in relation to net metering requirements under specific circumstances in Montana? If yes, explain.

In the spirit of promoting uniformity and efficiency, TASC believes that Montana should extend its net-metering policy to all rural electric cooperatives and all regulated utilities.[20] It is more difficult for PV companies and other distributed renewables providers to conduct business throughout a state when the ground rules -- including the availability and nuances of net metering -- differ from utility service territory to utility service territory. A uniform, statewide net-metering policy facilitates PV companies' planning processes and business operations in that state, generally helps to lower costs as a result.

[20] It is TASC's understanding that Montana's current net-metering policy already applies to NorthWestern Energy and Montana-Dakota Utilities.