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Before the U.S. Senate Subcommittee on Energy

“Net Metering and Interconnection Standards”

Thursday May 7, 2009 2:30pm

Madam Chairman, members of the Subcommittee, thank you for the opportunity to testify today. I am here on behalf of my company and on behalf of the Solar Energy Industries Association who is the leading national trade association for the solar energy industry. SEIA works to expand markets for solar, strengthen research and development, remove market barriers and improve public education and outreach for solar energy professionals. SEIA has over 900 member companies representing the entire spectrum of the industry, from the small installers to large multinational manufacturers.

Access to net metering and standardized and streamlined interconnection standards are critical to the widespread deployment of customer sited solar and other renewable energy generators. While a total of 42 states have net metering and every state has some form of interconnection rules, the rules vary widely. Some encourage the use of renewable energy generators while others hamper the national deployment of solar. I will herein describe in Section I the important aspects of net metering. In Section II I will discuss the need for comprehensive national standards for interconnection of small generators.

SECTION I: NET METERING – What is it?

Net metering is an economic arrangement between a customer who owns or operates their own generator (“customer generator”) and their local utility to effectuate the operation of the customer-generator’s generator. It is distinguished from interconnection standards which are the technical and safety requirements needed to connect a generator that will interact with the utility grid in a mode the industry calls “parallel operation”. While any generator that will avail itself of a net metering **must** be interconnected, an interconnected generator may or may not operate under a net metering tariff. It is important to distinguish between the two.

The term “net metering” derives from a simple utility metering system where a single meter spins forwards when a customer is using more electricity than they are generating and in reverse during those times when the generator output is greater than the customer’s load. Because the meter spins forwards and in reverse the meter itself “nets” excess consumption and generation and the meter reading shows the net of generation and consumption over any discreet billing period.

Interestingly, the simple meters typically deployed by utilities in the 1950’s and 1960’s with the spinning disk would net meter. All of these meters would simply spin in reverse when a generator on the customer’s side was producing more power than the customer was using.

Why is net metering needed?

For renewable generators like solar and wind, the renewable generator operates when the resource is available and cannot be throttled up or down to match the load at the customer’s home or business. That means that at any given time there is a high probability that the generator is either producing more than the customer needs or less. When the generator is producing more power the customer has three choices:

1) the customer can install a storage device (e.g. batteries) and send the excess power to storage to be used later.
2) the customer can turn on more electricity consuming equipment to use the excess power (not generally encouraged).
3) the customer can send the power to the electric grid for use by other customers.

Under option 3 -- the net metering option -- the customer is credited for the power to the grid and can use those credits later to offset future costs and lower their electric bill. Option 3 is the lowest cost option for the customer and in the case of solar generators the best option for the utility grid.

A standard net metering tariff allows the power producer to obtain full value for all of their power produced without the excess cost of installing batteries or other storage devices.

Why is their opposition to net metering?

The rate that a utility typically charges a customer for kilowatt-hours (kWh) consumed by the customer includes fixed charges. When a customer produces their own energy (kWh) and receives a full retail credit for excess kWh, the utility has a reduced revenue source for the fixed cost component of providing electric service. These lost contributions to fixed costs are born by the utility until their next rate case at which time other customers would pay an incrementally higher percentage of the fixed costs to make up the loss from the net metering customers.

This raises the largest question about net metering – whether power producers that are benefitting from net metering are paying their fair share of system costs. There is no clear answer and to the best of my knowledge, no comprehensive study has ever been undertaken to address and potentially resolve this issue.

Part of the reason the question cannot be answered simply is that net metering customers provide a host of indirect benefits to other utility customers. In the case of solar customer-generators these benefits include:

- reducing peak demand,
- avoiding environmental damage,
- improving grid efficiency,
- avoiding upgrades to transmission and distribution grid,
- providing local voltage support that can reduce the need for other utility equipment,
- reducing the need for operating and spinning reserves needed to assure electric reliability,
- the ease of deploying solar projects and their short lead times reduces the risk of forecasting mistakes that can result in costly power generation overcapacity[1].

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[1] From A WHITE PAPER By ED SMELOFF, "QUANTIFYING THE BENEFITS OF SOLAR POWER FOR CALIFORNIA"

All of these benefits go to reducing and perhaps eliminating any subsidy from non net metered customers. In fact, it may be true that net metering customers are subsidizing other customers.

In case there is a cross subsidy, net metering rules typically limit the total amount of customers who can net meter. For example, a state might limit net metering to five percent of the total capacity of generation on a utility system. This ensures that if there is a net metering subsidy, any subsidy is tiny and of minimal impact on other customers.

It is also worthy of note that net metering provides no worse an economic arrangement for the utility and other customers than the alternative presented to the customer-generator – storage.

If a customer-generator were to install a storage device for all of their excess production, they would cease to contribute to fixed costs for any of the kWh they produced (in an identical way, a customer who reduces their consumption through energy efficiency also contributes less to fixed utility costs). For the solar generator with storage, the situation becomes worse for other customers. Because solar generation typically occurs during the more costly peak times, the solar customer-generator is invariably producing excess power during the most costly periods for grid electricity while consuming excess net metering credits during off-peak periods. When the solar customer "net meters", the excess peak energy is sent to the grid and other customers see the benefit of this peak energy generation.

If a solar customer-generator were to instead use storage, they would be storing peak energy for off-peak usage. This is quite contrary to all grid storage strategies which store off-peak energy for on-peak usage. So were net metering not offered and customers were driven to an on-site storage option, other customers would be worse off than if net metering is used.

Why is a federal standard needed?

While 42 states have some form of net metering in place, no two are the same. Some state net metering rules are robust and can be said to encourage a wide array of renewable energy deployment by customers. Others are quite limited and act as barriers to the widespread use of solar energy. A ranking of the states showing how they compare against each other was performed by the Network for New Energy Choices and is attached to my testimony as Appendix A. It is my understanding that a grade of “C” under this ranking represents a functional standard for most customers. Lower grades mean the state’s rule contains some major and minor barriers.

A minimal federal standard that allows all customers to use solar energy for their electricity needs is critical to the growth of the solar industry. A federal standard will remove barriers that currently exist in the myriad of state net metering standards. While states should be encouraged to go beyond the minimal federal standard to actually promote the use of renewable energy, the industry needs a federal standard that removes all major barriers nationwide.

Key elements of a functional federal standard:

- 1:1 ratio of credit to kWh produced. A customer should see no reduction in the value of the power they produce. Not only is a lower ratio a deterrent to the use of renewable energy, it incurs extremely high administrative costs to implement. If those administrative costs are placed on the net metered customer, they often lose much of the value of the renewable energy they produce.
- Time of use open to net metering customers at an equivalent to the time of production and consumption. Where time of use rates are in place, a renewable customer-generator should get a peak credit for any excess peak power produced to be used to offset peak power consumption. The same is true for mid-peak and off-peak periods. If the peak power costs, for example, 2 times the mid-peak, the net metering customer should get 2 mid-peak credits in consumption for every peak credit they produce.
- Safe harbor provisions. A customer-generator should not be charged any special fees or other charges to have access to net metering and should be treated identically in terms of rates and other conditions of service to a similarly situated customer that does not have a renewable generator.

Recommendation on generator size limits

The size of a customer-generator’s generator does not impact the economic equation related to potential cross-subsidy discussed above. Therefore the size limitations on net metering generators should skew to the large to allow all customers to offset a substantial portion of their electricity needs. While the recent trend among states is to set the upper limit on the size of generator at 2 megawatts, several states have gone well above that limit. In addition, the size of solar generators at customer sites are trending to the larger sizes with the largest customer sited solar generator at the Nellis Air Force base in Nevada coming in at 14MW. To allow room for this growth to continue, I would recommend a **10MW** limit on the size of the net metered generator.

Recommendation on total capacity

To allow both for sufficient growth in the solar (and other renewable) industry, I would recommend that the total installed capacity limit for all net metered generators be set at **5 percent of the capacity of any individual utility system**. This limit ensures that a cross subsidy, if any exists, is small while at the same time allows for a decade's worth of growth in the industry. Even if the power exported to the grid is only worth the wholesale power rate (about half the net metering credit), that means the total cross subsidy is less than 2.5 percent. It is less both because of an assumption that the aforementioned list of benefits are worth something more than zero and because a capacity limit does not account for the many installations that will be exporting no power to the grid and hence incurring no subsidy (many solar installations at commercial and industrial sites never export to the grid even though they use a net metering tariff).

Recommendation on implementation

To avoid supplanting state work on net metering completely, I would recommend that the Federal Energy Regulatory Commission (FERC) be tasked with creating a model net metering tariff for states to use that eliminates all major barriers sometimes buried in net metering rules. States and utilities will then have a useful guide to creating their own net metering rules and will have the flexibility to go beyond the model to adopt rules that promote renewable energy. FERC should have the authority to order the adoption of the model rules in those cases where it determines, after hearing, the net metering rules of any particular utility constitute a barrier to the use of renewable energy.

Other Points

1) Net metering should address solely the economic arrangement for renewable customer-generators. Any technical or safety related issues including the types of equipment needed to interconnect and the costs for interconnection studies should be addressed in the interconnection standards.
2) Net metering should not be considered a buy and sell arrangement between the customer and utility. To simplify the entire transaction and avoid transactional costs, net metering should be constructed as a "swap" of kilowatt-hours where the parties receive kWh at a certain point in time to be consumed at a later point in time. When there is no buy-back or selling of kWh, there are no checks to be cut and no accounting ledgers to maintain. In the simplest and perhaps easiest form to implement net metering, excess kWh credits are simply carried forward month to month to be used by the customer at some time in the future. When the customer departs as a utility customer, any unused credits disappear.

INTERCONNECTION STANDARDS

Interconnection standards, unlike net metering rules, address technical, safety and contractual issues surrounding operation by a customer of any type of generator that generates in parallel to the utility grid. This includes generators sited at a customer's location that export power to the grid; generators sited at a customer's location that do not (and in some cases cannot) export power to the grid; and generators that are not at a customer site but are connected to the grid and export power. Interconnection standards typically address the smallest home generators in the kilowatt range to gigawatt sized generators.

Interconnection is accomplished by having the local utility "study" the impacts on the grid of connecting the proposed generator. Where the generator is small in relation to the capacity of the grid, the interconnection may be approved without any grid improvements. Where the new generator may overload utility protective devices or lines, the utility, at the generator's cost, will have to upgrade those devices or lines before the interconnection can be approved. The interconnection study process for the latter may take months and costs tens of thousands of dollars to complete.

SECTION II: Interconnection Standards -- The Need for a Comprehensive Federal Small Generator Interconnection Standard

FERC in its Order No. 2006[2] (et. seq.) created a small generator interconnection procedure (SGIP) that all federally regulated utilities were required to adopt. This standard was the result of a long series of stakeholder meetings FERC held subsequent to the issuance of its Notice of Proposed Rulemaking (NOPR) on small generator interconnection standards. The rules are generally comprehensive but are lacking in three distinct areas:

1) Order No. 2006 does not provide for standardized interconnection procedures for customer sited generators that will not export power to the grid. The stakeholder process that led to Order No. 2006 was limited in time and this aspect of the procedures was simply left unaddressed because of the time constraints. Larger combined heat and power generators typically fall into this category and at present there is no federal standard that expedites the interconnection of these generators. With the increasing size of solar generators, they too may soon find need for the interconnection rules for larger generators.
2) Updates from state interconnection proceedings. Many states have undertaken interconnection proceedings subsequent to issuance of FERC Order No. 2006 many of which have expanded upon and added refinements to the original FERC Order. FERC should revisit its Order to include the best practices from the state proceedings and their interconnection rules.
3) Order No. 2006 is not comprehensive in its application. While the SGIP addresses any interconnections to federal transmission facilities and those distribution facilities under an open access transmission tariff, most of the interconnections of customer-sited generators are not to these types of facilities. Not only does this leave potential gaps in the size of generators that can be interconnected but, like net metering,

[2] Standardization of Small Generator Interconnection Agreements and Procedures, Order No. 2006, 70 FR 34100 (Jun. 13, 2005), FERC Stats. & Regs., Regulations Preambles, Vol. III, ¶ 31,180, at 31,406-31,551 (2005).

> the state rules are a myriad of different regulations. Some state interconnection rules are quite accommodating to small and renewable generators while others constitute barriers. Irrespective of the good or the bad, the patchwork of state rules in this area represent a restraint on the ability of solar developers and manufactures to freely conduct interstate commerce. Many manufacturers of interconnection equipment for solar generators must take into account these varying state rules which adds costs to the systems they are trying to stamp out. A universal federal standard is needed.

What are the key elements of good interconnection procedures from small generators?

Interconnection rules can be a costly, time consuming, and arcane set of rules to follow for even the simplest small and renewable generators. The key to accommodating small generators is to identify a set of circumstances that allow the generators to be interconnected quickly and at low cost. Because solar and other renewable generators often use specialized electronic devices (inverters) to oversee the generators interactions with the grid, a number of utility safety and technical concerns are easy to address. Moreover, when the inverter devices are UL certified, the interconnection process can be nearly "plug and play". A series of quick engineering screens can be used which will either determine that the generator can be approved for interconnection or that additional study is needed.

The overarching objective in designing good and streamlined interconnection rules is to avoid unnecessary interconnection studies that, based on solid electrical engineering principals, do not need to be conducted. For example, while it may be academically interesting to see how that single installation affects power flows on a nearby transmission line for a small solar installation on a residential rooftop, the likelihood that that would ever occur is nil. Undertaking an engineering study to confirm that assumption would be both time consuming and costly for the residential customer. Such a study is unnecessary and should be excluded from good interconnection procedures.

Other elements that distinguish good interconnection rules from bad ones are:

- Some element of fixed cost to complete the interconnection study process that allows a solar developer to have a good idea of the cost to complete the interconnection study process
- Fixed timelines for the utility to complete interconnection studies so developers can know for certain the latest when their generator will be approved for operation.
- Prohibition on utility requirements to add additional and unnecessary protection equipment that increases the cost of a solar installation.
- Simplified and standard form interconnection agreements so each installation does not need to budget for legal counsel to assist in negotiating an interconnection contract.
- Prohibition on requirements for insurance above and beyond ordinary liability insurance.
- A dispute resolution process where a solar installer can have access to a knowledgeable expert or master who can resolve quickly and at little cost disputes over the interconnection requirements. Since solar installers and developers are almost always less capitalized, and have less expertise on staff, they may find their interconnection request at the mercy of a recalcitrant utility who has little interest in seeing the solar installation progress.

The overarching need of the solar community and other generator project developers is to have comprehensive rules that cover all generator interconnections. Unfortunately in many instances local rules act as a major barrier to the use of renewable generation.

Current State of Interconnection

Unfortunately, while several states have implemented comprehensive rules on interconnection, according to the NNEC report (Appendix A), only 15 states have interconnection rules that can be said to have eliminated all major and minor barriers to the interconnection of small generators. Just over half the states continue to have interconnection rules that constitute, to some degree, a major barrier to interconnection. This either prevents homeowners and businesses from using their own solar or renewable energy generator or significantly increases the time or cost to do so.

This is all the more unfortunate in light of the universal and functional FERC small generator interconnection procedures and the directives in EPAct 2005 to address interconnection.

Recommendation for Comprehensive Interconnection Rules

I would recommend that FERC be directed to reconvene working groups to update and complete the Small Generator Interconnection Procedures contained in FERC Order No. 2006. FERC should look to the state proceedings to include consensus best practices from recently promulgated state interconnection rules. A good guide and compilation of those best practices is found in the Interstate Renewable Energy Council's (IREC) model interconnection rules (IREC MR-I2005). IREC has a team of experts that not only work with states on creating interconnection rules but also update their model rules when a new best practice is developed.

After FERC has updated the SGIP, it should present that as a model for states and local utilities to adopt. As with net metering, FERC would retain jurisdiction and be able to require a utility to adopt the updated model interconnection rules where the rules otherwise adopted by the utility represented a barrier to the use of renewable generation. FERC should be tasked specifically with ensuring comprehensive and seamless interconnection standards irrespective of whether the interconnection is local or under traditional FERC regulation.

Appendix A – Excerpt from the Freeing the Grid Report

FREEING THE GRID

2008 EDITION
Foreword By U.S. Rep. Jay Inslee

Best and Worst Practices in State Net Metering Policies and Interconnection Standards

OCTOBER 2008

NNEC
Vote Solar
IREC
Interstate Renewable Energy Council
The Solar Alliance

APPENDIX A: STATE SCORING SPREADSHEETS

NET METERING

State	Total	Grade	System Capacity	Program Capacity	Rollover	Metering Issues	RECs	Eligible Tech	Eligible Customers	Aggregate Meters	Safe Harbor	Rule Coverage
Colorado	18	**A**	5	2.5	0.5	2	1	1	2		3	1
Maryland	17.5	**A**	5	2.5	0	2	1	1	2		3	1
Florida	17	**A**	5	2.5	0.5	2	1	1	2		3	0
New Jersey	17	**A**	5	2.5	0.5	2	1	1	2		3	0
Oregon	15.5	**A**	5	0.5	0	2	1	1	2	1	3	0
Pennslyvania	15	**A**	5	2.5	1	2	1	0.5	2	1	0	0
California	14.5	**B**	3	2	0	2	1	1	2		3	0.5
Connecticut	14	**B**	5	2.5	0.5	2	1	1	2			0
Delaware	14	**B**	5	1	0	2	-1	1	2		3	1
Massachusetts	13.5	**B**	5	2.5	1.5	2	-1	0.5	2	1		0
Arizona†	12.5	**B**	5	2	0.5	0	1	1	2		0	1
Nevada	12	**B**	4	1	1.5	1	0.5	1	2		1	0
Iowa	11	**B**	2	2.5	1.5	2		1	2		0	0
Vermont	11	**B**	2	2	0	2	0	1	2	1	0	1
Kentucky	10.5	**B**	0	1	1.5	2	-1	1	2		3	1
New York	10.5	**B**	5	1	0.5	2	-1	1	2			0
Arkansas	9.5	**B**	2	2.5	0	2	1	1	1		-1	1
Illinois	9.5	**B**	0	1	0	2	1	0.5	2		3	0
New Mexico	9	**B**	5	2.5	-2	2		0.5	2		-1	0
Missouri	9	**B**	1	2	0	0	-1	1	2		3	1
Rhode Island	9	**B**	4	1.5	0	2	-1	0.5	2		0	0
New Hampshire	8.5	**C**	1	1	1.5	2	-1	1	2			1
Ohio	8.5	**C**	5	2.5	-1	0	-1	1	2		0	0
Maine	8.5	**C**	1	2.5	0	2	-1	1	2			1
Louisiana	8	**C**	1	2.5	1.5	2	-1	1	1		-1	1
Montana	7.5	**C**	1	2.5	0	2	-1	1	2		0	0
Virginia	7.5	**C**	2	1	0.5	2	-1	1	2		0	0
Wyoming	7.5	**C**	0	2.5	0.5	2	-1	1	2		0	0.5
Hawaii	7	**C**	1	1	0	2	-1	1	2		0	1
DC	7	**C**	1	2.5	1.5	2	-2.5	0.5	1		0	1
Oklahoma	5.5	**D**	1	2.5	-4		-1	1	2		3	1
Minnesota	5	**D**	0	2.5	0	0	-1	0.5	2		0	1
Utah	5	**D**	5	0	-2	0	-1	1	2		0	0
Washington	5	**D**	1	0.5	0	0	-1	0.5	2	1	0	1

NET METERING

State	Total	Grade	System Capacity	Program Capacity	Rollover	Metering Issues	RECs	Eligible Tech	Eligible Customers	Aggregate Meters	Safe Harbor	Rule Coverage
Wisconsin	5	**D**	0	2.5	1		-1	0.5	2		0	0
Indiana	3.5	**D**	-1	0	1.5	2		1	0		0	0
North Dakota	3	**D**	1	2.5	-2		-1	0.5	2		0	0
Georgia	2.5	**F**	1	0	0	0	0	0.5	1		-1	1
Texas	2.5	**F**	1	2.5	-2	0	-1	1	2		-1	0
Michigan*	2	**F**	0	0	-1	0	0	1	2		0	0
North Carolina	2	**F**	1	0	0	1	-1	1	1		-1	0
West Virginia	2	**F**	0	0	0	0	-1	1	1		0	1
South Carolina	1	**F**						1				0
Idaho*	1	**F**	1	0	-1	0	-1	1	1		0	0
Alabama		**n/a**										
Alaska		**n/a**										
Kansas		**n/a**										
Mississippi		**n/a**										
Nebraska		**n/a**										
South Dakota		**n/a**										
Tennessee		**n/a**										

† = Proposed standards
***** = Voluntary program (Idaho = Idaho Power's program)

APPENDIX A: STATE SCORING SPREADSHEETS

INTERCONNECTION

State	Total	Grade	Eligible Tech	System Capacity	Breakpoints	Time lines	Interconnection $	Engineering $
Illinois	13	**B**	0	-0.5	1	-1	0.5	0
New Jersey	12.5	**B**	-1	-1	0	1	0.5	1
New Mexico	11	**B**	0	0	-1	0	1	0
Maryland	10.5	**B**	0	-0.5	1	0	0.5	0
Massachusetts	10.5	**B**	0	-0.5	0	0	0	1
Oregon	10	**B**	-1	-1	0	0	0	0
Pennslyvania	9.5	**B**	0	-1	0	0	0	0
California	9.5	**B**	0	0	-1	0	2	1
Nevada	9.5	**B**	0	0	-1	0	2	1
Arizona	9.5	**B**	0	-0.5	0	0	0	0
North Carolina	9	**B**	0	0	0	0	0.5	0
Vermont	8.5	**C**	0	0	-1	0	1	0
Colorado	8	**C**	0	-0.5	0	0	-1	0
Texas	8	**C**	0	-0.5	1	0	1	0
New York	7.5	**C**	0	-1	-1	0	-1	0
Connecticut	5.5	**D**	0	0	0	-1	1	0
Ohio	5.5	**D**	0	0	0	0	-1	0
West Virginia	5.5	**D**	0	-1	-1	0	0.5	0
Washington	5	**D**	0	0	-1	0	0	0
New Hampshire	5	**D**	-1	-4	-2	-1	1	n/a
Wisconsin	4.75	**D**	0	-0.25	1	-1	1	1
Florida	4.5	**D**	-1	-1	0	-1		0
Indiana	4.5	**D**	0	0	0		0.5	1
Michigan	4	**D**	0	0	1	0	0.5	0
Delaware	2.75	**F**	0	-2	-1	0	0	0
DC	1.5	**F**	-1	-4	-2	0	0	0
Georgia	1	**F**	-1	-4	-2			0
Minnesota	1	**F**	0	-0.5	-1	0	0	1
Missouri	0.5	**F**	-1	-4	-1	-1		0
Iowa	0	**F**	0	0	-2	-1	n/a	0
South Carolina	0	**F**	0	-4	-2	0	1	0
Virginia	0	**F**	-1	-3	-2	-1	2	0
Utah	-1	**F**	-1	-1	-2	n/a	n/a	0
Arkansas	-2.5	**F**	-1	-4	-2	0		0

APPENDIX A: STATE SCORING SPREADSHEETS

INTERCONNECTION

State	Total	Grade	Eligible Tech	System Capacity	Breakpoints	Time lines	Interconnection $	Engineering $
Montana	-2.5	**F**	-1	-4	-2	n/a	n/a	0
Louisiana	-3.5	**F**	-1	-4	-2	0	-1	0
Hawaii	-4	**F**	0	-4	-1	-1	n/a	0
Wyoming	-4.5	**F**	-1	-4	-2	n/a	n/a	0
Alabama		**n/a**						
Alaska		**n/a**						
Idaho		**n/a**						
Kansas		**n/a**						
Kentucky		**n/a**						
Maine		**n/a**						
Mississippi		**n/a**						
Nebraska		**n/a**						
North Dakota		**n/a**						
Oklahoma		**n/a**						
Rhode Island		**n/a**						
South Dakota		**n/a**						
Tennessee		**n/a**						

Grade	Score
A	**15+**
B	**9 to <15**
C	**6 to <9**
D	**3 to <6**
F	**< 3**

NOTE:
A score of 7.5 was added to Interconnection scores to normalize grading to net metering.