COMMENTS OF SUNEDISON, INC. ON PROPOSED INTERCONNECTION OF SOLAR/STORAGE SYSTEMS

SunEdison, Inc.[1], respectfully submits the following comments on issues related to the interconnection of customer-sited solar energy systems paired with storage capability. Specifically, these comments are responsive to the BPU Staff's request dated November 7, 2014 for further stakeholder feedback on alternative proposals for interconnecting, metering, and settling mixed renewable energy generation/storage systems to the EDC system – an initial proposal from the EDCs calling for, among other things, automatic Level 3 treatment for all such systems; and a compromise counterproposal from the Interstate Renewable Energy Council (IREC) calling for Level 2 treatment for systems up to 15% of circuit peak load.

SunEdison supports the adoption and implementation of the IREC proposal. As with the "15% rule" established for interconnection of solar PV at the advent of the New Jersey solar incentive program, this standard will serve the twin interests of ensuring that the safety and reliability of the distribution will not be compromised, while allowing the infant storage industry to gain market momentum. As described more fully below, we are concerned that a knee-jerk requirement that all storage-based systems be subject to more rigorous, time-consuming, costly and uncertain Level 3 review, based on speculative or strictly theoretical worst-case concerns, will stymie the very capabilities for a more responsive and resilient system the DPU and federal energy regulators are seeking to encourage. As with the interconnection of stand-alone solar PV, a 15% rule will enable a relatively modest storage market to gain a foothold and provide all market participants an opportunity to base future interconnection standards on actual system behavior and integration experience.[2]

We are concerned that the EDC proposal to relegate all storage-based systems to Level 3 review is disproportionate to the actual or potential system impacts associated with such systems. The system impacts identified by the EDCs in their August 14th presentation are based on generalized and unstated assumptions, fail to account for modern inverter capabilities, and in any event can be readily mitigated. A detailed response to the utility presentation is provided in Attachment 1 to these comments.

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[1] SunEdison is the world's leading developer of renewable energy, with over 1,600 MW of solar facilities under management and, with the acquisition of FirstWind, another 1,000 MW of wind assets. SunEdison has nearly two dozen operating systems in New Jersey, and operates its Regional Operation Center for the Northeast in Pennsauken.

[2] Ultimately, as storage penetration increases, we believe the utilities should develop the capability to establish feeder-specific limits that may well exceed an across-the-board threshold. A more particularized standard would be based on distribution feeder characteristics and not just load.

Sincerely,

Fred Zalcman
Managing Director of Government Affairs

ATTACHMENT A
DETAILED RESPONSE TO EDC 8/14/14 PRESENTATION

Slide	Statement	Comment/Question
3	· Each has Twice the Impact of an Equivalently Sized PV-Only System	- How does this generalized assumption apply to every system configuration?
	· Load change to Distribution System	- What is the timeframe assumed for the changes in PV or FR System output?
	· Multiple Systems Respond in Unison to PJM signal	- Frequency-droop settings will prevent such a response in unison and allow multiple systems to respond to the same signal in a coordinated manner.
	· Potential for Sustained High or Low Voltage	- This potential can be reduced or avoided by taking advantage of the inherent reactive power compensation capabilities of modern (i.e. "smart") inverters
4	· Increased Wear on Voltage Regulation Devices	- What studies have been done to support this claim? - FR Systems may be designed to operate with or without local voltage regulation and in coordination with existing voltage regulation devices to avoid undue wear.
	· Not Designed for Frequent Changes	- What is the assumed frequency of changes, and for what set of system and environmental conditions?
5	· Not Less Than Twice Inverter Rating	- What if the energy storage device can only charge/discharge at less than the inverter ratings?
	· Analysis Must Include Flicker Curve Considerations	- What are the assumptions with regard to FR System operation and interaction with the existing system to assess flicker impacts?

6	· Aggregated FR Will be Limited to an Amount Creating Voltage Fluctuations to Less Than ½ the Dead Band of Any Voltage Regulation Device.	- What analysis has been done to support this limitation? - How will the magnitude and frequency of voltage fluctuations from one or more FR devices be assessed in practice? - Modern inverters used for solar PV and energy storage are inherently capable of providing a variety of modes of dynamic reactive power compensation. These capabilities should be enabled and coordinated with the existing system devices to stiffen distribution system voltages, avoid unnecessary system upgrades, and allow technically feasible amounts of FR to be installed.

Comments of Solar Grid Storage LLC on the straw proposals for the interconnection of solar and storage systems

November 28, 2014

Dear Mr. Teague and Mr. Hunter,

Solar Grid Storage LLC ("SGS") appreciates the opportunity to provide these comments as part of the stakeholder group assembled by the Office of Clean Energy and specifically on the straw proposal developed by Staff in response to the IREC/SEIA proposal. As noted by Staff, IREC proposes a "15% rule" wherein storage interconnections to a distribution circuit would follow the Level 2 interconnection procedures provided the combined capacity of the storage facilities was less than 15% of peak load on a circuit. IREC's proposal was proffered as a compromise to the EDC position that all storage facilities undergo the more rigorous Level 3 interconnection review irrespective of the capacity of the storage facility or the combined amount of storage on a single circuit. IREC's position appeared to derive from a general consensus among working group members that there was little likelihood of a single or small storage systems compromising utility distribution grid functions. The EDC's expressed a concern that the proliferation of storage facilities particularly a concentration on a single circuit acting in concert with a single PJM ramping up or ramping down signal. Solar Grid Storage noted for the working group that the operation of our storage systems in the PJM frequency regulation ("FR") market under real life conditions and taking into account "wear and tear" on the battery systems demonstrated that the power swings from battery operations were less severe than those from PV-only systems under partly cloudy conditions (where clouds pass over a PV system dropping output dramatically only to have it repower in an equally dramatic fashion when the cloud passes).

Solar Grid Storage fully supports the IREC position as a reasonable compromise allowing storage systems to be implemented initially in small numbers without the expense and time burdens imposed on Level 3 interconnection facilities. We note that the EDC position that collective battery operations on a localized grid can have a bigger impact on circuit voltage than PV systems ***is lacking any basis in fact*** and, from the actual operations and field data from SGS systems, appears to be incorrect. Before the BPU and Staff accept the utilities concerns as real, there should be evidence showing more than the simple assertions.

Allowing early systems to be deployed under Level 2 interconnection procedures up to the 15% threshold will both enhance the ability of storage companies to deploy assets while giving the EDC's sufficient time and ability to collect data which we believe will illustrate that their concerns about simultaneous dispatch by PJM are unfounded. As circuits reach the 15% limit, the BPU and/or Staff can either determine that the 15% rule is unnecessary, or maintain that limit as good practice and require additional storage installations to follow the more enhanced study provisions under Level 3 interconnection procedures.

SGS believes it to be both prudent and desirable to ask PJM technical experts to participate in the discussion. Presumably, before PJM proffered the concept of load providing FR services, they investigated and determined that FR operation would not cause problems on the distribution grids of the EDCs. The PJM's position is important since they are actively encouraging new markets and participants to create greater security for the grid.

A critical aspect of the EDC position that must be explored is whether load participating in providing FR services should also be subject to the same kind of scrutiny the EDCs are asking for storage. A 2MW load responding to the PJM FR signal will have the identical distribution grid impacts as a 1MW battery responding to that same FR signal. Oddly, when asked about this circumstance at the working group meetings, the EDC's had no response. It is unclear how EDC's would propose to approve or deny approval to a load participating in the PJM FR market. Interference in either the FR market or the FR signal to load would undoubtedly invoke a jurisdictional struggle between this FERC approved and encouraged program and state regulation. It is a struggle that SGS would suggest should be avoided – and is avoided if the storage follows the same interconnection rules as the co-located PV system does.

Metering

Staff has additionally requested input on the metering arrangements proposed by the EDC's, IREC and SEIA. SGS supports the SEIA position and sees no need for additional metering for the case where the PV system and storage are served by the same inverter. Additionally, all of the SGS systems, and we believe, all systems participating in the PJM FR market will have extensive real time metering and data that can be shared (confidentially) with the EDC's if it enhances their research regarding local grid impacts. SGS monitors real time voltage and VAR conditions and can identify in real time any localized voltage or VAR fluctuations.

Metering beyond what is suggested by SEIA for the aforementioned shared inverter case is unnecessary and will add needless cost to the storage installations. Additionally, if the utilities want to meter at their expense, then again ratepayers will bear what we believe to be unnecessary expense. SGS is happy to provide any metering data we collect for any legitimate EDC research into the grid impacts from storage deployed with solar PV systems. Furthermore, SGS does not believe the metering requirement should be left to EDC discretion.

Respectfully submitted,

Christopher Cook

Christopher Cook, President
Solar Grid Storage LLC
ccook@solargridstorage.com

From: Michael Sheehan [mailto:sheehan.mt@gmail.com]
Sent: Thursday, August 14, 2014 2:13 PM
To: Hunter, B; Teague, John
Subject: Response to NMIX Technical Working Group Meeting August 14, 2014

Scott/John, the following proposal is in response to your request of my to write-up my verbal proposal.

Thanks again John for setting up the call-in for today's meeting.

Background -- The EDC's presentation a proposal to address "Behind the Meter Frequency Regulation". The proposal identified several possible impacts/concerns on the distribution system if Energy Storage was deployed on large scale on the distribution feeder. The concerns ranged from the combined response of the Energy Storage units to the possibly adverse impact on power quality and increase distribution maintenance cost. Because of these possible adverse impacts the EDC's proposed that all Energy Storage projects be required to be processed through a Level 3 Interconnection Procedure. Several developers expressed concern with the Level 3 requirement and the lack of confirmation of Energy Storage having adverse impacts on the distribution system.

Proposal-- The EDC's acknowledged that the system impacts from a small number of Energy Storage devices will probably not have an adverse impact on the distribution system. Whereas, the developers also acknowledged that there maybe system impacts a higher levels, but those possible impacts would probably be mitigated or offset by other distribution load changes. Both groups acknowledged that Energy Storage on the distribution system implemented properly will have a positive impact.

In order to enable the Energy Storage market to move forward and provide the necessary learning curve for the EDC's to evaluate the grid impacts of Energy Storage, IREC proposes that the NJ BPU consider the Energy Storage be allowed to follow the Level 2 Interconnection Procedure for feeders that are below the 15% peak of the distribution feeder load. For distribution feeders greater than 15% of the feeder peak the EDC's would follow the Level 3 requirements. In addition, to address the concerns of high levels of penetration of Energy Storage I will contact SANDIA National Labs to engage the lab to perform Time Series Power Flow Analysis to be capture possible system impacts of high levels of Energy Storage on the EDC's distribution system.

If you have any questions or concerns please let me know.

Cheers

Michael Sheehan, P.E.
IREC

7835 85th Place S.E.
Mercer Island, WA 98040
206.232.2493
cell 206.949.0795

September 5, 2014
RE: Stakeholder Questionnaire for NYSERDA MW Block Program Design

Dear Mr. Teague,

The Solar Energy Industries Association (SEIA) respectfully submits these comments in response to the request for comments on the EDC proposal on interconnection and net metering requirements for solar installations using storage as presented at the August 14 meeting of the Interconnection and Net Metering Working Group.

Established in 1974, SEIA is the national trade association of the United States solar energy industry and is a broad-based voice of the solar industry in New Jersey. Through advocacy and education, SEIA and its 1,000 member companies are building a strong solar industry to power America. SEIA member companies operation in all of New Jersey's market segments – residential, commercial, and utility-scale – and also have an interest in technologies that enable further penetration of solar power, such as energy storage. In addition, SEIA member companies provide solar panels and equipment, financing and other services to a large portion of New Jersey solar projects.

A decade ago, New Jersey lead the country in developing simplified interconnection standards for solar PV systems, balancing the utilities' concerns on safety and reliability with the State's goals to enable the development of a nascent industry. These standards, which included the '15% screen' for simplified interconnection, had a strong impact on FERC and the Small Generator Interconnection Procedures. This standard was instrumental in allowing the nascent solar industry to achieve scale, technology improvement and cost reduction while providing a widely accepted and extremely conservative standard so that such systems would not compromise reliability or safety of the grid.

Once again, New Jersey is on the cutting edge of technology adoption, as it looks to increase the adoption of battery storage. And once again, the BPU has a critical decision to make in order to both maintain the reliability of the distribution system as well as enable the growth of a new technology that is critical to the state's energy future. The EDC's proposed interconnection and net metering rules are overly conservative and will serve to unnecessarily increase the costs of installing battery storage with solar systems, stifling a nascent market and running counter to the State's energy goals. SEIA support's IREC's proposal of using a "15% rule" for new installations of solar + storage as a reasonable compromise. This will allow for a limited number of solar + storage systems to be developed without the costly and time consuming Level 3 interconnection review, and enable the BPU and the EDCs to gather data from the operation of these systems, which we believe will, in time, show that the 15% rule is overly conservative.

Furthermore, we are concerned that the utility proposal for more stringent interconnection review does not appear to be grounded in any specific analysis or actual operation of how solar/storage systems would be deployed in the field. Moreover, modern inverters used for solar PV and energy storage are inherently capable of providing a variety of modes of dynamic reactive power

compensation. These capabilities should be enabled and coordinated with the existing system devices to stiffen distribution system voltages, avoid unnecessary system upgrades, and allow technically feasible amounts of FR to be installed.

Lastly, the EDC proposal for more expansive and expensive metering systems for solar + storage systems is unnecessarily burdensome and would serve as a barrier to the adoption of such systems – running counter to the BPU's policy goals. As SEIA has stated in previous comments to this Working Group, with regards to a simple solar + storage case, wherein solar is combined with a battery behind one interconnection but no other form of Non-class I renewable energy generation is included, no further metering controls are needed. SEIA continues to assert that this complies with Staff's principles from both a physical and policy perspective. From a physical perspective, under a simple "solar + storage" scenario, it is impossible for there to be net generation above and beyond what the solar system would create on its own. From a policy perspective, continued use of simplified metering would enable further investment in much needed grid infrastructure and resiliency within New Jersey. Further, by doing so, the BPU would avoid creating unintended barriers to such projects participating in the PJM market for ancillary services, thus leveraging regional resources to enable higher penetration of photovoltaics on New Jersey's grid.

Sincerely,

Katie Bolcar Rever
Director, State Affairs
Solar Energy Industries Association
202-682-0556 / krever@seia.org

December 8, 2014

Via Email to: OCE@bpu.state.nj.us

John R. Teague, P.E., P.P.
Research Scientist-2
New Jersey Board of Public Utilities
Office of Clean Energy
44 S. Clinton Avenue, 7th Floor
E. State Station Plaza, Bldg #3
P. O. Box 350
Trenton, NJ 08608-0350

Dear Mr. Teague:

Please accept these comments on behalf of Atlantic City Electric Company ("ACE"), Jersey Central Power & Light Company ("JCP&L"), Public Service Electric and Gas Company ("PSE&G") and Rockland Electric Company ("RECo") (jointly referred to herein as the "EDCs") in response to your "Request for Comments on Responses to EDC Mixed Generation Proposal with Respect to Energy Storage" dated November 7, 2014.

Response to Staff's Straw Proposal Based on the IREC/SEIA Proposal

Counter to 15% Rule for Battery Frequency Response ("FR") applications

First of all, it is not the intent to drag each one of these applications through a full blown, three-study Level 3 analysis with exorbitant, unknown potential costs. The EDCs do not do that now on most Level 3 applications. The Level 3 application fee provides some compensation for the additional voltage analysis the EDCs do on most Level 3 and larger Level 2 applications now. To the extent the EDCs do not recover these costs from the applicant creating the need, the costs get passed on to all other customers.

These systems not only produce energy up to the inverter rating, they also add load in an equal amount. Consequently, they have twice the potential impact of a PV system with the same inverter rating, furthering the need to do some preliminary voltage impact analysis.

The participants in the FR market all respond to the same buck or boost signal from PJM. Consequently, these systems respond almost in lockstep, exacerbating the effect on voltage and further complicating the analysis. At a minimum, we need to look at the combined effect on any voltage EDC regulation equipment from a potential high or low voltage effect, flicker and increased maintenance of the equipment.

Because of the high potential for frequent combined loading changes, flicker (perceptible changes in lighting levels) curve review must be considered in the analysis. Simply stated, the greater the frequency, the lower the acceptable voltage changes.

The location of any type of generation inhibits each EDC's ability to reconfigure its system, both during system emergencies and on a more permanent basis to redistribute load for future load growth increasing costs to other ratepayers. At a minimum, these systems will likely be required to shut down during system emergencies.

Counter to "No Additional Metering Needed"

This appears as a thinly-veiled attempt to on the part of SEIA to extend the net metering benefits to non-eligible generation. Quite simply, absent the installation of additional metering, the EDCs cannot differentiate between the net metering-eligible energy and the non-eligible generation.

Answer to Meter 3 Redundancy Issue

If the EDCs can obtain metering data from the PJM performance monitoring meter that is compatible with their metering analysis software, the EDCs can probably forgo the need for this meter.

Additional Comments – Proposed Additions to Interconnection Application

JCP&L

New/changed Text in Blue:

Intent of Generation (* Denotes Mandatory Response)

Offset Load (Unit will operate in parallel, but will not export power to EDC) * ☐ Yes ☐ No

Net Meter (Unit will operate in parallel and will export power pursuant to New Jersey Net Metering or other filed tariff(s)) * ☐ Yes ☐ No

Wholesale Market Transaction (Unit will operate in parallel and participate in PJM market(s) pursuant to a PJM Wholesale Market Participation Agreement & may be eligible to export energy) * ☐ Yes ☐ No

If "Yes", please contact PJM to continue application process.

PJM Demand Response Market Participant (System will not export energy)

Energy, Capacity, Load Reduction &/or Synchronized Reserve Markets * ☐ Yes ☐ No

Regulation Market * ☐ Yes ☐ No (If Yes, Please contact EDC for supplemental information form)

Back-up Generation (Units that temporarily parallel for more than 100 milliseconds) * ☐ Yes ☐ No

Note:

JCP&L would also likely add an additional "Battery Storage" selection in the energy source question on page one of the application.

ACE

- ACE would also add choices for Energy Storage and PV with Energy Storage to the "Energy Source" Field and/or the "Prime Mover" field on application.

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Intent of Generation (* Denotes Mandatory Response)

Offset Partial Load (Unit will operate in parallel, but will not export power at any time to EDC) * ☐ Yes ☐ No

Net Meter (Unit will operate in parallel and will export power pursuant to New Jersey Net Metering or other filed tariff(s)) * ☐ Yes ☐ No

Wholesale Market Transaction (Unit will operate in parallel and participate in PJM market(s) pursuant to a PJM Wholesale Market Participation Agreement & may be eligible to export energy) * ☐ Yes ☐ No

If "Yes", please contact PJM to continue application process.

PJM Demand Response Market Participant (System will not export energy)

Energy, Capacity, Load Reduction &/or Synchronized Reserve Markets * ☐ Yes ☐ No

Regulation Market * ☐ Yes ☐ No

Back-up Generation (Units that temporarily parallel for more than 100 milliseconds) Note: Backup units that do not operate in parallel for more than 100 milliseconds do not need an interconnection agreement.

* ☐ Yes ☐ No

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- ACE would like to provide our draft supplemental form here and ACE would like to maintain the right to make changes to the supplemental form once we have some experience accepting Renewable-Energy Storage applications:

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NEW JERSEY ENERGY STORAGE SUPPLEMENTAL FORM

Customer Information

Customer Name:

Battery Storage Facility Address (if different from mailing address):

City:

State:

Zip Code:

ACE Account Number:

ACE Meter Number:

Battery Storage Information

Battery System Mfr: Model: Battery Type: (L Ion) Battery Charge/Discharge Rating (kW AC):

Battery Energy Capacity (kWh):

Inverter AC Voltage (V): PF Setting Range:

Is the system UL certified?

If using for Frequency Regulation:

Does it have ramp rate control?

Does it have the ability for time delay?

Does it have the ability to limit maximum charge and discharge?

Operation Information

Describe the intended operation of the battery _____

_____

Additional Comments

Signature

I hereby certify that, to the best of my knowledge, all of the information provided in this form is complete and true. I consent to permit the Board of Public Utilities and Atlantic City Electric Company to exchange information regarding the Energy Storage system to which this form applies.

Customer Signature: _____Date: _____

Printed Name: _____Title: _____

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PSE&G

PSE&G's existing application provides for "Battery Storage". We would like to reserve the right to send a request for additional information (Attached Document) upon receipt of initial application.

RECo

Page 1 of the Level 1 and Level 2/3 Applications will have the "Battery Storage" line as suggested by John Teague.

The existing "Intent of Generation" section of the Level 2/3 Application will be changed to:

Intent of Generation:

Offset Load (Unit will operate in parallel, but will not export power to EDC) ☐ Yes ☐ No

Net Meter (Unit will operate in parallel and will export power pursuant to New Jersey Net Metering or other filed tariff(s)) ☐ Yes ☐ No

Wholesale Market Transaction (Unit will operate in parallel and participate in PJM market(s) pursuant to a PJM Wholesale Market Participation Agreement & may be eligible to export energy) ☐ Yes ☐ No
If "Yes", please contact PJM to continue application process.

PJM Demand Response Market Participant (System will not export energy)
Energy, Capacity, Load Reduction &/or Synchronized Reserve Markets ☐ Yes ☐ No
Regulation Market ☐ Yes ☐ No

Back-up Generation ☐ Yes ☐ No
Note: Backup units that do not operate in parallel for more than 100 milliseconds do not need an interconnection agreement. Use the "Application for Standby Generator".

Energy Storage Supplemental Form

Customer Generator_____
Address_____

Is there any other existing or proposed source of generation at this facility ☐ Yes ☐ No
If Yes Identify Source and Size_____

Proposed Energy Storage Information

Size _____KW

Intent:

Offset Load (Unit will operate in parallel, but will not export power to EDC) ☐ Yes ☐ No

Net Meter (Unit will operate in parallel and will export power pursuant to New Jersey Net Metering or other filed tariff(s)) ☐ Yes ☐ No

Wholesale Market Transaction (Unit will operate in parallel and participate in PJM market(s) pursuant to a PJM Wholesale Market Participation Agreement & may be eligible to export energy) ☐ Yes ☐ No

PJM Ancillary Services
Market-Based Regulation ☐ Yes ☐ No
Synchronized Reserve ☐ Yes ☐ No

PJM Demand Response Market Participant (System will not export energy)
Energy, Capacity, Load Reduction &/or Synchronized Reserve Markets ☐ Yes ☐ No
Regulation Market ☐ Yes ☐ No

Back-up Generation (Units that temporarily parallel for more than 100 milliseconds) ☐ Yes ☐ No

Additional
Information:_____

From: partnerships1@verizon.net [mailto:partnerships1@verizon.net]
Sent: Monday, December 08, 2014 5:39 PM
To: Teague, John
Cc: yabdou@atensolar.com; brian.hamilton@comcast.net; paul@businovation.com; chris.z.martin@gmail.com
Subject: Comments on IXC Straw Proposal

My chief concern is to emphasize the difference between the **energy** delivered as kWh by Solar installations and their **power** expressed as kW. As proponents of Vehicle Solar Grid (VSG) integration, we need the ability to link an oversized inverter of a solar PV installation to a vehicle battery to provide ancillary services to the grid and backup power for resiliency to the owner. For example, a Nissan Leaf with a 24 kWh battery can readily deliver or absorb15 kW of power for frequency regulation. It handles more than that every day in normal driving. Limiting the Leaf to 10 kW in a Class 1 PV installation reduces its ability to serve the grid and its owner by 50% or more.

Ideally, we would like an extension of the useable inverters in Class 1 to 100 kW or even 200 kW to allow larger vehicles to be integrated with class 1 solar PV installations. At the very least, the distinction between limits on net energy generation and two way power capability with no net input or output of energy should be clarified, so that the latter can be developed.

Paul Kydd, President, Partnerships One, LLC

Comments on IXC Straw Proposal

With regard to the request for comments issued 11/03/14

Partnerships One, LLC is a New Jersey Limited Liability Corporation dedicated to research and development. We focus on distributed energy systems used for linking electric vehicle (EV) storage battery capabilities to Solar PV installations in providing ancillary services to the grid. We call this Vehicle-Solar-Grid (VSG) integration. We have demonstrated our technology with funding from a National Science Foundation Small Business Innovation Research Grant.

Partnerships One, LLC, supports the comments dated September 5 of the SEIA.

1. The recommendation that BPU use the 15% rule for new solar PV installations connected to the grid with energy storage backup. We note that this rule may be ready for review in light of the large amount of solar renewable generation that has been installed in New Jersey since it was adopted, and the amount of renewable energy that will be needed to meet the energy master plan. The rule is essentially arbitrary, and a higher limit may be acceptable to encourage renewables without risking system stability.
2. A simple solar plus storage installation with no other form of non-class 1 energy generation included should require no further metering or controls. This should apply specifically to solar plus EV battery storage systems.
3. When reviewing Energy Storage Systems that are proposed to be connected to NJ class I renewables, EDCs should use the level 2 interconnection on feeders that fall below the 15% peak load. However, we urge that for solar PV systems at 10 kW and below, including systems using EV batteries as storage, level 1 interconnection should be used.
4. There is no need for a metering change with a solar plus storage system.
5. Meter 3 is redundant and unnecessary in both Figures 2 and 3.

We have further comments directed at the Electric Distribution Company position expressed in:

Mixed Generation Interconnection, Metering & Settlement

Net metering Eligible, Class 1 Renewable Energy Generation Combined with Other Distributed Generation/Storage, Dated August 13, 2014

New Jersey has been a leader in solar photovoltaic installations. We believe the State can now become a leader in Electric Vehicle (EV) adoption with similarly well crafted policies that account for the synergies when Solar PV generation with storage capabilities of EVs are combined. Without such policies, EV adoption will likely lag, and the combined benefits from cleaner transportation and higher realized value of Solar PV will go unrealized.

The benefits of EV ownership are numerous. EV's have reduced cost of ownership from higher efficiency and lower fuel cost over those of internal combustion engines (ICE). EV's have lower environmental impacts particularly in New Jersey with our high proportion of nuclear power. EV's coupled with inverter technology can provide backup power services during grid outages. Using this same basic technology VSG equipped sites can perform onsite demand shifting and grid ancillary services with an EV's storage capacity. VSG is focused on demonstration of Frequency Regulation and demand regulation capability in the Ancillary Services markets. This

functionality is most readily demonstrated in net metered sites hosting a solar PV system. The advantages of VSG integration will improve the attractiveness of solar PV and foster its widespread installation in conformity with the NJ Energy Master Plan.

Specifically our comment will address:

1. Eligibility of storage to receive net metering treatment.
2. Monitoring requirements and meter location
3. Inverter sizing
4. Possible system impacts.
5. Metering analysis requirements
6. System analysis
7. Retroactive customer imposed costs in future system reconfiguration allegedly due to FR
8. Equity and fairness issues with billing and settlement fees

While for regulatory purposes storage battery systems may be considered to be Generators, it is important to remember that electric storage batteries are mot generators in the normal sense. They produce power but not energy. The only way a battery can deliver energy is if it has first been charged with energy from some other source.In fact batteries return slightly less energy than they consume in charging. The battery merely time shifts the release of energy product by the generator. Batteries deployed as part of a Class I renewable energy system are a component in the customer's Generating Facility

It may be objected that vehicle batteries could be recharged by running the gasoline engine and then delivering power to the grid, but no one would actually choose to do this. The cost of gasoline to generate power at $2.70 per gallon currently, is approximately equivalent to $0.18 per kWh, well above even the elevated retail price of electric energy in New Jersey.

1. In this context Partnerships One, LLC's business model is to aggregate more than 100 kW of EV storage capability at net metered PV installations to qualify for provision of ancillary services such as frequency regulation to PJM. Net metering is critical because the services are reimbursed for power capability. The net energy is zero and needs to be free of charge for that portion of the input that is balanced by the output for the economics to make sense.

2. The system architectures of interest to Partnerships are shown accurately in Figures 2 and 3 of the referenced document for AC and DC coupled frequency regulation storage. The provisions for metering and communication in the figure legends are acceptable, except that meter 3 is completely redundant. The PJM meter obtains exactly the same information, and only PJM need it. The statement in the legend for Figure 3 that "the energy flowing into the PVFR inverter will be used as a surrogate for the energy produced by the batteries" reflects a fundamental confusion. Batteries do not produce energy. They produce power.

3. It is important to note that there will be cases in which it will be advantageous to install an inverter with greater capacity than the PV array. The revenue from frequency regulation is determined by the power capability of the installation. The energy is determined by the solar PV generation capability. The optimum lies with a system that can deliver more power than it can generate. For example a Nissan Leaf can easily provide 15 kW of frequency regulation power from its 24 kWhr battery bank which would require all day to recharge from a typical 5 kW solar PV array. Such systems should still be permitted under the Class 1 Renewable regulations as long as their net output as true generators is 10 kW or less.

4. The extended discussion of "System Impact Issues" is overdrawn for distributed FR systems that will be little larger than the solar installations on which they are based. The entire rationale for providing distributed ancillary services is that it stabilizes the grid and reduces the need for additional investment in distribution. A balanced presentation should include these positive impacts.

5. The discussion of "Metering" is acceptable as long as it is recognized that power delivered by the FR battery bank is not generation. If power flowing into the bank is not netted against power flowing out, but has to be paid for, the economics of FR from battery storage are not viable

Under "Billing and Settlement"
"Energy into and out of a Frequency Regulation System"...."Inverter based systems.....do require additional analysis when used for FR."

6. Any additional analysis of PV systems used for frequency regulation at a level of 100kW or less is trivial and should be paid for by the EDC, if their system is so fragile as to require it. No net energy is produced by FR systems, as discussed above. The addition of FR capability does not increase the generation capability of a net metered Class 1 renewable system. Such a system should still qualify under the net metering regulations.

7. The power flow into and out of an FR storage battery under PJM regulation D is intended to be balanced to avoid net charge or discharge of the battery. Battery/charge systems are not perfectly reversible, and some net input of energy is involved. Billing this at the appropriate retail rate is justified.

8. Addition by the EDCs of a "Contract Demand Adder" and an "Additional Retail Statement/ Settlement Preparation charge" are wholly unjustifiable attempts by the EDCs to profit from the efforts of others to improve the grid, while contributing nothing. An analysis of the benefits to the EDCs and the RTO from distributed storage should result in a rate reduction or a payment for services rendered instead.

There is no necessity for a "Demand Adder" for FR systems. The normal demand charge for commercial and industrial customers service will reimburse the EDC for any additional demand at the service location.

"Netting the generation at the wholesale level produced and consumed by the FR system with a retail energy delivery charge for the energy consumed by the FR System" is acceptable, but it is handled automatically by net meter 1 without an extra meter 3. The losses in the FR system are simply part of the customer load.

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