Bloomenergy

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July 19, 2022

VIA E-FILING AND EMAIL

Acting Secretary Carmen Diaz
New Jersey Board of Public Utilities
44 South Clinton Avenue, 9th Floor
Post Office Box 350
Trenton, New Jersey 08625-0350
Board.Secretary@bpu.nj.gov

Re: I/M/O New Jersey Grid Modernization (BPU Docket No. QO21010085)

Dear Acting Secretary Diaz:

Please accept the following comments of Bloom Energy regarding the BPU's Grid Modernization proceeding. Bloom Energy is a manufacturer of solid oxide fuel cell technology that generates onsite power using a non-combustion process that produces near zero amounts of local forms of "criteria" air pollutants - NOx, SO2, Particulate Matter, and Black Carbon. Bloom Energy Servers are designed in a modular fault-tolerant format that provides mission critical reliability with no downtime for maintenance. Bloom Energy systems have been proven resilient through disruptive events including hurricanes, earthquakes, utility outages, physical damage, and fire damage. Bloom Energy has installed over 350MW of its non-combustion solid oxide fuel cell systems for customers in eleven U.S. states as well as in Japan, South Korea, and India.

Co-location of fuel cells with net-metered solar is one of the most effective ways to reduce fossil fuel use and achieve a combination of increased resiliency and near-term emission reductions without relying on pollution causing diesel generators. New Jersey's Energy Master Plan calls out the need for clean distributed generation, emphasizing that it "provides additional resiliency, which is particularly important in LMI and environmental justice communities".[1] Not since Superstorm Sandy has there been a more crucial time to allow customers to take advantage of a fuel cell's resilient power along with net metered solar power. For example, five days after

[1] 2019 Energy Master Plan at 202.

Tropical Storm Isaias ripped through New Jersey last year, there were still over 11,000 power outages in the PSE&G service territory.[2] As a result of the more recent Hurricane Ida, there were 81,740 EDC customers without power in New Jersey on September 1, 2021.[3] Moreover, last year Governor Murphy and the New Jersey Legislature recognized the crucial importance of fuel cells through the establishment of the Fuel Cell Task Force.[4] This task force is charged with developing a plan for increased use of fuel cells in New Jersey.

Customers should not have to choose between installing net-metered solar at their premises and increasing their resiliency during power outages by installing a fuel cell. A customer who generates solar and other Class I renewable energy on the customer's side of the meter is entitled by law to net meter its excess generation. N.J.A.C. § 14:8-4.3(a) expressly provides:

> All electric distribution companies . . . shall offer net metering to their customers that generate electricity on the customer's side of the meter, using class I renewable energy sources, provided that the generating capacity of the customer-generator's facility does not exceed the amount of electricity supplied . . . to the customer over an historical 12-month period that the customer-generator selects.

While N.J.A.C. § 14:8-4.1(b)(3) does restrict customers from having more than one net energy metering ("NEM") resource behind the meter, there is no restriction on a NEM facility being co-located behind the meter with a generation resource that is not NEM-eligible, such as a Bloom fuel cell powered by natural gas.

Co-location is an issue of paramount importance which Bloom Energy raised at the January 28, 2022, stakeholder meeting in the BPU's Grid Modernization proceeding. The Board's prior stakeholder meetings in 2014 and 2015 with the electric distribution companies ("EDCs") referred to co-location of solar with a fuel cell behind the same customer meter as "mixed generation". The BPU's consultant Guidehouse refers to this as "hybrid DER interconnection".

In its June 2022 draft report, Guidehouse acknowledged Bloom's call for a mechanism to allow customers to have both renewable and non-renewable energy sources co-located behind the same customer meter without forfeiting the right to receive net metering credits for solar

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[2] https://www.nj.com/weather/2020/08/isaias-power-outages-hit-day-5-in-nj-with-42k-still-out-full-restoration-could-take-2-more-days.html

[3] https://www.cincinnati.com/story/weather/2021/09/01/hurricane-ida-weather-thousands-without-power-north-jersey/5691143001/

[4] P.L. 2020, c. 38, Assembly No. A741, Senate No 762 (enacted June 19, 2020).

generation.[5] The Guidehouse draft report explains: "Currently NJ only allows renewable sources to participate in net metering. If a customer has renewable and non-renewable resources behind the same meter, the EDCs do not have standard policies for how such projects should be interconnected to the grid, or how net metering credits should be calculated to prevent de facto net metering of technologies that do not qualify for net metering credits."[6] Guidehouse recommends a rulemaking that would require non-renewable fuel sources, like fuel cells, to be separately metered from solar and other renewable energy sources instead of being combined for net metering purposes, and which allows full net metering credit for renewable generation without a penalty for the co-located non-renewable source.[7] The draft report also said that additional tariff provisions, such as standby purchased electric power tariffs for qualifying facilities and cogeneration, are needed to address hybrid DER interconnection and microgrids, "particularly where part of the hybrid resource involves a technology eligible for net metering and part of the hybrid resource does not".[8]

The Guidehouse report also calls for the creation of a definition for "non-renewable clean energy fuel sources", which would be allowed to take part in the net metering program with compensation at avoided energy cost.[9] And the report discusses other states, including New York, Connecticut, Rhode Island, Georgia, and Wisconsin, that are evaluating and implementing mechanisms to allow fuel cells and other non-renewable energy sources to take part in the net metering program.[10]

However, the Guidehouse report fails to discuss the problems resulting from the EDCs not allowing mere co-location without compensation for fuel cells and other non-renewable sources. While it would of course be great if the energy produced by fuel cells and other non-renewable DER could receive compensation, Bloom Energy would be satisfied if the Board implemented a rulemaking that simply allowed co-location of solar and fuel cells with only compensation for the

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[5] *See* Guidehouse draft report at 35, 39, 40, 70, 71, 85, available at: https://www.nj.gov/bpu/pdf/publicnotice/DRAFT%20Grid%20Modernization%20Report%206-20-22.pdf

[6] Guidehouse draft report at 40.

[7] Guidehouse draft report at 85.

[8] Guidehouse draft report at 40.

[9] Guidehouse draft report at 85.

[10] Guidehouse draft report at 70-71.

solar portion of the energy so that customers do not have to sacrifice resiliency in order to receive net metering credits.

Bloom is not the only company making such a request. DSM Nutritional Products ("DSM") filed a petition on July 29, 2021, requesting that the BPU direct JCP&L to apply solar net metering credits to DSM for the electricity that DSM's on-site solar generation exports to the grid, which JCP&L has refused to provide because DSM's solar panel system is co-located behind the meter with a CHP.[11] Unfortunately, it appears from a review of the docket that nothing has happened in this DSM proceeding since January 2022. DSM also filed comments in the Grid Modernization proceeding on March 21, 2022, stating: "The Grid Modernization initiative should embrace the allowance for multiple solutions behind the same meter to work together with the highest consideration to maximize the benefits of each, including full net-metering of renewable outputs." Bloom agrees with DSM's position.

PSE&G has also expressed opposition to the co-location / hybrid DER interconnection / mixed generation issue in the recent past. In 2019 and 2020 Bloom Energy engaged in discussions with PSE&G regarding whether the EDC would allow co-location of solar net metering projects with Bloom fuel cells powered by natural gas. On February 7, 2020, PSE&G sent a letter to Bloom's undersigned counsel stating, among other things, that:

> Exports from customers with fuel cells powered with natural gas combined with solar power behind the same retail meter are not eligible for net metering, since it is impossible to distinguish the source of the electrons being exported to the grid. Allocation methodologies do not resolve this problem and are not an acceptable alternative.
>
> ….
>
> Therefore, we cannot allow export of excess power from the contemplated comingled BTM generation resources, and instead require customers to ensure through control equipment that there are no exports from the ineligible facility at any time. That control equipment would have to either shut down the fuel cell to ensure that only Class I electricity is exported, or manage the resources in a manner ensuring that no exports are made.[12]

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[11] I/M/O Petition by DSM Nutritional Products to Direct JCP&L to Provide Net Metering Credit For Existing On-Site Solar Generation Facility (BPU Docket No. QO21071021).

[12] PSE&G letter attached as Exhibit A. Even though Bloom made it clear to PSE&G that it had no interest in having PSE&G or any other EDC purchase power from the fuel cell when it is co-located with solar net metering, PSE&G's February 2020 letter also stated:

> PSE&G's current electric tariff does not allow the company to purchase exported electricity generated by a natural gas powered fuel cell. The sheet titled "Payment Schedule PEP, Purchased Electric Power," Original Sheet No. 176 from the Company's Tariff for Electric Service, was developed to comply with

PSE&G appears to have taken the position that none of its customers that have previously installed net-metered solar projects are permitted to install a fuel cell without being denied the right to net meter excess Class I renewable electricity. PSE&G is also taking the position that any microgrid that includes both solar and a NEM-ineligible technology, such as a fuel cell, behind a single customer meter is prohibited. Such a position is inconsistent with current state policy and strategic direction with respect to the rights of customers utilizing solar and other Class I renewable resources and their desire to prepare for the public safety implications of our changing climate by increasing resiliency through the use of a fuel cell.

In 2014 and 2015 the EDCs Supported Mixed Generation Interconnection, Metering & Settlement

Solar co-located with a fuel cell or CHP, i.e., mixed generation behind the meter / hybrid DER interconnection, is not a novel issue for the Board. Bloom is simply asking the Board to finish the work that it started on this issue through stakeholder discussions that took place in 2014 and 2015, which involved all of the EDCs.

On August 13, 2014, the EDCs gave a presentation to the BPU entitled "Mixed Generation Interconnection, Metering & Settlement – Net-metering Eligible, Class 1 Renewable Energy Generation Combined with Other Distributed Generation/Storage", which is attached in Exhibit A. Slide 4 of this presentation stated the following:

- Additional metering will be installed, where necessary, at the customer's expense, to differentiate between Class 1 renewable energy which is eligible for net metering and other energy which is not.
- Metering requirements and configuration will be determined based on the type of generation, the intended purpose and operation of the of each of the generation systems and their source(s) of energy.
- While there may be some more unique situations, metering requirements will generally fall into one of three configurations that follow.

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federal law, particularly Section 210 of the Public Utility Regulatory Policies Act of 1978, which only allows for the purchase of electricity generated by a Qualifying Facility (QF) under 20 MW. Since a natural gas powered fuel cell does not meet the definition of a QF, PSE&G cannot purchase electricity exported to the grid by that type of resource under its existing tariff.

This is no longer a viable position for PSE&G or any other EDC to take since FERC issued an order in December 2020 establishing that fuel cells with heat recovery, such as Bloom fuel cells, are qualifying facilities (QF) under PURPA. See FERC order no. 874 (December 17, 2020), Docket Nos. RM21-2-000 and RM20-20-000.

This slide was followed by the following three diagrams showing potential metering configurations for mixed generation, including solar co-located with fuel cells.

Figure 1 - Mixed Generation Connection & Metering Oneline without Frequency Regulation

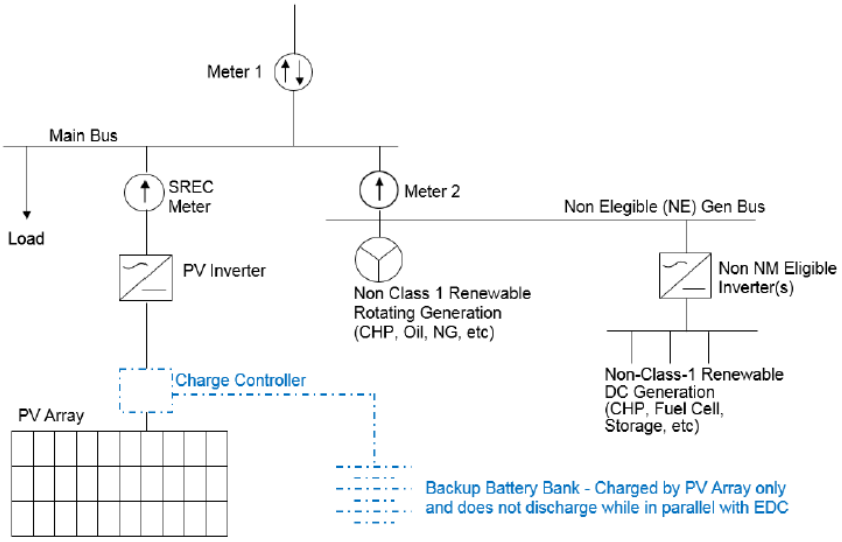


Figure 2 - Mixed Generation Connection & Metering Oneline with Frequency Regulation and Single Function Inverters

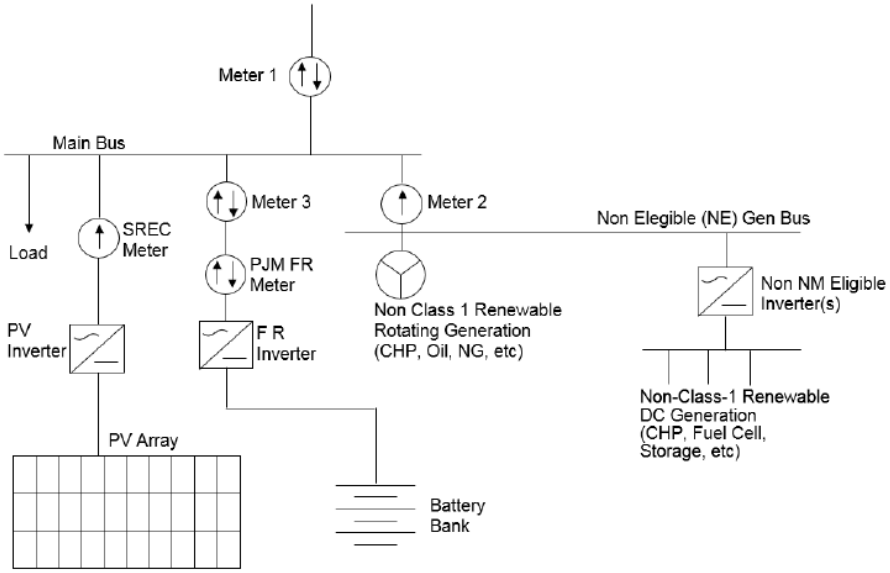
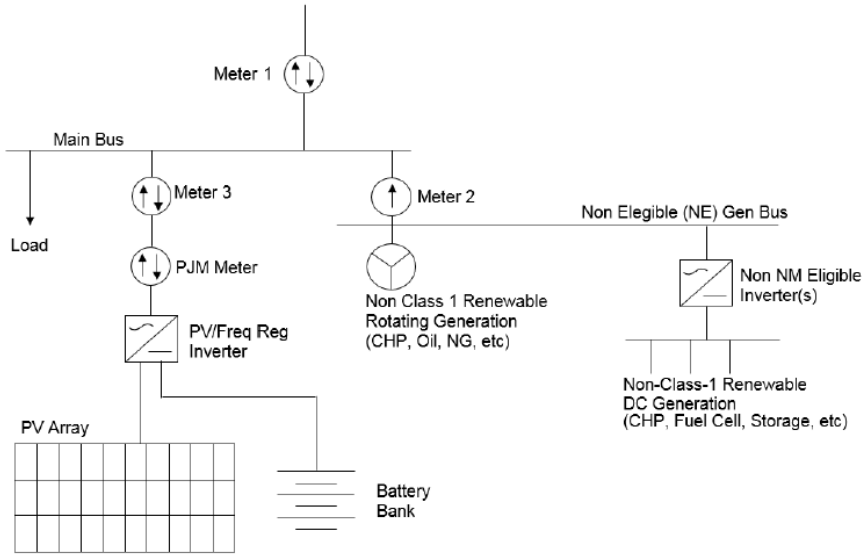


Figure 3 - Mixed Generation Connection & Metering Oneline with Frequency Regulation and Multi Function Inverter



In Slide 7 the EDCs presented the following "Conceptual Energy Differentiation Process" for calculating the solar net metering credit when solar is co-located behind the meter with a fuel cell (or other non-NM eligible energy):

- In any interval of measurement (monthly or hourly), subtract the non-NM eligible energy from the total exported in that interval.
- If the remainder is positive, that positive amount of energy is eligible for treatment under the netmetering regulations.
- The remainder of the exported energy in the interval is treated as wholesale or by some other mechanism.
- If zero or negative, all of the energy exported in the interval is treated as wholesale or by some other mechanism.
- For hourly metered customers, all of the NM eligible interval values and all of the non NM eligible interval values are added separately for appropriate processing.[13]

In Slide 8 the EDCs proposed the following "Billing and Settlement" procedure:

> **Net-metering Eligible Energy**
> • The amount of energy received by the EDC from Class 1 Renewable resource, equivalent to the amount the EDC would have received absent any additional generation will be treated in accordance with the Netmetering regulations; either used to offset energy consumed during the month or banked for later usage during the annualized period.

[13] "NM" is defined as net metering in this presentation by the EDCs.

Energy Produced by Qualifying Facilities (QFs)
• Energy received from traditional DG which are QFs will be compensated in accordance with the EDC's policy for purchasing such energy.

Energy Produced by Non-Qualifying Facilities (Non-QFs)
• An EDC may choose to purchase such energy but is under no obligation to purchase energy from non-QF DG. Non QF energy may be sold to a qualified wholesale market participant or directly to PJM. The EDCs will provide reasonable assistance to the customer generator in pursuing wholesale market sales.

On June 25, 2015, the Board issued an order in Docket No. 0015040476 (I/M/O The Comprehensive Energy Efficiency and Renewable Energy Resource Analysis for the Fiscal Year 2016 Clean Energy Program) which included the following "Net Metering and Interconnection Update":

> Throughout 2014, Staff periodically engaged stakeholders interested in Net Metering and Interconnection rules for New Jersey Class I renewable energy facilities. In addition to the routine implementation issues identified by stakeholders, the 2014 agenda for this group grew to include several new issues:
>
> - Increasing levels of penetration of interconnected NJ Class I renewable energy facilities on individual distribution feeder circuits,
> - Cases where NJ Class I renewable energy facilities were proposed to be co-located with other forms of distributed generation not addressed by the law enabling net metering and interconnection, and
> - Treatment of interconnection applications for energy storage equipment in support of NJ Class I renewable energy facilities.
>
> As Staff continues stakeholder discussions on evolving interconnection and net-metering issues, the goal is to ensure that the interconnection of a fossil-fueled generator alongside a NJ Class I renewable resource does not result in a greater net metering credit than the renewable system would be eligible for in isolation. The draft protocols are envisioned to involve proper meter placement, system controls, and EDC billing practices.

At a September 17, 2015, Net Metering and Interconnection ("NMIX") Stakeholder Meeting, the EDCs proposed "Protocols for the Treatment of Mixed Generation Behind a Single Meter", which are attached in Exhibit A. Among other things, the EDCs' proposal recommended the following:

> [T]he installation of combined netmetering eligible & non-eligible generation can be accomplished in either of two ways at the discretion of the connecting EDC. It can be done either by installing controls on the operation of the generation or by the installation of metering on the non-eligible generation to algorithmically differentiate between eligible and non-eligible generation.
>
> The cost of the installation of additional metering on the non-eligible generation and any upgrades to the service entrance metering along with any required communications (generally only required with interval metering) to each meter

location will be at the customers expense.
All mixed generation applications will be subject to Level 3 review requirements including application fees and review procedures. Additional studies will only be required if determined to be necessary during the initial review.
….
Algorithmic Determination of NM Eligible Energy
At the option and expense of the customer-generator, the EDC will install revenue grade interval or standard kWh metering on the output of the non-eligible generation. In the event the customer-generator opts for interval metering, the service entrance metering will be upgraded to interval metering if not already installed and; the customer-generator will be required to provide communications to each meter location.
Depending on the type of metering installed, the determination of energy eligible for net metering will be made either hourly or in a single monthly calculation as follows:

 The energy exported over an interval (hourly or monthly) to the EDC's electrical system will be reduced by the energy produced by the non-eligible generation over the corresponding interval.
- o If the balance is positive, i.e., the PV system production exceeded the customer-generator's usage:
  - That balance will be eligible for netmetering under the netmetering regulations and,
  - The amount of energy produced and exported by the non-eligible generation will be eligible for compensation in accordance with the EDC's policy for purchasing such energy.
- o If the balance is negative, i.e., the PV system production was less than the customer's usage:
  - None of energy exported over the interval will be eligible for netmetering and,
  - All of the energy exported over the interval will be eligible for compensation in accordance with the EDC's policy for purchasing such energy.

On December 17, 2015, Board Staff, including Scott Hunter, Manager in the BPU Division of Clean Energy, held another NMIX stakeholder meeting to discuss comments received regarding the EDCs' proposed mixed generation protocols. The minutes from this meeting state: "In response to a question on what the next steps are, Mr. Hunter said the EDCs are now implementing the existing net metering and interconnection rules and using the protocols to address situations that are not covered by those rules, i.e., issues involving fossil fueled generation." Exhibit A. However, PSE&G's letter to Bloom Energy in February 2020, which completely rejected mixed generation, indicates that PSE&G is not following the mixed generation algorithm protocols that the EDCs proposed to the Board in September 2015.

Conclusion

We urge the Board to issue an order or initiate a rulemaking proceeding to clarify the rules governing co-location / mixed generation / hybrid DER interconnection behind the customer's meter, including explaining the process that will be used to exclude the energy generated by the fuel cell / CHP from the calculation of the solar net metering credit when net metered solar is co-located with a fuel cell / CHP behind the same customer meter. Bloom Energy agrees with the above algorithm approach that was recommended by the EDCs in their September 2015 proposed protocols but does not agree that all mixed generation should be subject to the Level 3 interconnection review requirements.

Bloom Energy appreciates the opportunity to provide comments in the Board's Grid Modernization proceeding. We look forward to working with Board Staff and stand ready to provide additional information wherever that information will be helpful to the process.

Very truly yours,

/S/

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cc: Board of Public Utilities Commissioners

EXHIBIT A

Matthew M. Weissman
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February 7, 2020

Via Email: mbevan@bmgzlaw.com and Regular Mail

Murray E. Bevan, Esq.
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Dear Murray,

We have reviewed your concerns with respect to Bloom Energy fuel cells operating behind the meter (BTM) in PSE&G's service territory, and more specifically, the treatment of excess electricity produced by the fuel cell unit.

Stand alone:

PSE&G's current electric tariff does not allow the company to purchase exported electricity generated by a natural gas powered fuel cell. The sheet titled "Payment Schedule PEP, Purchased Electric Power," Original Sheet No. 176 from the Company's Tariff for Electric Service, was developed to comply with federal law, particularly Section 210 of the Public Utility Regulatory Policies Act of 1978, which only allows for the purchase of electricity generated by a Qualifying Facility (QF) under 20 MW. Since a natural gas powered fuel cell does not meet the definition of a QF, PSE&G cannot purchase electricity exported to the grid by that type of resource under its existing tariff. A tariff change would be required to add fuel cells to the allowable generation resources. However, a tariff change adding fuel cells to facilities qualified under the PEP tariff would be inconsistent with the purpose of that tariff, which was developed exclusively to comply with PURPA's requirements regarding small QFs. Moreover, that change would be inconsistent with State policy and with PSEG's own strategic direction with respect to carbon emitting generating resources.

Comingled with solar facilities

Generation resources eligible for net metering are governed by the following regulations

- NJAC 14:8-4.1, which establishes that net metering is only available to customers who generate Class 1 renewable energy

- NJAC 14:8-1.2, which establishes that only fuel cells that are powered by renewable fuels can be considered Class 1 Renewables

Exports from customers with fuel cells powered with natural gas combined with solar power behind the same retail meter are not eligible for net metering, since it is impossible to distinguish the source of the electrons being exported to the grid. Allocation methodologies do not resolve this problem and are not an acceptable alternative.

Therefore, we cannot allow export of excess power from the contemplated comingled BTM generation resources, and instead require customers to ensure through control equipment that there are no exports from the ineligible facility at any time. That control equipment would have to either shut down the fuel cell to ensure that only Class I electricity is exported, or manage the resources in a manner ensuring that no exports are made. It is my understanding that the other New Jersey electric delivery companies have interpreted these regulations in the same manner for any non-Class I generating resource collocated behind the meter with solar. Again, this interpretation is consistent current State policy and with PSEG's strategic direction with respect to carbon emitting generating resources.

Thank you very much for your inquiry,

Best regards,

Matthew M. Weissman

Mixed Generation Interconnection, Metering & Settlement

Netmetering Eligible, Class 1 Renewable Energy Generation Combined with Other Distributed Generation/Storage

1

System Impact Issues

Traditional Distributed Generation (DG)

- **The EDCs will continue to analyze the impact of traditional DG operating in parallel with the EDC's distribution system, behind the same meter with new or existing Class 1 renewable generation in accordance with the regulations for a Level 3 application. Installations not combined with Class 1 renewable generation may be treated as a Level 1 or 2 application.**
- **These include both rotating equipment and inverter based generation which produce energy to offset retail customer usage in accordance with the netmetering regulations and/or deliver wholesale energy to the EDCs distribution system.**

Note: Any interconnected generation capable of islanded (I.e., Stand Alone) operation, must separate form the EDCs electrical system prior to energizing the islanded portion of the customer's system.

2

System Impact Issues

Frequency Response Systems ("FR") - Voltage Impact

- Each has Twice the Impact of an Equivalently Sized PV-Only System
  - Load change to Distribution System
    - PV System: 0 to Minus Inverter Rating
    - FR System: Plus inverter Rating to Minus Inverter Rating
- Multiple Systems Respond in Unison to PJM signal
  - Load Changes are Additive
  - No Diversity
- High Frequency of Operation
- Potential for Sustained High or Low Voltage

3

System Impact Issues

FR Systems – EDC Maintenance Issues

- Increased Wear on Voltage Regulation Devices
  - LTCs, Line/Bus Regulators/Switched Capacitors
- Not Designed for Frequent Changes
- Voltage Regulation Equipment is Designed with Intentional Time Delay to Prevent Premature Wear
  - May Contribute to Sustained High and Low Voltage without Preventative Controls

4

System Impact Issues

Frequency Response Systems ("FR") - Analysis Requirements

- Interconnection Application Notification Mandatory
  - Request OCE Mandatory Requirement
  - Add to Interconnection Application
  - Need for Improved PJM Notification of Intended Application
- Systems Analyzed at Full Potential Load Swing
  - Not Less Than Twice Inverter Rating
- Multiple Systems on Distribution Circuit & Substation Must be Analyzed in Aggregate
- Analysis Must Include Flicker Curve Considerations

5

System Impact Issues

Frequency Response Systems ("FR") - Operational Requirements / Limitations & Conditions for Interconnection

- Aggregated FR Will be Limited to an Amount Creating Voltage Fluctuations to Less Than ½ the Dead Band of Any Voltage Regulation Device.
- Presence of FR may significantly increase costs to reconfigure system to accommodate future load growth or inhibit/prevent system reconfiguration.
  - Additional costs to reconfigure system because of FR may be passed on to customer or
  - FR may be required to cease interconnected operations.
- FR Operation May Only be Permitted While System is Configured as Originally Studied (i.e., Not During Restoration / Maintenance)
- Maximum Ramp Rates & Staggered Responses May be Required

6

Metering

- **Additional metering will be installed, where necessary, at the customer's expense, to differentiate between Class 1 renewable energy which is eligible for net metering and other energy which is not.**
- **Metering requirements and configuration will be determined based on the type of generation, the intended purpose and operation of the of each of the generation systems and their source(s) of energy.**
- **While there may be some more unique situations, metering requirements will generally fall into one of three configurations that follow.**

7

Figure 1 - Mixed Generation Connection & Metering Oneline without Frequency Regulation

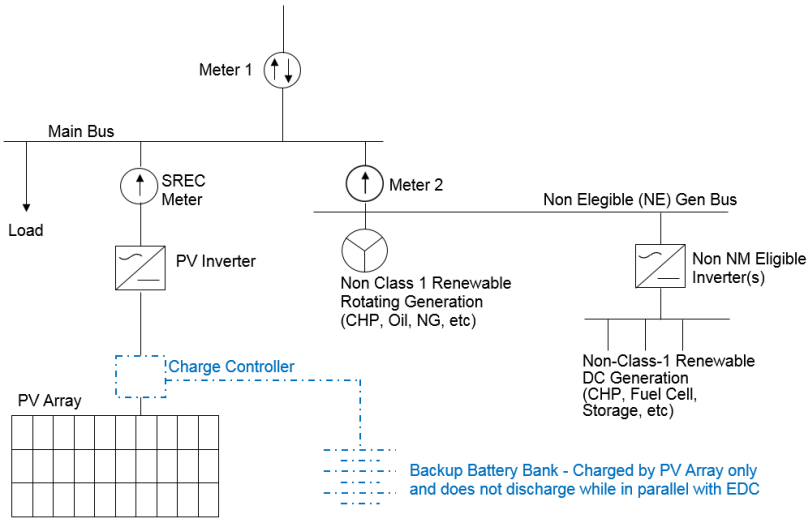

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Figure 1 Legend

- **Meter 1 - Service Entrance Bidirectional Metering (kWh_{In}, kWh_{Out}): Provided and installed at the EDC's expense based on the metering requirements of a comparable non generation Customer. Any upgrades (e.g. interval capability) are at the Customer's expense. Meter socket & installation by the Customer.**
- **Meter 2 - Non Class 1 Renewable Generation Metering (kWh_{NE}): Provided and installed by the EDC at the Customers expense. Meter socket & installation by the Customer.**
- **SREC Meter - SREC Verification Metering: Provided & installed by the Customer at the Customers expense.**
- **Communications: Where interval metering is required either for billing under the tariff rate schedule or at the request of the customer, the cost of the communications service and the installation of the communications medium are the responsibility of the Customer.**

9

Figure 2 - Mixed Generation Connection & Metering Oneline with Frequency Regulation and Single Function Inverters

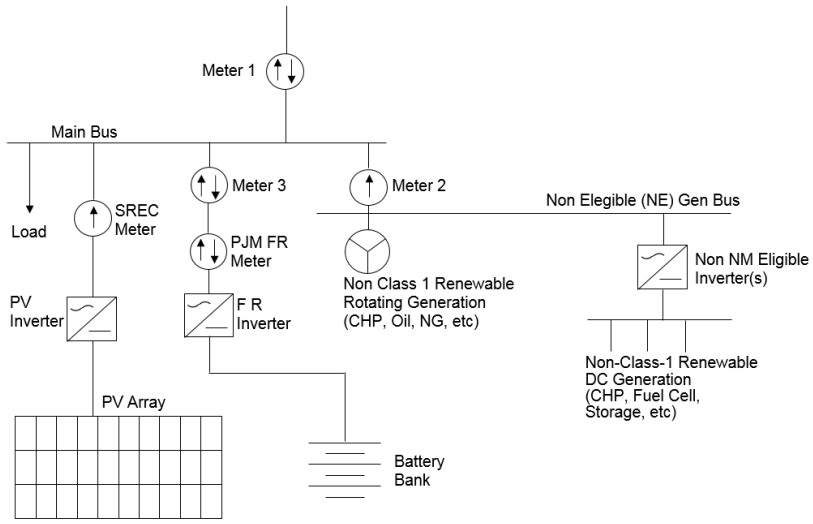

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Figure 2 Legend

- **Meter 1 - Service Entrance Bidirectional Metering (kWh_{In}, kWh_{Out}): Provided and installed at the EDC's expense based on the metering requirements of a comparable non generation Customer. Any upgrades (e.g. interval capability) are at the Customer's expense. Meter socket & installation by the Customer.**
- **Meter 2 - Non Class 1 Renewable Generation Metering (kWh_{NE}): Provided and installed by the EDC at the Customers expense. Meter socket & installation by the Customer.**
- **Meter 3 - Battery Storage Bidirectional FR System Meter (kwh_{Chg}, kWh_{B}): Provided and installed by the EDC at the Customers expense. Meter socket & installation by the Customer.**
- **PJM FR Meter - PJM Frequency Regulation Performance Metering: Provided & installed by the Customer at the Customers expense.**
- **SREC Meter - SREC Verification Metering: Provided & installed by the Customer at the Customers expense.**
- **Communications: Where interval metering is required either for billing under the tariff rate schedule or at the request of the customer, the cost of the communications service and the installation of the communications medium are the responsibility of the Customer.**

11

Figure 3 - Mixed Generation Connection & Metering Oneline with Frequency Regulation and Multi Function Inverter

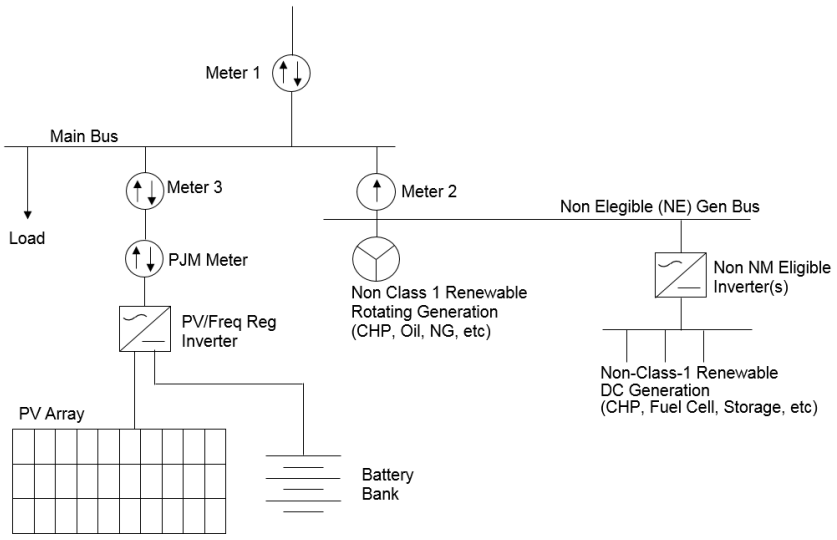

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Figure 3 Legend

- **Meter 1 - Service Entrance Bidirectional Metering (kWh_{In}, kWh_{Out}): Provided and installed at the EDC's expense based on the metering requirements of a comparable non generation Customer. Any upgrades (e.g. interval capability) are at the Customer's expense. Meter socket & installation by the Customer.**
- **Meter 2 - Non Class 1 Renewable Generation Metering (kWh_{NE}): Provided and installed by the EDC at the Customers expense. Meter socket & installation by the Customer.**
- **Meter 3 - PV / Battery Bidirectional SREC Meter (kWh_{Chg}, kWh_{PV-B}): Provided and installed by the EDC at the Customers expense. Meter socket & installation by the Customer. Note: the energy flowing into the PV/FR inverter will be used as a surrogate for the energy produced by the batteries.**
- **PJM Meter - PJM Regulation Performance Metering: Provided & installed by the Customer at the Customers expense.**
- **Communications: Where interval metering is required either for billing under the tariff rate schedule or at the request of the customer, the cost of the communications service and the installation of the communications medium are the responsibility of the Customer.**

13

Metering

Conceptual Energy Differentiation Process

- **In any interval of measurement (monthly or hourly), subtract the non-NM eligible energy from the total exported in that interval.**
- **If the remainder is positive, that positive amount of energy is eligible for treatment under the netmetering regulations.**
  - **The remainder of the exported energy in the interval is treated as wholesale or by some other mechanism.**
- **If zero or negative, all of the energy exported in the interval is treated as wholesale or by some other mechanism.**
- **For hourly metered customers, all of the NM eligible interval values and all of the non NM eligible interval values are added separately for appropriate processing.**

14

Billing & Settlement

Netmetering Eligible Energy

- **The amount of energy received by the EDC from Class 1 Renewable resource, equivalent to the amount the EDC would have received absent any additional generation will be treated in accordance with the Netmetering regulations; either used to offset energy consumed during the month or banked for later usage during the annualized period.**

Energy Produced by Qualifying Facilities (QFs)

- **Energy received from traditional DG which are QFs will be compensated in accordance with the EDC's policy for purchasing such energy.**

Energy Produced by Non-Qualifying Facilities (Non-QFs)

- **An EDC may chose to purchase such energy but is under no obligation to purchase energy from non-QF DG. Non QF energy may be sold to a qualified wholesale market participant or directly to PJM. The EDCs will provide reasonable assistance to the customer generator in pursuing wholesale market sales.**

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Billing & Settlement

Energy Into and Out of a Frequency Regulation System

- **Inverter based systems previously approved for use in a PV system do require additional analysis when used for FR. Such systems need more analysis in order to mitigate potential problems on the EDC's distribution system, power quality concerns and potential harm to customer's equipment.**
- **The energy produced by FR systems is not derived from Class 1 renewable resources and increases the amount of energy produced from fossil fueled generation.**
- **FR systems do not qualify for treatment under the netmetering regulations.**

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Billing & Settlement

Energy Into and Out of a Frequency Regulation System (continued)

- **The EDCs plan to assess retail charges for the use of the distribution system, based on analysis to date, potentially in some combination of:**
  - **A contract demand adder based on the maximum load requirements of the FR system**
  - **Retail energy rates for energy consumed by the FR system and wholesale rates for sales into the market for energy produced by the system.**
  - **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.**
  - **Additional retail statement/settlement preparation charge.**
- **The EDCs are continuing to develop appropriate charges compatible with their rate structures which may be unique to each EDC. These concepts represent the general discussions amongst the EDCs. Each EDC reserves the right to take individual positions in current and future proceedings, as it deems appropriate.**

17

Protocols for the Treatment of Mixed Generation Behind a Single Meter

Under the NJ BPU regulations, only electrical energy produced from Class I Renewable Resources is eligible for netmetering.

If the potential for the customer's netmetering eligible generation alone is small (i.e. minimal energy exported to the EDC system absent the non-eligible generation), the customer should evaluate the economics of not pursuing, or continuing, service under the netmetering regulations.

In the event the customer does intend to take or continue taking service under the netmetering regulations, the installation of combined netmetering eligible & non-eligible generation can be accomplished in either of two ways at the discretion of the connecting EDC. It can be done either by installing controls on the operation of the generation or by the installation of metering on the non-eligible generation to algorithmically differentiate between eligible and non-eligible generation.

The cost of the installation of additional metering on the non-eligible generation and any upgrades to the service entrance metering along with any required communications (generally only required with interval metering) to each meter location will be at the customers expense.i

All mixed generation applications will be subject to Level 3 review requirements including application fees and review procedures. Additional studies will only be required if determined to be necessary during the initial review. Storage systems will be analyzed based on difference between their maximum production and maximum load and their interaction with other generation and in particular, other storage systems where applicable

<u>Controls</u>

The customer-generator must design & install a system that prevents the operation of the non-eligible generation at the same time the eligible generator is exporting energy to the EDC's electrical system. Stated another way, the non-eligible generation must be reduced to zero as the output of the PV or other renewable system approaches the customers load, or the renewable system production will need to be reduced in order to continue operating the non-eligible generation. Metering may be required to verify control system performance.

<u>Algorithmic Determination of NM Eligible Energy</u>

At the option and expense of the customer-generator, the EDC will install revenue grade interval or standard kWh metering on the output of the non-eligible generation. In the event the customer-generator opts for interval metering, the service entrance metering will be upgraded to interval metering if not already installed and; the customer-generator will be required to provide communications to each meter location.

Depending on the type of metering installed, the determination of energy eligible for netmetering will be made either hourly or in a single monthly calculation as follows:

- The energy exported over an interval (hourly or monthly) to the EDC's electrical system will be reduced by the energy produced by the non-eligible generation over the corresponding interval.
    - If the balance is positive, i.e. the PV system production exceeded the customer-generator's usage:
        - That balance will be eligible for netmetering under the netmetering regulations and,
        - The amount of energy produced and exported by the non-eligible generation will be eligible for compensation in accordance with the EDC's policy for purchasing such energy.
    - If the balance is negative, i.e. the PV system production was less than the customer's usage:
        - None of energy exported over the interval will be eligible for netmetering and,
        - All of the energy exported over the interval will be eligible for compensation in accordance with the EDC's policy for purchasing such energy.

[i] Participation in the PJM Demand Response Frequency program does not permit the export of electrical energy to the EDC's electrical system. At the EDC's discretion, the installation of any battery storage systems or other generation for such participation will require service entrance interval metering and associated communications at the customer's expense along with advanced notification of scheduled participation.

A.F.Mensah

AF Mensah (AFM) appreciates the opportunity to present our views and suggestions to the NJ Board of Public Utilities (BPU) and Board Staff on the document entitled "Protocols for the Treatment of Mixed Generation Behind a Single Meter" submitted on behalf of the major electric distribution companies (EDC) in New Jersey.

AFM agrees that there needs to be a reliable and cost effective method of differentiating between the energy produced by Class I renewable (eligible) resources and other non-eligible sources of generation. AFM comments are based on this premise.

I. METERING REQUIREMENTS

1. Meter Eligibility

The customer-generator should have the option to;

a. Install approved metering on the output of the non-eligible generation, or

b. Implement controls on the non-eligible generation as outlined in the proposed protocol.

Meters compliant to the ANSI c12.1 certification should be recognized as approved metering for determination of energy eligible for net-metering.

If the non-eligible generation has an approved meter in place, (i.e. ASNI c12.1 certified or equivalent), then the EDC should recognize that meter for determination of energy eligible for net-metering without requiring an additional meter.

If there is no approved meter in place, then the EDC should install a meter on the non-eligible generation at the customer's expense for determination of energy eligible for net-metering.

2. Algorithmic Determination of the NM Eligible Energy

In order to align with current NEM rules, the determination of energy eligible for net-metering should be made in a single monthly calculation.

AFM is aligned with the algorithmic determination of the NM eligible energy outlined out in the proposed protocol.

3. **Submission of Meter Data**

   The customer-generator and EDC should use a recognized platform (like PJM's GATS) to share/collect data from the approved meter on the non-eligible generation as outlined below.

   "*The Generation Attribute Tracking System (GATS) has a wide variety of subscriber classes. From the large electric utility to the small generation supplier, from the large wind farm to the household solar panel, from state regulators to commodity brokers, the GATS is a ranging platform designed to meet the needs of all involved in the renewable energy credit (REC) market.*

   Due to the wide-spanning nature of the system's audience, the system itself needs to be wide-spanning. To small renewable generation owners, such as those with solar PV systems, the GATS allows users to report generation data and collect credits. To larger systems, electric distribution companies (EDCs), and electric generation suppliers (EGS') the GATS allows the users generation data to meet the various information disclosure requirements imposed by state entities. Additionally, the GATS provides users a bank account of sorts for those subscribers who need to demonstrate REC compliance." (i)

   (i. http://pjm-eis.com/getting-started/about-GATS.aspx)

   As the state of New Jersey currently uses PJM's GATS for settling SREC accounts, this approach will result in the most cost-effective solution for state regulators, EDCs and customer-generators by using an approved platform for settling accounts and for auditing the output of the non-eligible generation on a monthly basis.

II. INTERCONNECTION REQUIREMENTS (Level 3)

AFM understands that there are concerns by the BPU and EDC's with co-locating the installation of eligible and non-eligible generation behind the meter. AFM agrees that precautions need to be made to ensure that for net metering billing purposes, energy generated by non-eligible resources is not included in the amount of net generation from a facility. With this said, AFM continues to question the blanket need for a Level 3 Interconnection study by the EDC's with the installation of non-eligible generation behind the meter.

If the non-eligible generators (battery storage systems in particular) are inverter-based, then they should follow the already existing established interconnection procedures established by the BPU and EDC's and should not automatically be defaulted to a Level 3 Interconnection study. If those systems are not inverter based, then a Level 3 Interconnection study should be considered.

A.F.Mensah

In conclusion, AFM looks forward to continued engagement with Board Staff and the EDC's Manager on this process and to the success of its implementation.

Respectfully submitted,

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October 19, 2015

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NEW JERSEY BOARD OF PUBLIC UTILITIES

Protocols for the Treatment of Mixed Generation Behind a Single Meter

Comments of SolarCity Corporation

SolarCity supports the efforts of the New Jersey Board of Public Utilities to integrate increasing amounts of distributed energy resources onto its system, particularly the combination of resources behind a single customer meter that includes both resources eligible for netmetering ("eligible resources") and resources not eligible for netmetering ("non-eligible resources"), together referred to as mixed generation. Regarding the protocols for the treatment for mixed generation proposed by the EDC's, we offer comments on three general issues:

- Existing interconnection review requirements for renewable generators should also apply to mixed generation and level 3 review should only be required in the case that one of the extensive list of system requirements of the level 2 review is not satisfied or the installation exceeds the 2 MW threshold.

- For interconnection purposes, the impact of storage systems on the grid should not be based on the difference between their maximum production and maximum load and EDCs should be required to move toward assessing distributed energy resources systems based on the cumulative effect of mixed generation, or Hosting Capacity Factor, of each system.

- Regarding netmetering, installation of mixed generation can be achieved through demonstration that a non-eligible generator will not export onto the grid; demonstration that a battery storage system will be charged only from the customer's eligible generation; or through algorithmic determination of eligibility using any revenue grade meter compliant with ANSI C12.20 standards or estimation of the output of small eligible generators.

Experience in Energy Storage and New Jersey Market

SolarCity's involvement in the energy storage space has evolved from a five-year effort to develop, pilot, and deploy stationary energy storage systems that allow solar customers to extract additional value from their distributed generation and provide additional benefits to the grid. This collaboration began with grant funding from California Public Utilities Commission to pilot and deploy Tesla stationary storage systems at SolarCity customer sites. To date, SolarCity has installed over 340 of these battery systems for residential customers and over a dozen installations for commercial customers including WalMart, BJs Wholesale, and others. In

addition to our considerable experience with energy storage, SolarCity has installed over 38 MWs of PV serving over 9,000 residential, commercial, and public sector customers in the New Jersey area. SolarCity also employs more than 400 people and maintains 4 warehouses in the state.

SolarCity's use of the combination of solar and storage in its installations gives it extensive experience in deploying mixed generation. For commercial and industrial customers, SolarCity offers DemandLogic, which uses solar and storage to reduce customer peak demand and exposure to demand charges. For residential customers SolarCity offers solar and storage behind a single inverter to provide backup power. These systems are designed to be aggregated in order to provide grid services in the future. The combination of these resources provides additional value to customers and mitigates the effect of distributed energy resources on the distribution grid, allowing for the integration of more renewable and distributed energy resources without changes to the existing grid. Based on this, we highlight the importance of mixed generation resources and urge the BPU to create a path for the interconnection of these resources that is simple and efficient. This will ensure that mixed generation installations are enabled to provide the maximum benefit to customers and allow the BPU to achieve its goals of integrating renewable energy in the state.

Review Requirements

SolarCity strongly urges that the review requirements applied to customer-generator facilities under N.J.A.C. 14:8-5 also apply to customer-generator facilities with mixed generation; inverter-based facilities with a capacity of 10 kW or less would require a level 1 review and customer-generator facilities with a capacity of 2 MW or less would require a level 2 review. Only customer-generator facilities that do not qualify for level 1 or level 2 interconnection review procedures would be subject to a level 3 interconnection review.

A default requirement of level 3 review for mixed generation will be prohibitive, both from a cost and timing standpoint. First the costs of an impact study are not clear and potentially extremely high. Both the uncertainty and high costs can deter development and would be entirely prohibitive for residential customers. In addition, the level 3 review procedures include no time limit for completion, adding to the uncertainty for developers and customers. These factors would make it extremely difficult to deploy mixed generation projects in the state and defeat the goals of integrating additional renewable energy.

Level 1 and 2 Review Requirements Contain Significant Protections

The existing requirements for level 1 and 2 reviews already contain thorough requirements to ensure continued reliable operation of the distribution system. EDC's have not identified

specific concerns with the interconnection of mixed generation that are separate from issues related to the interconnection of eligible resources in the proposal. In fact, non-eligible generators are unlikely to affect the system in a manner at all different from eligible systems. To address potential concerns, the level 2 interconnection review includes an extensive list of system requirements that must all be met for the customer-generator to be approved under the level 2 interconnection procedure:

- Aggregate generation capacity on the line section shall not cause distribution protective equipment or customer equipment on the electric distribution system to exceed 90% of the short circuit interrupting capability of the equipment.
- If there are posted transient stability limits to generating units located in the general electrical vicinity of the proposed point of common coupling, the aggregate generation capacity connected to the distribution low voltage side of the substation transformer feeding the line shall not exceed 10 MW.
- The aggregate generation capacity connected to the line section, shall not contributed than 10% to the line section's maximum fault current at the point on the high voltage level.
- If a customer-generator facility is to be connected to a radial line section, the aggregate generation capacity connected to the electric distribution system by non-EDC resources shall not exceed 10% of the total circuit annual load.
- If a customer-generator facility is to be connected to three-phase, three wire primary EDC distribution lines, a three-phase or single-phase generator shall be connected phase-to-phase.
- If a customer-generator facility is to be connected to three-phase, four wire primary EDC distribution lines, a three-phase or single phase generator shall be connected line-to-neutral and shall be effectively grounded.
- If a customer-generator facility is to be connected to a single-phase shared secondary, the aggregate generation capacity on the shared secondary not exceed 20 kVA.
- If a customer-generator facility is single-phase and is to be connected to a transformer center tap neutral of a 240 volt service, the addition of the customer-generator facility shall not create an imbalance between the two sides of the 240 volt service, which is greater than 20 percent of the nameplate rating of the service transformer.
- A customer-generator facility's point of common coupling shall not be on a transmission line.
- If a customer-generator facility's proposed point of common coupling is on a spot or area network, the interconnection shall meet all of the following requirements that apply, in addition to the requirements in (c) through (k) above:
    - For a customer-generator facility that will be connected to a spot network circuit, the aggregate generation capacity connected to that spot network from customer-

generator facilities shall not exceed five percent of the spot network's maximum load;

- For a customer-generator facility that utilizes inverter based protective functions, which will be connected to an area network, the customer-generator facility, combined with other exporting customer-generator facilities on the load side of network protective devices, shall not exceed 10 percent of the minimum annual load on the network, or 500 kW, whichever is less; and/or
- For a customer-generator facility that will be connected to a spot or an area network that does not utilize inverter based protective functions, or for an inverter based customer-generator facility that does not meet the requirements of (l)1 or 2 above, the customer-generator facility shall utilize reverse power relays or other protection devices that ensure no export of power from the customer-generator facility, including inadvertent export (under fault conditions) that could adversely affect protective devices on the network.

If any of these requirements is not met, the generator will be required to use a level 3 interconnection procedure. With such significant protections already in place at the level 2 review requirements, EDCs can incorporate additional generation with confidence under existing requirements. Because of the comprehensive nature of these protections, the automatic requirement of a level 3 review for mixed generation is unnecessary.

Analysis of Storage Systems

Storage systems in isolation should be analyzed based on their nameplate power capacity (kW). Basing an analysis on the difference between their maximum production (i.e. discharging) and maximum load (i.e. charging), exactly equal to double the nameplate power capacity, is simply double-counting. Battery storage systems either draw electricity when charging or release electricity when discharging; they cannot perform both functions at one time, so the maximum effect on the electrical system, either as load or generation, is limited by the nameplate power capacity. Even under a hypothetical scenario where a certain resource could both draw from the grid and discharge to the grid at the same time, the impact of these two functions would not be additive. Furthermore there would be no incentive for the resources to operate in that manner were it a possibility. However, if the potential for a resource to charge and discharge simultaneously remains a concern, resources capable of that operation should be addressed separately from battery storage.

As part of a mixed generation installation, analysis of the combined resource, including storage, should be based on the maximum potential effect on the system- represented by the lesser of inverter capacity or generation capacity for each resource for inverter-based resources. Inverter-based resources cannot discharge electricity onto the grid in a quantity greater than the inverter's capacity. For mixed resources behind a single inverter, such as residential solar+storage

installations, the lesser of the inverter capacity or combined power capacity of the generators should be the basis for analysis.

For mixed resources behind separate inverters, analysis should be based on the lesser of the inverter capacity or generator capacity for each generator.

Interaction with Other Generation

EDCs should be required to specify the interactions of storage systems with other generation and other storage systems they wish to analyze. Any requirements determined necessary to address potential issues should then be added to the requirements of the level 2 review procedure. As with the other requirements in the level 2 review procedure, if the interconnection of a specific generator would cause the exceedance of the determined parameter, then level 3 review could be required.

Appropriately Analyzing Distributed Energy Resources

SolarCity notes that basing analysis of mixed generation on inverter capacity and setting requirements that trigger additional study are only interim next steps in appropriately assessing the effect of distributed energy resources (DERs) on the distribution system.

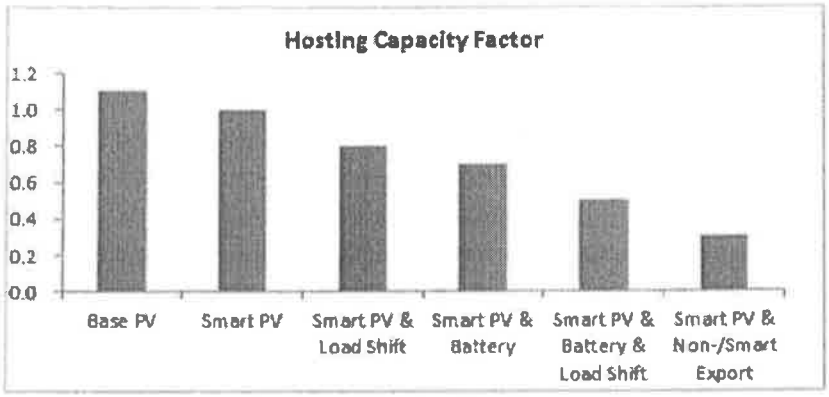
SolarCity recommends that DERs be studied based on their Hosting Capacity Factor, which determines the percentage of the DERs nameplate capacity that counts against a circuit's capacity to accommodate DERs, or hosting capacity. The Hosting Capacity Factor is lower for advanced DERs that integrate smart technologies and controls that lessen the effect of the DER on the distribution system such as smart inverters and load shifting technologies.

For example, the Hosting Capacity Factor of a solar PV system would be calculated as the nameplate capacity of the solar PV less the contribution of the advanced technologies to the degree those technologies will reduce the extent to which the solar system exports to the grid. So, for a solar PV installation with a 10 kW nameplate capacity, the addition of a battery system and load controls that would both shift electricity from the solar panels in order to use it on-site instead of exporting, the Hosting Capacity Factor for the entire system would be less than 10 kW:

10 kW Solar PV – 3 kW Battery – 3 kW Load Shifting = 4 kW Total Capacity

Additional technologies including smart inverters can also be used to minimize the effect of DERs on the distribution system, reducing the system's Hosting Capacity Factor and allowing a higher number of DERs to be integrated without additional system upgrades.

The figure below illustrates the cumulative effect of advanced DERs on Hosting Capacity Factor.



We propose that as the BPU works to achieve its mission of integration of renewable energy, it require EDCs to take steps to more accurately assess the effect of DERs on the distribution system based on the use case and operational parameters of those DERs. This will facilitate increased penetration of DERs while ensuring system reliability.

Installation of Combined NM Eligible and Non-Eligible Generation

Regarding the application of netmetering to mixed generation, we propose that the installation of mixed generation can be accomplished in a variety of ways at the discretion of the customer-generator. It could be done through controlling the operation of the non-eligible generation to ensure non-export, or, in the case of battery storage, ensuring that the battery is charged exclusively from the customer's eligible generator. It could also be done through metering the non-eligible generation to differentiate between eligible and non-eligible generation.

Controls

We propose that customer-generators be allowed to interconnect mixed generation systems through the use of "controls" that ensure 1) the non-eligible generation will be a non-export resource, or 2) when a battery storage system will be charged entirely from eligible generation.

Non-Export Resources

We propose clarifying the EDC proposal regarding controlling the export of non-eligible generation onto the EDC's electrical system into a non-export option with two compliance methods: 1) prevent the operation of the non-eligible generation at the same time the eligible generator is exporting to the EDC's electrical system; or 2) design the system so that non-eligible

generation is reduced to zero when the eligible generation reaches the level of the customer load. Non-export systems may utilize either physical hardware or use case and operational parameters in order to prevent the export of non-eligible generation onto the EDC electrical system.

SolarCity believes that to ensure that the undue restrictions are not placed on the amount of DERs that can be interconnected, it is critical that the use case of DERs be factored into the impact analysis. The mixed generation system may be designed and operated in such a way that would not include the export of non-eligible generation onto the EDC's electrical system, even without specific preventions in place. This type of system should be considered to comply with the control requirements.

Specifically, SolarCity's DemandLogic solar+storage systems are designed in such a way that the non-eligible generation is brought to zero before the eligible generation approaches the customer's load. The operation of DemandLogic systems is determined by algorithm that is designed to dis-charge the battery when the facility load is at its highest levels (i.e. peak demand reduction). As such, the battery is discharging only at times when the algorithm determines that onsite load and customer demand is likely to impact a customer's peak demand and associated demand charges. This is necessarily at times when the associated solar energy system is not exporting since the solar system will only export during times when the instantaneous production from the solar system exceeds onsite load, and demand is therefore zero. In other words, when generation exceeds load, the battery will not discharge. If anything, it would charge at that time, thus lowering the amount of net metering.

Additional metering should not be required to verify the operation of resources with preventions or designs that will not result in the export of non-eligible generation onto the EDC electrical system. Requiring additional metering would instead, effectively eliminate this method of compliance and leave only the option to comply by separately metering each generation resource.

Battery Storage Charged from an Eligible Resource

We propose that a second method of compliance through controls be added for the case when a battery storage system will charge entirely from the customer's eligible generation. In this case, any electricity discharged onto the EDC electrical system would have originally come from the customer's eligible generation and have simply been stored over some amount of time. If anything, the method would reduce the total amount of eligible generation net metered from the customer due to losses incurred by the battery.

This method of compliance is particularly important for enabling residential solar+storage systems, for which the cost of additional metering would be entirely prohibitive. As with the

design of non-export systems, the design of battery storage systems can ensure that the battery is charged only from the customer's eligible generation, either through the use of specific hardware or software designs. For example, SolarCity's solar+storage offering to residential customers includes programming that requires the battery to be charged from exclusively from the customer's solar panels.

Algorithmic Determination of NM Eligible Energy

We support the option to separately meter generation resources in order to determine the amount of eligible and non-eligible generation from a single customer; however, we propose that the customers be allowed to use meters that comply with specific standards instead of requiring the EDCs install their own meters at the customer expense.

The American National Standards Institute (ANSI) has issued standards for electricity meters in ANSI Standard C12.20, which many states use as requirements for revenue grade meters. Customers should be allowed to utilize any compliant meter to separately meter eligible and non-eligible generation. This would be similar to ISO/RTO metering requirements that allow customers to "bring their own equipment," as long as it complies with specific requirements.

Requiring the customer utilize meters installed by the EDCs would not only add costs to mixed generation projects, but add redundancy to systems that already include ANSI C12.20 compliant meters for the purposes of the customer or developer. For example, SolarCity's DemandLogic product utilizes separate meters for the customer's solar and storage installations. Adding a third meter provided by the EDC to the existing revenue grade meters would add unnecessary costs and provide no additional value.

Estimation of NM Eligible Energy for Small Resources

We propose that for small mixed generation systems, an estimation methodology for the determination of the output of eligible generators, similar to the policy recently adopted by the California Public Utilities Commission. In the case of mixed generators that share a single inverter, such as SolarCity's residential solar+storage systems, it may not be physically possible to place an additional meter on either the non-eligible or eligible generator. Even if it were possible to install an additional meter, the cost would likely be prohibitive for small systems.

The California Public Utilities Commission (CPUC) recently determined that for NM-eligible generators paired with storage devices with a maximum discharge 10 kW or less, the use of an estimation methodology based on a presumed generation profile of the eligible generator to validate the NM credits will be allowed. No additional metering equipment will be required for these systems; instead, the lesser of the actual export by the system or the estimated generation

profile of the eligible generator will be credited to the customer for purposes of netmetering. A separate CPUC ruling will describe the process for finalizing the presumed generation profile based estimation methodology. The CPUC noted that this method "balances the Commission's priority of ensuring NEM integrity with a cost-effective solution."[1]

Conclusion

SolarCity thanks the BPU for the opportunity to comment on this important issue and for its continued efforts to further integrate renewable energy and distributed energy resources in the state. As a developer of mixed generation systems, we highlight the importance of streamlining review processes, appropriately assessing distributed energy resources, and fairly distinguishing between eligible and non-eligible electricity exported onto the electrical grid.

We look forward to continued engagement on the deployment of distributed energy resources in the state.

Respectfully submitted,

Betty Watson
Deputy Director, Policy and Electricity Markets
SolarCity Corporation

[1] California Public Service Commission, *Decision Regarding Net Energy Metering Interconnection Eligibility for Storage Devices Paired with Net Energy Metering Generation Facilities,* Decision 14-05-033 (May 15, 2014), Rulemaking 12-11-005, p15-22.

COMMENTS OF THE NJ COMBINED HEAT AND POWER/DISTRIBUTED GENERATION COALITION

REGARDING THE PROTOCOLS FOR THE TREATMENT OF MIXED GENERATION BEHIND A SINGLE METER

SUBMITTED BY STEVEN S. GOLDENBERG, FOR THE COALITION

DECEMBER 15, 2015

Protocols for the Treatment of Mixed Generation Behind a Single Meter

Under the NJ BPU regulations, only electrical energy produced from Class I Renewable Resources is eligible for netmetering.

If the potential for the customer's netmetering eligible generation alone is small (i.e. minimal energy exported to the EDC system absent the non-eligible generation), the customer should evaluate the economics of not pursuing, or continuing, service under the netmetering regulations.

In the event the customer does intend to take or continue taking service under the netmetering regulations, the installation of combined netmetering eligible & non-eligible generation can be accomplished in either of two ways at the discretion of the connecting EDC. It can be done either by installing controls on the operation of the generation or by the installation of metering on the non-eligible generation to algorithmically differentiate between eligible and non-eligible generation.

> ***Coalition Comment: The method used to accomplish should be at the discretion of the customer as long as the method adopted is consistent with predefined rules approved for the interconnecting EDC. Control options and metering requirements should be proposed by the EDCs as part of an expedited, generic stakeholder process and approved by the BPU.***

The cost of the installation of additional metering on the non-eligible generation and any upgrades to the service entrance metering along with any required communications (generally only required with interval metering) to each meter location will be at the customers expense.

> ***Coalition Comment: Metering requirements and meter specifications (new and existing service metering), together with communications protocols and requirements should be defined in advance through an expedited, generic stakeholder process convened by the BPU. The BPU should require that utility costs be transparent and, to the extent possible, consistent among all EDCs in order to foster development of these projects.***

All mixed generation applications will be subject to Level 3 review requirements including application fees and review procedures. Additional studies will only be required if determined to be necessary during the initial review. Storage systems will be analyzed based on difference between their maximum

production and maximum load and their interaction with other generation and in particular, other storage systems where applicable

Coalition Comment: It is understood that where combined netmetering-eligible & non-eligible generation incorporates storage systems, the combination may be sufficiently complex from a technical perspective to render appropriate a Level 3 review. However, where combined netmetering eligible & non-eligible generation does not incorporate storage technology, it should be presumed that only a Level 2 study is required to be performed in accordance with N.J.A.C. 14:8-5.

Controls

The customer-generator must design & install a system that prevents the operation of the non-eligible generation at the same time the eligible generator is exporting energy to the EDC's electrical system. Stated another way, the non-eligible generation must be reduced to zero as the output of the PV or other renewable system approaches the customers load, or the renewable system production will need to be reduced in order to continue operating the non-eligible generation. Metering may be required to verify control system performance.

Coalition Comment: The operative period of measurement for this provision should one year, as opposed to the stated real time approach. The annualized measurement period should be administered in a manner consistent with the provisions of N.J.A.C. 14:8-4.3. Accordingly, during hours of Class 1 maximum power output, eligible generation could be exported while the non-eligible system remains operational. However, consistent with N.J.A.C. 14:8-4.3, under the annualized approach, the eligible generating capacity of the customer-generator's facility would not be permitted to exceed "the amount of electricity supplied by the customer's electric power supplier or basic generation service provider to the customer over the historic 12-month period that the customer-generator selects in accordance with this section".

Algorithmic Determination of NM Eligible Energy

At the option and expense of the customer-generator, the EDC will install revenue grade interval or standard kWh metering on the output of the non-eligible generation. In the event the customer-generator opts for interval metering, the service entrance metering will be upgraded to interval metering if not already installed and; the customer-generator will be required to provide communications to each meter location.

Depending on the type of metering installed, the determination of energy eligible for netmetering will be made either hourly or in a single monthly calculation as follows:

- The energy exported over an interval (hourly or monthly) to the EDC's electrical system will be reduced by the energy produced by the non-eligible generation over the corresponding interval.
    - If the balance is positive, i.e. the PV system production exceeded the customer generator's usage:
        - That balance will be eligible for netmetering under the netmetering regulations and,
        - The amount of energy produced and exported by the non-eligible generation will be eligible for compensation in accordance with the EDC's policy for purchasing such energy.
    - If the balance is negative, i.e. the PV system production was less than the customer's usage:
        - None of energy exported over the interval will be eligible for netmetering and,
        - All of the energy exported over the interval will be eligible for compensation in accordance with the EDC's policy for purchasing such energy.

Coalition Comment: The costs associated with the installation of revenue grade interval metering should be fair, standardized among the EDCs, and publicly disclosed. Communications protocols and requirements should also be standardized among the EDCs. As long as the non-eligible generation does not exceed the customer's load on an hourly basis, all generation exported to the EDC's electrical system should be eligible for netmetering in accordance with N.J.A.C. 14:8-4.3.

Participation in the PJM Demand Response Frequency program does not permit the export of electrical energy to the EDC's electrical system. At the EDC's discretion, the installation of any battery storage systems or other generation for such participation will require service entrance interval metering and associated communications at the customer's expense along with advanced notification of scheduled participation.

Comments to Proposed Protocol for the Treatment of Mixed Generation Behind aSingle Meter

Joe Sullivan Concord Engineers 12/15/2015

Protocols for the Treatment of Mixed Generation Behind a Single Meter

Under the NJ BPU regulations, only electrical energy produced from Class I Renewable Resources is eligible for netmetering.

If the potential for the customer's netmetering eligible generation alone is small (i.e. minimal energy exported to the EDC system absent the non-eligible generation), the customer should evaluate the economics of not pursuing, or continuing, service under the netmetering regulations.

All customers should be encouraged to develop distributed generation especially when it can contribute to reduced congestion which benefits all NJ electric consumers. The evolution of small distributed generation can contribute to increased distributed resources and net metering of a system which incorporates multiple DG technologies should only be limited by customer choice, grid reliability, distribution system safety, economics and technology.

In the event the customer does intend to take or continue taking service under the netmetering regulations, the installation of combined netmetering eligible & non-eligible generation can be accomplished in either of two ways at the discretion of the connecting EDC. It can be done either by installing controls on the operation of the generation or by the installation of metering on the non-eligible generation to algorithmically differentiate between eligible and non-eligible generation.

The development of net metering should be driven by available technology and safety considerations. The connecting EDC should be directed to develop and make available appropriate multi source net metering standards with and without export capability.

The cost of the installation of additional metering on the non-eligible generation and any upgrades to the service entrance metering along with any required communications (generally only required with interval metering) to each meter location will be at the customers expense.i

All mixed generation applications will be subject to Level 3 review requirements including application fees and review procedures. Additional studies will only be required if determined to be necessary during the initial review. Storage systems will be analyzed based on difference between their maximum production and maximum load and their interaction with other generation and in particular, other storage systems where applicable

Controls

The customer-generator must design & install a system that prevents the operation of the non-eligible generation at the same time the eligible generator is exporting energy to the EDC's electrical system. Stated another way, the non-eligible generation must be reduced to zero as the output of the PV or other renewable system approaches the customers load, or the renewable

system production will need to be reduced in order to continue operating the non-eligible generation. Metering may be required to verify control system performance.

This proposed language would discourage the development of renewables as a integrated part of a behind the meter microgrid This would also unnecessarily restrict the ability of existing net metered renewables customers from upgrading their systems to be functional microgrids with increased resiliency and economic capabilities. One of the goals incorporated to the energy master plan is to increase instate generation and CHP. In the case of mixed generation behind a single meter we are actually looking at these systems acting as microgrids with many capabilities which are compatible with this goal. The ability to run in island mode and to black start is a requirement under the NJ Energy Resilience Bank along with resiliency for continued service in the event of grid power failure.

Net metering of exported power from the metered or submetered renewable energy resource should be limited such that the annual net metered electric power is zero or near zero with some agreed true up provision. A behind the meter microgrid could be running CHP plus renewable generation and exporting up to the limits of the renewable generation. Grid economics should determine if it is advantageous during a given hour or day to export up to the maximum of the renewable metered power generation. This would encourage not discourage more DG during peak loads periods and this is when the economic signals are aligned with exporting power. This is also when NJ consumers are paying a high price for congestion. If done appropriately the behind the meter microgrid will be able to shift their storage, reneweable generation and on-site generation so that it coincides with grid peak power demands.

Outside of peak load periods there is no economic advantage to exporting net metered renewable energy. For nearly all net metered renewable energy the source is solar PV and solar is only produced during the times when the electric grid can benefit by having DG contribute even small increments of power.

Algorithmic Determination of NM Eligible Energy

At the option and expense of the customer-generator, the EDC will install revenue grade interval or standard kWh metering on the output of the non-eligible generation. In the event the customer-generator opts for interval metering, the service entrance metering will be upgraded to interval metering if not already installed and; the customer-generator will be required to provide communications to each meter location.

Depending on the type of metering installed, the determination of energy eligible for netmetering will be made either hourly or in a single monthly calculation as follows:

- The energy exported over an interval (hourly or monthly) to the EDC's electrical system will be reduced by the energy produced by the non-eligible generation over the corresponding interval.
    - If the balance is positive, i.e. the PV system production exceeded the customer-generator's usage:
        - That balance will be eligible for netmetering under the netmetering regulations and,
        - The amount of energy produced and exported by the non-eligible generation will be eligible for compensation in accordance with the EDC's policy for purchasing such energy.
    - If the balance is negative, i.e. the PV system production was less than the customer's usage:
        - None of energy exported over the interval will be eligible for netmetering and,
        - All of the energy exported over the interval will be eligible for compensation in accordance with the EDC's policy for purchasing such energy.

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[i] Participation in the PJM Demand Response Frequency program does not permit the export of electrical energy to the EDC's electrical system. At the EDC's discretion, the installation of any battery storage systems or other generation for such participation will require service entrance interval metering and associated communications at the customer's expense along with advanced notification of scheduled participation.

NET METERING AND INTERCONNECTION STAKEHOLDER MEETING
December 15, 2015
Trenton, NJ

Meeting Notes

- **Introduction (John Teague and Scott Hunter, BPU Office of Clean Energy)**

Mr. Teague called the meeting to order at 10:05 pm and asked the participants in the room and those on the phone to introduce themselves. Mr. Hunter read a disclaimer on the purpose of the meeting and the role of Board staff.

- **EDC's Proposal to Address Interconnection Timelines Impacted by Investment Tax Credit Reduction/Dept. of Community Affairs Presentation (Scott Hunter and David Greenhill, DCA)**

Mr. Hunter briefly reviewed the situation regarding the surge in SRP registrations brought about by the impending expiration of the 30% Federal Investment Tax Credit currently scheduled for the end of 2016. He said there will be enormous pressure in Q4 of 2016 on both the EDCs and local code officials to complete inspections necessary to have solar systems receive permission to operate by the tax deadline. A PSE&G representative suggested that installers should order advanced metering equipment, telemetry and communications circuits as early as possible to avoid missing the deadline. He also said that PSE&G will take steps to reduce failure rates, since systems that fail inspection are moved to the back of the queue and could be in danger of missing the deadline. Mr. Hunter said it's imperative to address this issue if high first-time failure rate risks tax credit eligibility.

David Greenhill of the DCA's Office of Codes and Standards said many municipalities have reduced their inspection workforces or downgraded them to part-time positions. He said installers should contact him if they encounter problems with inspectors, but must understand that many municipalities cannot schedule inspections on a moment's notice because of staffing limitations. He said DCA inspectors could potentially fill in for local inspectors if the latter are unavailable.

In response to a question on inspection timelines, Mr. Hunter stressed the importance to installers to ensure that someone is scheduled to be on-site on the inspection date assigned or risk losing their place in the queue. Mr. Greenhill said that as long as the owner or an agent of the owner is on-site for the inspection, the installer does not have to be there too.

- **Update on Implementation of the EDC's "Mixed Generation Proposal for Interconnection with NJ Class I RE" (Scott Hunter and Commenters)**

Mr. Hunter started the discussion noting comments received by Solar City and A.F. Mensah on the proposal issued at the last stakeholders' meeting and gave the commenters an opportunity to summarize their positions.

A representative of Solar City said the proposed protocols would be hugely restrictive for residential installations of solar-plus-storage. She said sufficient protocols are already in place to protect the safety and integrity of the distribution system. She added that existing interconnection review requirements for renewable generation should also apply to mixed generation.

A representative of A.F. Mensah said his firm is already installing an ANSI-rated meter on storage systems and it is not necessary for the EDCs to require the installation of a redundant meter for non-renewable generation. He also said that protocols already in place are sufficient for smaller storage units; and it should not be a requirement to perform a Level 3 interconnection study for a 5 kW system.

Gearoid Foley and Steve Goldenberg, representatives of the NJ Combined Heat and Power/Distributed Generation Coalition – which had not previously submitted written comments – cautioned the Board and participants to keep in mind the larger goals of DG, CHP and energy resiliency as outlined in the Energy Master Plan and not get bogged down in technical details that could severely limit the development of these projects. Mr. Hunter suggested the Coalition put their comments in writing and submit them.
(Note: The written comments referenced above can be viewed in their entirety at http://www.njcleanenergy.com/files/file/public_comments/Protocols%20121515.pdf)

A discussion followed on the impact of net metering on a large industrial customer who had both on-site solar and CHP systems. A PSE&G representative said problems could occur when a customer with an existing solar system sized to their annual consumption now installs a CHP system that reduces that consumption and results in a large amount of solar generation being carried over month-to-month under net metering rules.

In response to a question on what the next steps are, Mr. Hunter said the EDCs are now implementing the existing net metering and interconnection rules and using the protocols to address situations that are not covered by those rules, i.e., issues involving fossil fueled generation. He also reminded participants that the proposed protocols require Level 3 interconnection studies only for those NJ Class I RE plus storage projects participating in PJM's FERC regulated frequency regulation market. Since behind-the-meter projects face severe restrictions on frequency regulation market participations, he said he does not expect there will be many such studies required.

- **EDC Update on the Number of Closed Circuits or those Approaching Closure due to High Penetration (EDCs)**

Representatives of each EDC presented the status of their EDC. PSE&G said they had 18 circuits at capacity; JCP&L said about 1% of their 1,100 distribution circuits are

"constrained". RECO said it has not closed off any circuits due to high penetration. ACE said there has been no change since the last meeting, with a map posted to their Green Power Connection website indicating five distribution circuits closed to new interconnection applications. A participant praised ACE's map on closed circuits as excellent. PSE&G and JCP&L advised activity underway to create similar maps for their systems.

- **Hosting Capacity Study: Methods of Increasing Photovoltaic Hosting Capacity With Cost/Benefit Analysis (Steve Steffel, Pepco Holdings / Atlantic City Electric)**

Mr. Steffel gave a presentation, previously distributed to stakeholders through the listserv, on a USDOE-sponsored study conducted by Pepco, Rutgers, EDD, Clean Power Research and the BPU on "Model-Based Integrated High Penetration Renewable Planning and Control Analysis." The goal of the project was to look at cost-effective ways of increasing solar PV penetration on a distribution circuit without having to rebuild an entire feeder. Among the feeder improvements Mr. Steffel listed were reduced voltage settings, dynamic voltage control, additional capacitors and battery storage. The report will be distributed publicly so that other utilities across the country will be able to benefit from the research.

- **Update of ACE's Efforts to Maintain Established Timelines for Interconnection and Permission to Operate Rules (Josh Cadoret, Atlantic City Electric)**

Mr. Cadoret said ACE has received 5,766 applications year-to-date, which is an 82% increase over last year. He said ACE is meeting deadlines and seeing an average of 9 to 13 business days for reviewing applications. He urged developers to contact him if they continue to have problems. He said ACE's billing department has hired five additional people to meet demand. He also noted that ACE is using a new work management system that now has "all the bugs worked out of it."

- **EDC Update on Implementation of Interconnection Application List Scrub Procedures (EDCs)**

ACE did not have updated numbers but would check on them. PSE&G said they would do a 2015 scrub next month and then start working on 2016. RECO said six letters were sent out this month. JCP&L said letters would be sent out after New Year's.

- **New Business / Adjournment**

There being no new business, Mr. Teague adjourned the meeting at 1:15 pm.

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