**DATE:** November 6, 2017

**TO:** Jason Pause, Electric Distribution Systems,
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Department of Public Service
3 Empire State Plaza, Albany, NY 12223

**FROM:** Joint Utilities of New York – Interconnection Technical Working Group

**RE:** 10/16/17 ITWG Meeting Follow-Ups -- Interconnection Application Requirements for Energy Storage Systems (ESS)

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Pursuant to your request, this is a follow-up from the Joint Utilities of New York ("JU") regarding interconnection application requirements for Energy Storage Systems (ESS) to distribution systems, updating initial information provided on September 8, 2017. The redlined information indicates changes from our previous submission. This response reflects the position of all of the utilities identified on this letterhead, although it does not necessarily apply to network systems. This information is preliminary for discussion purposes and is not intended to represent a final position on any issues.

## I. Purpose

~~The~~Following the JU September 6, 2017 initial response and at the ITWG's October 16, 2017 request, the purpose of this document is to highlight *additional* questions to be asked of the Developer regarding the interconnection of battery or energy storage systems (ESS) within the distribution system, beyond what is already required through the New York State Standardized Interconnection Requirements~~,~~ (NYSSIR), Interconnection Technical Working Group documentation, and individual utility interconnection requirements. This information shall be required as a part of a complete application package.

## II. Scope

~~In~~ Energy storage systems, within the scope ~~is~~of this document, refers to behind-the-meter (BTM) mass market residential or commercial~~;~~ ESS, BTM commercial and industrial~~;~~ ESS, and remote net metered or community distributed generation (DG) paired with ESS assets, that are coupled with distributed generation (DG~~).~~)..  Standalone ESS assets directly connected to the distribution system are also in-scope. ~~This~~

The scope ~~covers~~of this document further includes the following technical components of ESS:

1. ~~(1)~~ **Technology**: ~~electricity~~electric battery storage[1]
2. ~~(2)~~ **Nameplate Rating**: ~~total aggregate~~inverter nameplate rating of the DG and coupled ESS ~~that is~~are each less than or equal to 5 MW~~.~~ in accordance with the NYSSIR, with a total net export less than or equal to 5 MW.
3. ~~(3)~~ **Charging**: ESS may be charged from DG only, a combination of DG and distribution system supply, or from distribution system supply only.
4. ~~(4)~~ **Dispatch/**~~discharge~~**Discharge**: dispatch or discharge of ESS and DG may be limited to no net export of energy or nameplate of DG only, or may have no limitations.

5. **Loading**: the ESS may be co-located with load or may be stand-alone, without any associated load (other than heating and cooling systems associated with the battery).

Community microgrids and other multiple-tenant or individual facility islanding applications are out of scope~~.~~, as are non-inverter-based technologies.

## III. System Equipment Characteristics

a. Indicate the type of DG and energy storage technologies to be used. For example, common types of anticipated DG could be photovoltaic (PV) and the energy storage technologies to include NaS, Dry Cell, PB-acid, Li-ion, vanadium flow, etc.
b. If the intended use case for the ESS includes BTM backup services, please provide a description and documentation illustrating how the entire system disconnects from utility during an outage (e.g. mechanical or electronic, coordination, etc.).



[1] *Note: This is the prevalent type of energy storage marketed to the JU at present; consequently this is the JU's current focus.*

c. Provide the model, capacity (kWh), and manufacturer of the *battery portion* of the energy storage equipment.
d. Indicate any impacts of ambient temperatures on charging and discharging capabilities, specifically noting any restrictions on available capacity as a function of temperature and listed on the system facility's nameplate.
e. Provide details on cycling (anticipated maximum cycles before replacement), depth of discharge restrictions, and overall expected lifetime regarding the energy storage components.
f. Provide proposed inverter(s) power factor operating range and whether inverter(s) are single quadrant, two-quadrant, or four-quadrant operation.
g. Provide specification data/rating sheets including the manufacturer, model, and nameplate ratings (kW) of the inverter(s)/converters(s) for the energy storage and/or DG system[2], and to include required ancillary equipment demand levels such as battery heating and cooling requirements (HVAC), pump loading, etc.
h. Provide details on whether the inverter(s)/converter(s) have any intrinsic grid support functions, such as California Rule 21 Phase 1, Phase 2, and/or Phase 3 capabilities for autonomous or interactive voltage and frequency support. If they do, please describe these functions and default settings.
i. Indicate whether the energy storage and DG system inverter(s)/converter(s) are DC-coupled or AC-coupled.
j. Indicate whether the system inverter(s)/converter(s) is/are listed on the NY DPS "Certified Interconnection Equipment List"[3] (yes, it is on the list or else no, it is not on the list) and/or ~~UL 1741 SA~~ whether the components are UL 1741 SA certified.
    a. If the interconnected inverter(s)/converter(s) are not listed on the "Certified Interconnection Equipment List" but are certified, provide a copy of the certificate of compliance.
    b. If the interconnected inverter(s)/converter(s) are not listed on the "Certified Interconnection Equipment List~~" or~~", are otherwise UL 1741 SA certified, or the storage and paired DG are AC coupled, please detail the use of utility grade relays used in interconnection protection, including AC and DC control schematics and relay logic.
    c. If the interconnected inverter(s)/converter(s) are not listed on the "Certified Interconnection Equipment List", please detail the verification of protection operation in equivalent deployments of the equipment configuration. For example, if this exact configuration has been previously deployed, please describe the project and reference the commissioning/test report.



[2] *If the inverter is packaged together with the battery system, or packaged with other system components as a unique assembly, then the overall assembly (inverter and all components) must be examined. Supplemental* documentation to *submit should include:*

- *Shop drawings illustrating the physical product.*
- *Single line diagrams showing equipment layout.*
- *Three-line schematics showing protective device and monitoring equipment.*
- *DC schematic showing control logic.*
- *Operating procedure including scheduled times of charging and dispatch.*

[3] http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/dcf68efca391ad6085257687006f396b/$FILE/06598086.docx/Current%20SIR%20Devices%207-31-2017.docx

d. Identify if inverter analytical models are available for use in the utility's power flow analysis program, and if there are any restrictions on their use.

k. Indicate whether the interconnected inverters inverter(s)/converter(s) is/are compliant to the latest versions of the following additional standards. If partially compliant to subsections of the latest standards, please list those subsections:

1. IEEE 1547a
~~2. IEEE 519~~
~~3.~~2. UL 1741-SA
~~4. ANSI C37.2 (Over/Under Voltage/Frequency – Functions 27/59/81O/81U, Overcurrent – Functions 50P/50G/51P/51G, Anti-Islanding).~~

l. If the interconnected inverter(s)/converters are not compliant with the previously listed additional standards, please describe ~~your future intentions going forward to comply with these standards~~how utility grade protection, relay and controls are implemented between your hardware and the utility.

m. ~~Please detail~~Detail any integrated protection that is included in the interconnected inverter(s)/converters. For example, describing over/under-voltage/current frequency behavior and reconnection behavior would comply, such as solid state transfer switching or other.

## IV. System Electrical Characteristics

a. Provide detailed operating philosophy for the proposed system. For example, please provide details on what the project intent, anticipated operating schedule, and/or a description of the plant management system.

1. Provide ~~a typical 24-hour profile~~the typical 24-hour profiles for all operating scenarios and identify the timeframes under which each scenario will be operated, with a data file, of the energy storage and/or DG system and description of the use case(s) and anticipated exceptions to the use case. Use cases should describe the basic function (e.g. Peak Shaving, Frequency Regulation, Demand Charge Reduction, Power Quality Improvement, etc.) and should provide details of operation sequence within each use case. The x-axis should be time and the y-axis should be typical output ~~capacity~~as well as demand capacities. [4]
2. Identify the maximum nameplate rating in kW and kWh as well as net export capability of the inverter based upon utility grade control systems.
3. Identify the maximum demand level of the ESS plus ancillary (HVAC and auxiliary) load of the power conversion system.

b. Indicate the charging configuration and maximum ramp rate:

1. ~~Charged~~When the ESS is charged via interconnected DG (e.g. solar PV panels tied to the storage system)?
2. When the ESS is ~~C~~charged via distribution supply through a converter (built in or separate)?



[4] *If the DG and the battery are able to export simultaneously, both must be considered when evaluating the maximum potential output from the site. The maximum output of the site will be equal to the maximum rated output of the DG plus the maximum rated output of the battery.*
*If the DG and the battery are not capable of simultaneous exports, the maximum output of the site will be the DG output or the battery output, whichever is greater.*

c. -Indicate the discharging configuration and maximum discharge rates.

~~c.~~d. Provide details on grounding of the interconnected energy storage and/or DG system to meet utility effective grounding requirements.

~~d.~~e. Provide short circuit current capabilities and harmonic output from the energy storage and/or DG system.

~~e.~~f. Provide a summary of protection and control scheme functionality and provide details of any integrated protection of control schematics and default settings within controllers.

~~f.~~g. Provide descriptions of any software functionality that enables intelligent charging and discharging of the ESS using interconnected DG, such as PV. For example, if the ESS can be charged only through the DG input, or if the ESS can be switched to be charged from the line input, provide those details.

~~g.~~h. Provide details on standard communication hardware interfaces that are available, e.g., TCP/IP, serial, etc.[5]

~~h.~~i. Provide details on standard communication protocols that are available, e.g., MODBUS, DNP-3, 2030.5, etc.[5]

~~i.~~j. Provide details on standard communication data models that are available, e.g., 61850-90-7, SunSpec, MESA, etc.[5]

**V. Market Participation**

a. Are the assets intended to operate in the NYISO market? The market participation is non-binding; however, the market characteristics as defined in Section IV (a) are binding.

  1) Initially, or in the future

  ~~1)~~2) If market participatory, what are the intended markets?

~~a. If market participatory, please provide a typical 24-hour profile(s) of the energy storage and/or DG system, as well as a typical 24-hour profile(s) of the energy storage demand/generation (without DG) impact, for each of the intended markets.~~

b. What compensation is the facility seeking under the VDER Order (for metering purposes)?

~~b.~~c. Are you participating or intending to participate in any utility demand reduction program, and if so, please describe?



[5] This information will be required for all communicating devices and is not exclusive to storage. This information will need to be part of the updated ~~SIR~~NYSSIR.