APPENDIX K

**Energy Storage System (ESS) Application Requirements /
System Operating Characteristics / Market Participation**

1. Application Requirements:

a. Provide a general overview / description and associated scope of work for the proposed project. Is the new ESS project associated with a new or existing DG facility?

b. Identify whether this is a stand-alone or hybrid ESS proposal, or a change to the operating characteristics of an existing system. If hybrid, please select your hybrid configuration option:

1. Hybrid Option A - ESS is charged exclusively by the DG

2. Hybrid Option B - ESS will not export to the grid, only DG will.

3. Hybrid Option C - ESS may charge/discharge unrestricted, but grid consumption by ESS is netted out of grid exports.[1]

4. Hybrid Option D - ESS may charge/discharge unrestricted, but any consumption on the account is netted out of grid exports

5. N/A - not Value Stack

c. Will the system operate or participate[2] in any of the following:

1. Compensated under a utility tariff(s)? If yes, please specify. Identify any associated use case stacking i.e. parallel standby, net meter, VDER, import only, export only, peak shaving, generator firming, demand response, PQ injection, Microgrid, reactive power control etc.

2. NYISO markets? If yes, has the NYISO process been initiated? Pplease specify which anticipated NYISO market(s).

3. As part of an NWA? If yes, will the inverter be capable of directly supporting simultaneous modes as well as receiving "ad-hoc" commands?

4. A program or market not listed? If yes, please describe.

d. Indicate whether the ES and DG system inverter(s)/converter(s) are DC-coupled or AC-coupled and provide the following:

1. DER Nameplate Ratings:

   i. Storage inverter rating (kW) for AC coupled or stand-alone systems, and

   ii. DG inverter rating (kW) for AC coupled systems (if DG present), or

   iii. DG + ESS inverter rating (kW) for DC coupled systems.

2. Storage capacity (kWh).

> **Commented [CV1]:** This seems to conflict with the 24-hour period identified in Q.

> **Commented [CV2]:** What does that mean for SCADA markets? This is driven by NYISO.

> **Commented [CV3R2]:** This is a utility to ISO conversation.

> **Commented [CV4]:** Utilities to review

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[1] ESS may have restricted charge/discharge to be defined in question 2e.
[2] Market participation information is non-binding; however, operating characteristics and market choices will be used for technical study and determine participation specific requirements.

e. Provide specification data/rating sheets for both the AC and/or DC components including the manufacturer, model, and nameplate ratings (kW) of the inverter(s)/converters(s) and controllers for the energy storage and/or DG system, and capacity, of ESS unit(s) (kWh).

f. Indicate the type of energy storage (ES) technology to be used. For example, NaS, dry cell, PB-acid, Li-ion, vanadium flow, etc.

g. ~~Indicate how the ESS will be charged and/or act as a load: (1) electrical grid only, (2) unrestricted charging from electrical grid and/or DG system, (3) restricted charging from electrical grid and/or DG systems, or (4) charging from DG only.~~

h. ~~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.~~

i. ~~Provide details on cycling (anticipated maximum cycles before replacement), depth of discharge restrictions, and overall expected lifetime regarding the energy storage components.~~

j. ~~Provide proposed inverter(s) power factor operating range and whether inverter(s) are single quadrant, two-quadrant, or four-quadrant operation.~~

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 1547-2018

   2. UL 1741 and its supplement SA

l. ~~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.~~

m. List the system's maximum import in kW AC, including any equipment and ancillary loads (i.e. HVAC) to be installed to facilitate the ESS installation.

n. Indicate desired ramp rates in kW/second during charging and discharging (worst case will be assumed if not provided). Please attach a charge and discharge data/curve.

o. Is the ESS symmetrical or asymmetrical (e.g. charge magnitude equivalent to discharge magnitude)? Provide proposed inverter(s) power factor operating range and anticipated operational setpoints[3] in the context of the expected two-quadrant or four-quadrant operation.

p. Indicate the maximum potential change in power magnitude expressed in equipment limitations such as per-second, minute, hour, or day and kW or % of kW as applicable.

q. Indicate any specific operational limitations that will be imposed (e.g. will not charge or discharge across PCC between 2-7 pm on weekdays; ESS will not charge at any time that would increase customers peak demand; etc). Charge/discharge at any time (24-hour) will be assumed if not provided.

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

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[3] Note: final setpoints are subject to change per utilities direction.

s. Submit control schemes, electrical configurations, and sufficient detail for the utility to review and confirm acceptance of proposal. Detail any integrated control scheme(s) that are included in the interconnected inverter(s)/converters including a sequence of operations for expected events, energy flows, or power restrictions. For example, provide details 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, or if a control scheme is proposed to prohibit power flow directionality or peak values. ~~Provide details on grounding of the interconnected energy storage and/or DG system to meet utility effective grounding requirements.~~

t. Provide short circuit current capabilities and harmonic output from the hybrid project or stand-alone storage system.

u. If the intended use case for the ESS includes behind-the-meter 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.).

2. Optional Questions:

Questions in this section are not required for a complete application, although any responses provided may support utility decisions to review the project performance in a manner that could result in less impact to the customer interconnection.

a. 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:

   a. SunSpec Common Smart Inverter Profile (CSIP) v2.103-15-2018

b. Any other recognized standard or practice. Indicate the maximum frequency of change in operating modes (i.e. charging to discharging and vice-versa) that will be allowed based upon control system configurations.

c. Provide details on standard communication as follows:

   a. hardware interfaces that are available, e.g., TCP/IP, serial, etc.

   b. protocols that are available, e.g., MODBUS, DNP-3, 2030.5, etc.

   data models that are available, e.g., 61850-90-7, SunSpec, MESA, 2030.5, OpenADR, etc.

d. Provide details on whether the inverter(s)/converter(s) have any intrinsic grid support functions, such as autonomous or interactive voltage and frequency support. If they do, please describe these functions and default settings.