APPENDIX K
Utility Recommended revisions
Industry Recommended revisions

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:
        i. Hybrid Option A - ESS is charged exclusively by the DG
        ii. Hybrid Option B - ESS will not export to the grid, only DG will.
        iii. Hybrid Option C - ESS may charge/discharge unrestricted, but grid consumption by ESS is netted out of grid exports. ESS may have restricted charge/discharge to be defined in question 2.e.
        iv. Hybrid Option D - ESS may charge/discharge unrestricted, but any consumption on the account is netted out of grid exports
        v. N/A - not Value Stack
        *Note, multiple Hybrid Options can be selected, however the most impactful option will be used in the Utility's analysis.

    c. Indicate whether the ES and DG system inverter(s)/converter(s) are DC-coupled or AC-coupled.
        i. AC Coupled Systems
            1. DG inverter rating (kW)
            2. Storage inverter rating (kW)
            3. Storage capacity (kWh) - Industry recommends removing this as a requirement or moving it to the General Information Section its subject to change.
        ii. DC Coupled Systems
            1. DG system size (kW)
            2. Storage system size (kW)
            3. Storage capacity (kWh) - Industry recommends removing this as a requirement or moving it to the General Information Section its subject to change.
            4. PV + ESS inverter rating (kW)

    d. 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).

Industry recommends removing this as a requirement or moving it to the General Information Section as its subject to change.

e. Indicate the type of energy storage (ES) technology to be used. For example, NaS, dry cell, PB-acid, Li-ion, vanadium flow, etc. ~~Provide data on operating and/or non-operating state of charge indicating energy level requirements relative to the capacity of the battery unit in percent capacity.~~ Industry recommends moving this question to General Information Section and removing from requirements as its subject to change.

~~f. 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.~~

g. Submit control schemes, electrical configurations and sufficient detail for the utility to review and confirm acceptance of proposal. Recommended move to Protection System Verification.

h. 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 the utility during an outage (e.g. mechanical or electronic, coordination, etc.). Recommended move to Protection System Verification.

~~i. 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.~~

j. Provide details on cycling (anticipated maximum cycles before replacement), depth of discharge restrictions, and overall expected lifetime regarding the energy storage components. Recommended to remove this question as it is competitively sensitive for the manufacturers.

k. Provide proposed inverter(s) power factor operating range and whether inverter(s) are single quadrant, two-quadrant, or four-quadrant operation. Recommended to remove this question as its stated below in Section 2, question C.

~~l. 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.~~

m. 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. Recommended move to Protection System Verification.

n. 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:
   i. IEEE 1547-2018.1
   ii. UL 1741 and its supplement SA
   iii. SunSpec Common Smart Inverter Profile (CSIP) v2.103-15-2018 Industry recommends moving this question to General Information Section and removing from requirements as its not currently a requirement.

~~o. Detail any additional integrated protection that is included in the interconnected inverter(s)/converters, outside of standard UL 1741 requirements. For example, describing over/under-voltage/current frequency behavior and reconnection behavior would comply, such as solid-state transfer switching or other.~~

2. System Operating Characteristics:
   a. List the system's maximum net export and import in kW AC, including any equipment loads (i.e. HVAC) In general Industry Reps agree with including this information. For clarification, we're expecting this information is for control or verification of operations and not to apply a second meter Auxiliary loads.

   b. 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.

   c. Is the ESS symmetrical or asymmetrical (e.g. charge magnitude equivalent to discharge magnitude)? Please also specify the full range of power factor capabilities in the context of the expected 2-quadrant or 4-quadrant operation.

   d. 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 and associated maximum potential change in power magnitude expressed in equipment limitations such as times per second, minute, hour, or day and kW or % of kW as applicable. Industry reps are concerned about this part of the assessment as it is not known to be a factor in other large Storage Market states. We'd like to understand how significant the worst case scenario would be in the impact studies, and how this compares to how new customer loads are considered.

   e. Indicate any specific operational limitations that will be imposed (e.g. will not charge or discharge across PCC between 2-7pm on weekdays). Charge/discharge at any time (24-hour) will be assumed if not provided. Are there other operational limits that could be included here? For example, one limitation that the CA utilities found useful: "ESS will not charge at any time that would increase the customer's peak demand"

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. Recommended move to Protection System Verification.

g. Is the system expected to participate in multiple use cases as part of dual-participation or another NWA? If so, will the inverter be capable of directly supporting simultaneous modes as well as receiving “ad-hoc” commands? Recommended to move to General Information.

~~h. List any available inverter ride-through capabilities on grid-island and island-grid transfers. Provide system description and design where multiple components are required or equipment data sheets for manufactured units identifying transfer method of unit (i.e. open, closed, static).~~

i. 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. For example, describing over/under-voltage/current frequency behavior and reconnection behavior would comply, such as solid-state transfer switching or other. 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 in a sequence of operations. ~~Provide details on grounding of the interconnected energy storage and/or DG system to meet utility effective grounding requirements.~~ Recommended move to Protection System Verification.

j. Provide short circuit current capabilities and harmonic output from the hybrid project or stand-alone storage system. Industry recommends moving this question Protection System Verification Section

k. Provide details on standard communication hardware interfaces that are available, e.g., TCP/IP, serial, etc. Industry recommends moving this question to General Information Section

l. Provide details on standard communication protocols that are available, e.g., MODBUS, DNP-3, 2030.5, etc. Industry recommends moving this question to General Information Section

m. Provide details on standard communication data models that are available, e.g., 61850-90-7, SunSpec, MESA, 2030.5, OpenADR, etc. Industry recommends moving this question to General Information Section

3. Protection System Verification

a. If Equipment is being derated, are operational controls accepted with NRTL attestation that equipment meets the requirements of the UL 1741 Certification Requirement Decision on Power Control Systems.

4. Market Participation and Metering Configuration: (non-binding information)

   a. Will the system operate in the NYISO markets? If yes, please specify which anticipated NYISO market(s).

   b. Will the system be 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.

5. General Information: (non-binding for information for future use)