



DATE: November 6, 2017

TO: Jason Pause, Electric Distribution Systems,
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FROM: Joint Utilities of New York – Interconnection Technical Working Group

RE: 10/16/17 ITWG Meeting Follow-Ups – JU Modified and Proposed NYSSIR Screens to Accommodate Energy Storage

Pursuant to your request, here is the response from the Joint Utilities of New York (“JU”) regarding modifications to the preliminary and supplemental screens within the New York State Standardized Interconnection Requirements (NYSSIR) that would be required to accommodate energy storage within the screening process. The response reflects the position of all of the utilities identified on this letterhead, although it does not necessarily apply to network systems.

1 Energy Storage Screens Discussion

1.1 Purpose

The purpose of this document is to provide modifications to preliminary and supplemental screening requirements within the New York State Standardized Interconnection Requirements (NYSSIR) for interconnecting energy storage systems (ESS) within the electric distribution system of a hosting utility. The electrical characteristics of energy storage are significantly more complex than standalone generators. An ESS has the ability to rapidly swing from full charge (acting as a load) to full discharge (acting as a source) at any time. As a result, the potential use cases and control systems vary significantly.

The JU provided comments on the Initial EPRI Screening Report on October 31, 2017. The comments in this document are on the Updated EPRI Screening Report provided on October 23, 2017, and assume that the JU recommendations provided on the Initial EPRI Screening Report are approved.

1.2 Scope

Energy storage systems, within this scope 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. Standalone ESS assets directly connected to the distribution system are also in-scope.

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

1. **Technology:** electric battery storage
2. **Nameplate Rating:** inverter nameplate rating of the DG and coupled ESS 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. **Charging:** the ESS may be charged from DG only, a combination of DG and distribution system supply, or from distribution system supply only.
4. **Dispatch/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.

2 Identified Gaps in NYSSIR Preliminary and Supplemental Screens

Screening for battery storage interconnection is more complex than screening for other distributed generation. The dual-behavior of energy storage systems to appear as a source or as a load, and control systems and operating characteristics are more frequently customized. Participation in complex markets such as frequency regulation may be more difficult to screen than simply defined charging and discharging periods. In addition to the nameplate rating, the ability of the ESS and any co-located distributed generation to export power from the point of common coupling (PCC) changes the complexity of the analysis. Preliminary screens, especially where automated, will evaluate an immediate transition from full charge to discharge mode and vice-versa. Control systems will require additional review.



The following tables provide a comparison of the existing NYSSIR screens, relevant recent recommendations from EPRI concerning updates to these screens, and identified gaps in the screens that apply to the deployment of ESS.

Table 1: Review of the EPRI Recommended Preliminary Screens

Current NYSSIR Interconnection Screens	EPRI Recommendations for Changes to Existing NYSSIR Screens¹	JU Recommended Changes to the EPRI Screens per October 31 Submission	Identified Gap(s) with Respect to Energy Storage and Recommended Modification
Screen A: Is the PCC on a Networked Secondary System?	No change to existing screen.	No recommended changes.	No additional modifications required.
Screen B: Is Certified Equipment used?	No change to existing screen.	Recommend that solar photovoltaic interconnections utilize smart inverters certified to UL-1741-SA in addition to the current version of IEEE 1547.	JU recommend expanding our recommendation to include all inverter-based DER.
Screen C: Is the Electric Power System (EPS) Rating Exceeded?	Define “aggregated gross rating” to include existing generation, storage and DER. Replace the terms “generating facilities” with “DER”.	The transformer and secondary system should be considered in addition to the medium voltage system. Overloading, voltage and current unbalance must be included in Screen C.	Aggregation of DER in context of ESS (load and source) is not adequately described. JU recommend defining, “aggregated DER generation or loading capacity” to be the total DER nameplate capacity (separated by source and load) aggregated on a line section. The JU recommend that the screen be conducted twice: (1) using the lesser of the nameplate rating or maximum export limitation of the ESS and paired DG, and (2) if charging in any capacity from the grid, using the

¹ Key, T., Rogers, L., York, B., “Recommendations for Harmonizing Distributed Generation Interconnection Practices: Technical Review Processes in NY State, Addendum: Includes Initial Consideration for Energy Storage in Screening”, EPRI, Submitted to NYSERDA and NYSDPS, October 18, 2017



Current NYSSIR Interconnection Screens	EPRI Recommendations for Changes to Existing NYSSIR Screens¹	JU Recommended Changes to the EPRI Screens per October 31 Submission	Identified Gap(s) with Respect to Energy Storage and Recommended Modification
			nameplate rating of the ESS plus ancillary (HVAC and auxiliary) load.
Screen D: Is the Line Configuration Compatible with the Interconnection Type?	Revise Screen D to address basic service configuration compatibility checks.	The JU supports EPRI’s approach of considering aggregate DG. Reviewing the power service configuration at the PCC will require an engineer’s review of both proposed and existing application materials in most instances. This may create challenges to automation.	No additional modifications required.
Screen E: Simplified Penetration Test	Revise Screen E by dropping the term “facility” and state that aggregate includes installed as well as any DER approved in the queue to be installed, including both DG and energy storage. Confirm this screen is for medium voltage.	The JU recommended to continue including Screen E, but note that load data from mid-line reclosers may not be readily available to evaluate line sections.	The JU support EPRI’s recommendation that DER installed and queued be considered. They must be evaluated both from a source and load perspective. The screen does not currently account for storage in charging mode. The JU recommend that the screen be conducted twice: (1) using the lesser of the nameplate rating or maximum export limitation of the ESS and paired DG, and (2) if charging in any capacity from the grid, using the nameplate rating of the ESS plus ancillary (HVAC and auxiliary) load.
Screen F: Simplified Voltage Fluctuation Test	Revised Screen F: The aggregate DER relative to the capacity (available power rating) at the PCC does not exceed 40% at MV and 50% at LV.	The JU need to ensure the potential for voltage issues is identified during preliminary screening.	The JU request clarification on the 40% aggregate DER for MV and 50% for LV. The screen does not currently account for



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	<p>Aggregate DER includes all DG and energy storage on a line section or LV transformer bus. If not exceeding these limits (pass). Preliminary Screening Analysis is complete. If exceeding (fails preliminary screening), additional supplemental review or study is required.</p>	<p>The JU recommend a new screen be developed to evaluate the total aggregate DER on a line section using the circuit's stiffness ratio as a screening criteria (Stiffness Ratio >25 = pass).</p>	<p>storage in charging mode. The JU recommend that the screen be conducted twice: (1) using the lesser of the nameplate rating or maximum export limitation of the ESS and paired DG, and (2) if charging in any capacity from the grid, using the nameplate rating of the ESS plus ancillary (HVAC and auxiliary) load. DER interconnected and queued must be considered, both from a source and load perspective. The load evaluation should utilize the GE Flicker Curve.</p>

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Table 2: Review of the EPRI Recommended Supplemental Screens

Current NYSSIR Interconnection Screens	EPRI Recommendations for Changes to Existing NYSSIR Screens²	JU Recommended Changes to the EPRI Screens per October 31 Submission	Identified Gap(s) with Respect to Energy Storage and Recommended Modification
Screen G: Supplemental Penetration Test	Revise language from “Generating Facility” to “DER”.	No additional modifications required.	DER interconnected and queued must be considered, both from a source and load perspective. The JU recommend that the screen be conducted twice: (1) using the lesser of the nameplate rating or maximum export limitation of the ESS and paired DG, and (2) if charging in any capacity from the grid, using the nameplate rating of the ESS plus ancillary (HVAC and auxiliary) load.
Screen H: Power Quality and Voltage Tests	New screens out of Screen F to be performed here in Supplemental Review to screen for no more than 3% voltage change at the PCC, 5% voltage at any point on a line segment, or 1.5% voltage change at any regulating device.	The voltage calculation should also consider potential violations with the ANSI C84.1 Voltage Range A limits at any point on the utility system. The JU additionally recommended the voltage change at any regulating device be against the lesser of either 1.5% voltage change or half the bandwidth of the regulator.	The ESS must be modeled as a source (plus paired DG) accounting for the net export limit and a load with the specified ramp rates in conducting the screen.
Screen I: Safety and Reliability Tests	Remove existing Screen I and consider a new Screen I to address operating modes, options, protection	This level of review is often limited to the detailed analysis of a CESIR. If this screen is to be implemented as written, the	The JU support EPRI’s updated recommendation in the report that includes ESS to remove this screen. If the screen remains, iterations with the

² Key, T., Rogers, L., York, B., “Recommendations for Harmonizing Distributed Generation Interconnection Practices: Technical Review Processes in NY State, Addendum: Includes Initial Consideration for Energy Storage in Screening”, EPRI, Submitted to NYSERDA and NYSDPS, October 18, 2017

Current NYSSIR Interconnection Screens	EPRI Recommendations for Changes to Existing NYSSIR Screens²	JU Recommended Changes to the EPRI Screens per October 31 Submission	Identified Gap(s) with Respect to Energy Storage and Recommended Modification
	adequacy, and coordination.	JU recommended additional business days and cost be allotted in the supplemental screens.	developer to change set points and operating characteristics require a CESIR.
Screen J: Review of non-certified DER?	Include additional screening to evaluate if the required relay protection functions are included and configured properly for the proposed site?	This level of review is often limited to the detailed analysis of a CESIR.	No additional modifications required.
Screen K: Special Protection Requirements for Network-connected DG	Review if the aggregate DER is less than the minimum load on any network protector?	This level of review is often limited to the detailed analysis of a CESIR. The JU will require longer than twenty (20) business days and supplemental review costs will exceed \$2,500 due to the additional review of design drawings and review of network protection and configurations.	To provide clarity, the JU recommend removing the word “any” from the screen description”: “Review if the aggregate DER is less than the minimum load on network protectors?” Utilities may have specific requirements, particularly for smaller spot networks.

In addition, the existing NYSSIR screens do not account for systems with nameplate ratings less than 50kW. It is recommended that control systems for ESS plus distributed generation aggregated to less than 50kW with export to the grid be allowed extra time for review due to the additional analysis required.

3 Summary of Recommendations

Based upon the gaps identified in Section 2, the JU have the following recommendations regarding ESS screens. These are additional recommendations since the JU provided on the Initial EPRI Screening Report on October 31, 2017, and assume that those previously submitted recommendations are adopted:

1. Where supplemental screens are not applicable due to the complexity of the operating characteristics and control systems, failure of the any preliminary screens will result in proceeding directly to CESIR. For example, regulation market participation.
2. The JU recommend the preliminary screens consider net export limitations, but that the control systems for these net export limitations be reviewed in a supplemental process. For systems with aggregate (ESS plus paired DG) nameplate ratings less than 50kW or for systems that pass preliminary screening, a “supplemental review process” (separate from the supplemental screening) should be developed to review control system settings anytime export to the grid will be limited. The process will require additional time and cost allocation for completion.

3. Along with a few other adjustments and clarifications, most screens require modification to evaluate the ESS from a source and load perspective. The following is a summary of recommendations on a per screen basis:

Preliminary Screens

- **Screen A** – No additional recommendations.
- **Screen B** – Expand the JU’s recommendation to require solar photovoltaic interconnections utilize UL-1741-SA and IEEE 1547 certified smart inverters to all inverter based-DER.
- **Screen C** – Need to define aggregation of DER in the context of ESS. Define “aggregated DER generation or loading capacity” to be the total DER nameplate capacity (separated by source and loading) aggregated on a line section. The JU recommend that the screen be conducted twice: (1) using the lesser of the nameplate rating or maximum export limitation of the ESS and paired DG, and (2) if charging in any capacity from the grid, using the nameplate rating of the ESS plus ancillary (HVAC and auxiliary) load.
- **Screen D** – No additional recommendations.
- **Screen E** – The screen does not currently account for storage in charging mode. The JU recommend that the screen be conducted twice: (1) using the lesser of the nameplate rating or maximum export limitation of the ESS and paired DG, and (2) if charging in any capacity from the grid, using the nameplate rating of the ESS plus ancillary (HVAC and auxiliary) load.
- **Screen F** – The JU request clarification on the 40% aggregate DER for MV and 50% for LV. The screen does not currently account for storage in charging mode. The JU recommend that the screen be conducted twice: (1) using the lesser of the nameplate rating or maximum export limitation of the ESS and paired DG, and (2) if charging in any capacity from the grid, using the nameplate rating of the ESS plus ancillary (HVAC and auxiliary) load. The load evaluation should utilize the GE Flicker Curve for evaluation.

Supplemental Screens

- **Screen G** – The JU recommend that the screen be conducted twice: (1) using the lesser of the nameplate rating or maximum export limitation of the ESS and paired DG, and (2) if charging in any capacity from the grid, using the nameplate rating of the ESS plus ancillary (HVAC and auxiliary) load.
- **Screen H** - The ESS must be modeled as a source (plus paired DG) accounting for the net export limit and a load with the specified ramp rates in conducting the screen.
- **Screen I** - The JU support EPRI’s updated recommendation in the report that includes ESS to remove this screen. In addition, iterations with the developer to change set points and operating characteristics require a CESIR.
- **Screen J** - No additional recommendations.
- **Screen K** – Update the language to, “Review if the aggregate DER is less than the minimum load on network protectors.”



4 Conclusion

The JU are supportive of expanding the scope of the NYSSIR to include energy storage. Considering the more nascent nature of the storage market in New York State compared to solar PV, the JU have provided the aforementioned comments and recommendations with the goal of consistency with other recently submitted documents and discussions on the subject. The JU look forward to additional discussion with the New York Interconnection Technical Working Group regarding our comments and questions.

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