Pending Revisions of
PSEG Long Island's
DER Interconnection Technical Requirements Document

Long Island Interconnection Working Group Meeting
December 17, 2021

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We make things work for you.

Disclaimer

Requirements for interconnection of DER to the LIPA system are defined in the *PSEG Long Island's Smart Grid Small Generator Interconnection Technical Requirements and Screening Criteria for Operating in Parallel with LIPA's Distribution System* document, as currently published. This presentation is intended to be informative, only, and does not modify, supplement, or interpret the requirement document as currently published.

Reasons for Proposed Modification

The proposed modifications are intended to be an incremental document maintenance update, driven by the following:

- Recognition that UL-1741 SB has been delayed
- Recognition that prevailing dc/ac ratios can allow significant PV output over a slightly longer period each day
- Revisions to formulas used to estimate minimum feeder load in penetration calculations
- Consideration in preliminary screening of the potential high variability of energy storage participating in the frequency regulation
- Necessity of including rotating generators in the screening process
- Recognition that PV does not cause flicker, but other aspects of short-term voltage variation do have an impact
- Unavailability of section-by-section load data
- Correction to a prior revision

UL-1741 SB Certification

- Present document requires SB certification starting on January 1, 2022

- Final approval of UL-1741 SB has been delayed

- Inverter OEMs expect significant NRTL availability issues constraining certification to new standard when complete

- JU has set July 1, 2022 as the requirement for SB certification

- PSEG-LI believes that this may not be practical, and is thus proposing December 1, 2022 as the target date

Time of Day for PV Penetration Evaluation

- Present document specifies penetration ratio for PV to be calculated using minimum load between 10 am – 4 pm

- Industry trend is for increasing dc/ac ratios (avg. 1.23 for large non-residential in 2020 per LBNL 9/21 report)

- As a result, PV output can be substantial over a longer part of the day

- Proposed revision is for a 9 am – 5 pm minimum load evaluation period

Minimum Load Estimations

- Penetration ratios are based on DER capacity / customer load
- Feeder SCADA recordings can only show <u>net</u> load; actual customer load minus existing DER output
- Appendix A of the document provides formulas for estimating actual load value
  - Formulas were based on the assumption that minimum observed load (net load) occurs during pre-dawn hours
  - High PV penetration feeders can have minimum observed load during mid-day
  - Result: unreasonable estimates of load result
- Proposed revisions correct these formulas to account for high-PV situations

Rotating Generator Inclusion in Screening

- Present document excludes rotating generators (synchronous, induction) from Preliminary Screening
  - Not all impacts are covered in Supplemental Screen
  - Need to perform both Preliminary + Supplemental Screens for rotating generators
- Presence of existing rotating generators is not adequately considered in present Preliminary Screening process for inverters
  - Proposed change introduces "Equivalent Penetration Ratio" (EPR)
  - $EPR = \dfrac{kW_{inverter} + 6 \cdot kVA_{rotating}}{kW_{Load}}$
  - Factor of six accounts for the greater "strength" of rotating generators
  - EPR is only applicable to Screen P6 (substation 3V0) and Screen P10 (islanding risk)
  - Ordinary (unfactored) penetration ratio used for remainder of Preliminary Screens (voltage-related)

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Voltage Variability

- Present Screen S-3 uses a geospatial diversity factor that includes a flicker curve weighting approach

- Utility industry experience, EPRI research, and common-sense analysis makes a convincing case that PV does not cause "flicker"

- Short-term DER power variability can cause voltage excursions outside of the acceptable range due to response time of corrective measures (tap movement, capacitor bank switching)

- Thus, screening must continue to identify DER that cause substantial voltage variations

- But, flicker-curve weighting of correlations between sites is now judged to be inappropriate

- Proposed change uses a straight-line correlation coefficient that reaches zero at 2700' of site separation (based on SUNY Albany technical paper)

Variability of ESS Performing Frequency Regulation

- Frequency regulation service involves relatively rapid changes in output/input to balance generation and load within NYISO, updated every few seconds

- Potentially much greater variability than PV, with resulting impact on power quality and utility equipment

    - Worst-case PV variability: assumed to be between 20% and 100%

    - Energy storage can vary from -100% to +100%; thus 2.5x geater

- Screen P12 modification:

> Screen P12 – Does the total DER penetration on the primary substation bus exceed 25% of the substation transformer rating, or does the penetration of energy storage on the primary substation bus, that participates or may participate in the frequency regulation ancillary services market, exceed 10% of the substation transformer rating?

Section-Level Penetration

- Present document calls for calculation of penetration on a feeder section basis
  - Feeder section is segment between automatic sectionalizers or between substation breaker and first sectionalizer
- Available data does not support this granularity of analysis
- Present practice is to perform screening based on feeder (or substation) level
- Proposed change of document reflects this practical reality
- This is less conservative when the feeder's DER capacity is concentrated on a section

Fault Current Contribution

- Change reverts formula for Screen S7 back to what it was prior to 2020 update.

- Correction: $$\frac{1.2 \cdot S_{Inv\_total} + 5 \cdot S_{Rot\_total}}{\sqrt{3} \cdot V_{nom} \cdot 1000} + I_{no\_DER} \leq I_{\text{int}\,errupting} - I_{\text{trans}}$$

- I_{trans} has the same effective definition as I_{no_DER} ; effectively double accounting of the pre-existing fault current

- Correction is favorable to DER under review

Questions?