PSEGLI Hosting Capacity General Review Initiative

Summary & Comments on Historic Initiatives, & Questions Regarding Substation Backfeeding

Version 3c

Version Tracking

ID	Date	Edits By	Summary of Changes, Comments
Ver 1	11 Feb 2021	Industry	Original presented at group meeting.
Ver 2	20 Feb 2021	Industry	Updates made by industry based on discussion during presentation. Currently posted on IWG website.
Ver 3	Dec 2021	Industry	(a) Removal of old material. (b) One topic "break away" with questions to be tracked separately. (c) Additional additions/edits in Yellow.

Preface Notes & Discussion Goals

A. The views expressed herein are solely those of the DER Industry representatives participating in the Interconnection Working Group. Neither PSEG Long Island nor LIPA make any representation as to the accuracy of the information contained in this report.

B. This presentation is part of the ongoing series of presentations/discussions regarding hosting capacity limitations on PSEGLI's network.

C. Some key goals of this document/presentation include
   a. Summarize select presentations & published documentation to date on this topic. This enables all to see key highlights in a single document without having to open/search multiple sources. -- See previous version.
   b. Obtain clarity on PSEGLI's stance on substation backfeeding. Determine whether PSEGLI's position differs from that of other utilities within and external to the JU.
   c. Trac and examine the variety of challenges impacting hosting capacity.
   d. Create "break away" topics as desired with dedicated presentations.

D. This presentation is part of NYSEIA's "Red to Green Initiative".

E. Note: The "PSEG Long Island's Smart Grid Small Generator Interconnection Technical Requirements and Screening Criteria for Operating in Parallel with LIPA's Distribution System" is referred to as the "**Interconnection Technical Requirements**" or "**ITR document**" herein.

F. Key questions and potential action items a outlined in dark red
   All red text at the time of this edit is still an open question by Industry.

G. Please note that it is not expected that PSEGLI respond to all of the questions highlighted in a single presentation. We understand and respect that these are complex topics that may take multiple presentations to review as part of this working group.

Contingency Conditions & 2020-06-30 (U) DER Feeder Interconnection Limit Considerations Review

Edit Dec 2021: Section updated.

PSEGLI gives a followup presentation on proposed, revised feeder backfeeding, with the key points, summarized as follows:

A. Previously a limit of 3MW aggregate was allowed on feeders, & anything more required a dedicated feeder
B. In summary, the reason was "load masking" caused by the injection of DER. If the DER was lost, then thermal overloads would be reached.
C. Current maximum DER penetration is 3 to 4 MW until new rules implemented

Scenario	DER Single Injection Limit for Non Dedicated Feeder	Maximum allowed DER penetration per feeder	SCADA Requirement (Preliminary)
Existing	3 MW	3 – 4 MW	1 MW
Proposed	5 MW*	Case by Case basis *	500 kW**

*Provided all applicable study requirements are met and dependent on existing DER penetration on that specific feeder. Specific location of DER on the feeder will also vary this limit

Key industry questions:

A. General industry questions on this "load masking" contingency condition presentation
    a. Where can I find a list of this and other technical limitations?
        i. For example, how do these limitations manifest ITR procedures?
        ii. Note that we also do not see any reference to this limit in the June 2019 presentation on "DER Technical Requirements"?
    b. Is this simply part of the "perform CESIR analysis" section 6 and thus not expressly outlined? (See also the request below to provide detailed information regarding CESIR analysis.)
    c. Are these revised feeder limitations in alignment with practices with other members of the JU?
B. What other contingency conditions exist that are impactful of hosting capacity? For example, loss of one of two substation transformer banks.

Review of Utility 2.0 Filing, NYS Power Grid Study & Related Documents

2021 U2.0 Review & "Increasing Hosting Capacity Initiative"

Edit Dec 2021: This is a newly added section.

A new U2.0 study has been published on July 1, 2021. Currently, the primary initiative that involves hosting capacity is Section 4.2.4 ”Increasing Hosting Capacity Study” which is first, studying saturated locations for their thermal, voltage, and protection-related bottlenecks and secondly, studying & prioritizing cost-effective solutions.

The report indicates study will provide insight on best approach that can be employed to increase hosting capacity, the study is scheduled to be completed at end of 2022. As outlined in the first section of this document, Industry believes that time is of the essence, and thus requests that this study be accelerated as much as possible, and that preliminary results be shared throughout the year.

Key industry questions:

A. Does PSEGLI have any pilot programs or is studying any technologies that enable dynamic control of DER? Example- DERMS, ADMS
B. 2021 Utility 2.0 plan does not mention any solutions/technologies that can increase hosting capacity. Does PSEGLI believe we need these solutions to achieve 2025 (188MW of ESS in LI) & 2030 (10GW of DER) CLCPA goals? Is the current phase sufficient?
C. Industry requests PSEGLI to provide any additional information related or in addition to that published in the 2021 U2.0 paper regarding (a) increasing hosting capacity, (b) reducing interconnection costs, or (c) reducing timeframe from application to connection.

New York Power Grid Study & Others?

It is our understanding that the following other initiatives have taken place or are underway that also pertain to increasing hosting capacity. LIPA/PSEGLI was a participant in the T&D Investment Working Group.

- 2 November 2020 - Utility Transmission and Distribution Investment Working Group Report Published.
- 18 January 2021 - NYSEIA (& others) respond with comments
- 19 January 2021 - Initial Report on the New York Power Grid Study published. (Note that this report contains information from the Utility T&D IWG report. Comments due 22 March 2021.)

Edit Dec 2021 -- QUESTIONS B & C ADDED BELOW

Key industry questions

A. To what extent does the general and LIPA specific suggestions impact on PSEGLI distribution side hosting capacity?
B. Where has the initiative taken place? Does it have a dedicated Docket number? If not, how can stakeholders track and comment on progress?
C. Historically, what did stakeholder involvement look like?
D. How may the suggested activities in these reports influence the priorities we select to pursue in this group and how will that ultimately impact the SGIP or ITR documents?
E. Are there any OTHER initiatives or activities that PSEGLI is involved in that may influence hosting capacity?

Industry Observations & Questions Regarding PSEGLI Policy on Substation Backfeeding

Please know that many in the industry have an impression that PSEGLI does not allow backfeeding power flow from substation distribution to transmission systems. It is our goal that this conversation will provide clarity on current PSEGLI technical policies.

For reference, below is an excerpted description of Penetration Ratio (PR):

For the purposes of the preliminary screening process specified in this document, DER penetration is defined as the aggregate DER capacity installed on the particular feeder section or distribution system divided by the minimum concurrent load level for the same feeder section or distribution system.

Given this definition, please affirm or correct the following statement as it pertains to solar DER:
In the event that feeder and/or substation solar backfeeding is allowed, that feeder or substation would have a penetration ratio of greater than 100%. In other words, for example, the aggregated solar DER capacity installed on the feeder or substation would be greater than the minimum concurrent daytime load.
Edit Dec 2021 -- Industry understands this statement to be correct.

Review of the ITR shows that none of the preliminary screens prohibit a penetration ratio of greater than 100%, rather it says that if a certain threshold is exceeded a CESIR must be performed or could go to a supplementary screen if desired. Similarly, none of the supplemental screens prohibit a PR of greater than 100%, but ouline many factors that could potentially limit the size of a new project, such as: limits on repetitive voltage variation; excessive operation of load tap changer; loss/return over/under voltage limits; misc impacts on other customers, etc. **In conclusion, while there is no language that explicitly prohibits backfeeding, it appears that many other factors may limit the ability for DER of a certain size to connect.**

Please note that there is no guidance in the CESIR analysis section which provides insight into how it is performed and what the specific limits are, such as the 3 to 4 MW feeder limit previously described. This topic is continued in the "CESIR Analysis Details Request" section below.

As observed in the 2016 ITWG presentation, the JU has a published position on the topic of reverse power flow at substations. It is also our understanding that other JU members have explicit technical policies which may allow for substation backfeeding up to 75% of the substation transformer nameplate ratings, and/or provide specific guidance on backfeeding limits based thermal, protection, or other factors.

Edit Dec 2021: Additional questions added as highlighted below
In review of this discussion and observations, the industry requests additional guidance as follows:

A. Please provide a clear explanation of PSEGLI's technical policy regarding the maximum allowable substation backfeeding limit.
    a. **Edit Feb 2021: PSEGLI Meeting Note: PSEGLI does not prohibit backfeeding. Estimate 75% or 80% of transformer rating. Industry is still waiting for an official response.**
    b. Confirm whether PSEGLI includes minimum daytime loading in "Ultimate Max HC" limit. For example: Ultimate Max HC = Substation nameplate (or thermal?) bank rating PLUS minimum daytime loading.
B. As a meaningful benchmark to track, please specify what percentage of PSEGLI network feeders and substations have a PR of greater than 100%.

CESIR Analysis Details Request

Presently the ITR Document, Section 6, provides no information regarding how a CESIR analysis is performed.

6. Coordinated Electric System Interconnection Review (CESIR)

DER interconnection applications that do not pass the supplemental screening process may, at the discretion of the applicant, be subjected to a Coordinated Electric System Interconnection Review (CESIR). A CESIR is a detailed engineering study and often requires system simulation and modeling.

Note that we do acknowledge some additional background technical information is provided in the inaugural IWG presentation given June 2019 titled "DER Interconnection Technical Requirements".

- Scopes of CESIR are defined on a case-by-case basis depending on:
  - Characteristics and rating of DER systems
  - Characteristics of LIPA system at the proposed point of interconnection
  - Specific criteria failed in the screening process
- Coverage of CESIR in the document is presently a limited placeholder

Industry questions & requests

A. Please know that the ITWG industry is currently undergoing a comprehensive review of each utility's CESIR analysis assumptions. This online document summarizes all the analysis and to date feedback from each JU member of this ongoing initiative. The analyses are also embodied in the JU Standardized CESIR Template (August 2018) document, section 5.0 "System Impact Analysis". In a similar item by item fashion, the industry requests a concise outline of each of its analysis, assumptions, limits, etc.
B. What other unpublished technical limitations exist and are incorporated into the CESIR analysis (such as the feeder limit that would have otherwise been unknown)?
C. Please share in what scenarios is system modeling software utilized and what modeling software does PSEGLI use for each scenario?
D. Please provide any other information relevant to performing CESIR analysis.

Hosting Capacity Map Stage 3 Ultimate Max Calculation Clarification

Edit Dec 2021: This is a newly added section based on the recent launch of Stage 3.

For reference, here is PSEGLI's current guidance, and sample information

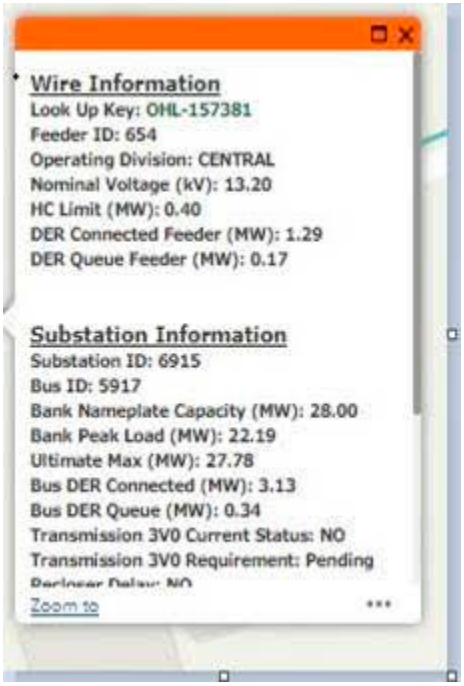
Assumptions: The hosting capacity analysis also does **not take into account contingency scenarios**, and is contingent upon GIS feeder models, electrical parameters and the analysis settings in EPRI drive.

HC Limit (MW): Amount of DER that can be interconnected on the feeder capturing thermal, voltage constraints of the feeder and bus thermal limitations. In addition, the hosting capacity also captures the transmission 3V0 constraint and applies this constraint to the substation bus. This limitation is further extended to the feeders where no feeder HC is greater than HC of the bus. If the line item “3V0 Requirement” is Yes or Pending for a particular node then the HC limit will incorporate 3V0 constraints. If the line item for “3V0 Requirement” is “No” then the HC limit will not incorporate the 3V0 constraint.

Ultimate Max (MW): This theoretical value provides a nonbinding estimate of the Ultimate Distributed Generation (DG) capacity MW value that can be accommodated on the bank without triggering major

upgrades on bank level. The value does not capture **the impact of voltages, protection related limitations, impact of DERs in queue or the limitations** covered under the PSEG LI technical screening guide on developer side of interconnection.

Sample Substation ID - 6915 Information:



Industry Attempt to Understand "Ultimate Max" Calculation

Industry is having difficulty understanding how the Ultimate Max HC is calculated. Following is a sample analysis using the screenshot data by industry. We would appreciate additional guidance or corrections on our analysis below.

- Industry acknowledges what this value does not capture the items above
- Observe that the sum of connected + queued DER = 3.47MW.
- Thus minimum daytime load (according to ITR) = Peak load x 0.5 = 11.095MW
- Minimum Load (according to ITR) = Peak load x 0.3 = 6.657 MW
- Based on assumptions and simple calculation Ultimate Max HC on the substation can be calculated as (Bank Nameplate Rating - (Connected DER + Queued DER)) = (28 - 3.47) = 24.53MW.

Industry Followup Questions Re Calculation Methods

A. Can PSEGLI share a technical paper by EPRI Drive team, or can PSEGLI share additional technical details on how the "HC Limit" value is determined, beyond the existing summary explanation above?
B. Can PSEGLI share a technical paper by EPRI Drive team, or can PSEGLI share additional technical details on how the "Ultimate Max" value is determined, beyond the existing summary explanation above?
C. Are the ITR defined minimum daytime and minimum load considerations applied to HCM?