

PSEG Long Island's CESIR Study Scopes

Long Island Interconnection Working Group Meeting
December 17, 2021

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.

Purpose

Coordinated Electric System Interconnection Review - CESIR

- Determine if proposed DER interconnection, along with existing and previously-approved DER will create unacceptable impacts
 - Safety hazards for the public and for PSEG-LI employees
 - Risk to LIPA system equipment
 - Risk to the equipment of other customers
 - Unacceptable quality of service (power quality) to other customers
- Evaluate compliance with DER interconnection technical requirements document (partial, system aspects only)
- Defining criteria
 - PSEG-LI's DER interconnection technical requirements document
 - PSEG-LI's system performance and planning standards

CESIR Study Approach

- Study is tailored to the risks and impacts presented by the individual DER interconnection under review
 - Differs from the JU approach of a single study scope applied to all projects
- A number of different CESIR study “elements” have been defined, characterized by:
 - Similar impact issues
 - Common study model and tools
- Applicability of these different types of studies depends on the Preliminary and Supplemental Screens that the project fails

Study Elements

- Primary loadflow/voltage
- Secondary voltage
- Feeder protection/short circuit
- Transmission backfeed
- Feeder grounding
- Feeder load-rejection overvoltage
- Secondary network impact
- Review of non-certified DER
- Review of composite DER systems
- Specific implementation

Study Matrix – P Screens

Screen ¹	Primary Loadflow/Voltage	Secondary Voltage	Feeder Protection/Short Circuit	Transmission Backfeed	Feeder Grounding	Feeder Load Rejection Overvoltage	Secondary Network Impact	Review of Non-Certified DER	Review of Composite DER Systems	Specific Implementation ²
P1							X			
P2			X							
P4									X	
P5								X		
P6				X						
P7	X									
P8	X									
P9 ³	X		X		X	X				
P10										X
P11										X
P12 ³	X									
P13 ³		X								

¹ Preliminary screens not shown do not map directly to a CESIR

² Specific modifications of system required, but not a “system study”, per se

³ Studies not required if related supplemental screens are passed

Study Matrix – S Screens

Screen ¹	Primary Loadflow/Voltage	Secondary Voltage	Feeder Protection/Short Circuit	Transmission Backfeed	Feeder Grounding	Feeder Load Rejection Overvoltage	Secondary Network Impact	Review of Non-Certified DER	Review of Composite DER Systems	Specific Implementation ²
S1	X									
S2	X									
S3	X									
S4	X									
S5	X									
S6	X									
S7			X							
S8						X				
S9					X					
S10			X							
S11		X								
S12		X								

Primary Loadflow/Voltage Element

- Objectives
 - Ensure primary voltages are acceptable throughout primary system
 - Determine if substation transformer LTCs will see excessive operation
 - Evaluate voltage fluctuations
- Uses feeder model and distribution loadflow software (CYMDIST)
- Voltage level and loading test; evaluate voltage and loading for
 - Peak load
 - Minimum daytime load
 - Overall minimum load (only for non-PV)
- Voltage variability test
 - NOT A FLICKER TEST!!
 - Ensure that power changes faster than system regulating components do not drive voltages outside of the acceptable voltage range

Primary Loadflow/Voltage Element (cont'd)

- Simultaneous trip and resume service test
 - Verify that DER penetration does not lead to a severe undervoltage following simultaneous trip of all DER; e.g., after a feeder momentary outage
 - Verify that DER without certified ramp-on capability (certification to UL 1741 SA or SB) does not cause excessive overvoltage
- Tapchanger impact tests (applies only to highly variable DER)
 - Verify that that change in PV output and regulation-serving BESS state does not cause substation transformer tap movement
 - <100% of tap control bandwidth is the criterion
- Mitigation alternatives to be considered:
 - Tapchanger control adjustments
 - DER leading power factor
 - Switched capacitor bank application
 - Lateral or feeder reconductoring
 - Dedicated lateral or feeder

Secondary Voltage Element

- Objective
 - Ensure that secondary voltages are within limits for DER on shared secondaries
- Tools:
 - Distribution loadflow with specific secondary modeled, or
 - Hand calculation
- Tests and criteria
 - Verify voltages acceptable at peak DER output
 - Ensure neighbor's voltage change is $< 2V$ (for 80% PV power variation, 200% power variation for regulation-serving BESS)
- Mitigation alternatives to be considered
 - Operation of DER at leading pf
 - Upgrade of distribution transformer or secondary cables
 - Interconnecting DER customer via a dedicated distribution transformer

Feeder Protection/Short-Circuit Element

- Objectives
 - Verify proper detection of all fault types, anywhere on feeder, by substation relays
 - Verify that relay misoperation does not occur due to current backfeed
 - Verify that short-circuit contribution of DERs do not cause short-circuit ratings of equipment to be exceeded
- Uses short-circuit analysis software
- Mitigation alternatives:
 - Increase impedance of ground sources
 - Apply or modify DER ground current protection (if DER provides a ground source)

Transmission Backfeed Study

- Objectives
 - Determine if substation can be radially-fed, such that DER backfeed could cause a transmission 3V0 situation
 - Determine compatibility of existing substation bank tap changer controls with reverse power flow
- Methodology:
 - Engineering review of subtransmission configuration considering contingency operation
 - Evaluation of existing tap changer control capabilities
- Mitigation alternatives
 - Apply transmission 3V0 protection
 - Apply ground source at the transmission level
 - Upgrade LTC control

Feeder Grounding Study

- Objective: determine if DER can cause ground-fault overvoltage (3V0) on feeder
- Methodology and criteria
 - Evaluate DER penetration relative to concurrent minimum load
 - Consider concurrent load composition: phase-ground vs ungrounded load
 - Consider fast-tripping of UL-1741SB inverters
 - Evaluate potential for GFOV using IEEE C62.92.6 symmetrical component methodology
- Mitigation alternatives
 - Apply a 3V0 (59N) protection at the DER
 - Apply a ground source at DER (e.g., grounding transformer)

Feeder Load Rejection Overvoltage Study

- Objective: Determine if DER can cause excessive overvoltage due to feeder tripping
- Compare DER output relative to concurrent minimum load
 - Discount output of UL1741SB inverters
- Mitigation:
 - Require UL1741SB inverters

Secondary Network Impact Study

- Ensure that DER connected to spot networks or feeders that also supply secondary networks do not cause network protector backflow
- Uses distribution loadflow software (CYMDIST) to evaluate flow patterns considering DER output with concurrent load
- Mitigation alternatives:
 - Connect DER to a different feeder
 - Connect DER to a dedicated feeder

Review of Non-Certified DER

- Confirm that the DER system that includes non-certified equipment is compliant with IEEE 1547 and PSEG-LI requirements
 - Typically rotating generators plus protective relays
 - Can also be hybrid PV + energy storage not certified to UL 1741 CRD for Power Control Systems
- In the form of an engineering review (likely to be outsourced)

Review of Composite DER Systems

- IEEE 1547-2018 requires compliance for larger (exporting > 500 kW) DER to achieve compliance at the Point of Common Coupling to utility
 - Unit certification is not sufficient, per the standard
- Objective – verify compliance at the PCC
- In the form of an engineering audit of DER plant design
 - Considers the conformance testing of DER system components
 - Review balance of plant parameters, and how they affect compliance

Questions?



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