

## First Energy (“FE”) Comments to Attachment H - Interconnection Standards For 2 to 10 MW

### General Comments

- 1 IEEE 1547 is primarily intended to be applicable to interconnection of DR on radial distribution systems (**Section 1.3 Limitations** - “Installation of DR on radial primary and secondary distribution systems is the main emphasis of this standard, ...”). From a practical standpoint, this represents an upper limit of 3 to 5 MW on most of FE’s distribution circuits, unless constructed for the sole purpose of interconnecting the DR.
- 2 In general, requirements developed to connect 10MVA and smaller generation to looped networked sub-transmission systems will be more involved and diverse than those needed for radial distribution systems, limiting the degree of standardization.
- 3 The differences between a looped network point of interconnection versus a radial distribution point of interconnection must be addressed in the PJM document if it is to be a valid reference. This should include the updating of the attached diagrams, protective relaying, and other equipment considerations.
- 4 IEEE 1547 does not specifically address connection of generation to looped networks. Additional considerations are required and these considerations would apply to Penelec's looped 23KV, 34.5KV, and 46KV systems; Met-Ed's 69KV system; and NJ's 34.5KV system:
  - Protective schemes on looped networks are typically stepped zone distance (some with high-speed pilot).
  - Connection of a generation source converts a two terminal line into a 3 terminal line, which may require protection upgrades at all terminals and a breakered substation bus at the point of interconnection.
  - For larger generators, breaker and other equipment changeouts may be required at the remote terminals.
- 5 All interconnection requests for facilities greater than 2 MW will likely require a study to determine the impact of the DR on the particular line.
- 6 All proposed DR interconnections to other than FE’s radial distribution would be submitted through PJM in accordance with PJM procedures.
- 7 Larger facilities will require stability studies and review of the Northeast PA Transfer Limits. This stability limit is aggravated as more generation is added to the distribution system.
- 8 While the functional requirements of IEEE 1547 are generally appropriate and acceptable for larger facilities, FE reserves the right to specify the type of protection necessary for interconnected operations.

## Specific Comments

- 1 **Section 4.1.1, voltage regulation** – For facilities connected to other than FE’s radial distribution system, FE reserves the right to require the facility provide or absorb reactive power and/or follow a voltage schedule.
- 2 **Section 4.1.2, Integration with Area EPS Grounding** - FE agrees with the requirements set forth in 1547. However, for connections to other than FE’s radial distribution system, specific protection requirements will be determined on a case by case basis and will depend on the generation facility's location and system configuration.
- 3 **Section 4.1.3, Synchronization** - FE agrees with the requirements in IEEE 1547
- 4 **Section 4.1.4.1, Distribution Secondary Grid Networks and Section 4.1.4.2, Distribution Secondary Spot Networks** – FE agrees with the PJM standard and will investigate interconnection on an exception basis.
- 5 **Section 4.1.5, Inadvertent Energization of the Area EPS** - FE agrees with the requirements in IEEE 1547
- 6 **Section 4.1.6, Monitoring** – Depending line parameters, for larger facilities, FE may require SCADA monitoring for generation connected to radial distribution circuits.

For facilities connected to other than a radial distribution circuit, regardless of size, a full SCADA RTU is required. The RTU shall:

- Provide FE with control of all circuit interrupting devices that are directly in the FE transmission path.
  - Provide FE with position indication of all transmission voltage circuit interrupting devices and motor operated disconnect devices.
  - Provide FE with alarms for each circuit interrupting device and protective relaying in the transmission path (including protection that operates a circuit interruption device in the transmission path).
  - For operational purposes, provide FE with instantaneous bi-directional real and reactive power metering (voltage, MW, MVAR) for each line in the transmission path. Amperes are required for each transmission breaker in the transmission path. Relay accuracy instrument transformers and meters/transducers may be used.
  - Provide FE access to the revenue metering quantities specified in and in compliance with Section 12 of the FE Connection Requirements using DNP 3.0 communications protocol.
- 7 **Section 4.1.7, Isolate Device** – FE requires a readily accessible, lockable, visible-break isolation device located between FE’s system and the DR unit.

- 8 **Section 4.1.8.1, protection from EMI** - FE agrees with the requirements in IEEE 1547
- 9 **Section 4.1.8.2, Surge Withstand Performance** - FE agrees with the current requirements, however, there may be instances where the surge protection devices will need to be coordinated with the FE system
- 10 **Section 4.1.8.3, Paralleling Device Withstand** - FE agrees with the requirements in IEEE 1547
- 11 **Section 4.2.1, Area EPS Faults** - FE agrees with the requirements in IEEE 1547. However, larger facilities may require the installation of additional equipment such as directional relaying at the substation feeding the circuit.
- 12 **Section 4.2.2, Area EPS Reclosing Coordination** - FE agrees with the requirements in IEEE 1547
- 13 **Section 4.2.3, Voltage** - FE agrees with the requirements in IEEE 1547. However, FE may specify clearing times for DR greater than 30 kW as necessary.
- 14 **Section 4.2.4, Frequency** - FE agrees with the requirements in IEEE 1547, however for DR > 30 kW, under frequency settings should coordinate with PJM / FE automatic load shedding requirements.
- 15 **Section 4.2.5, Loss of Synchronism** - FE agrees with the requirements in IEEE 1547, however, loss of synchronism protection will need to be applied to larger units based on stability studies.
- 16 **Section 4.2.6, Reconnection to Area EPS** - FE agrees with the requirements in IEEE 1547, however, for larger units, FE may require verbal communication with the System Operator before returning generation to the system.
- 17 **Section 4.3.1, DC Injection** - FE agrees with the requirements in IEEE 1547
- 18 **Section 4.3.2, Limitation of flicker** - FE agrees with the requirements in IEEE 1547, however, larger facilities subject to intermittent operation may require provisions for additional voltage regulation as determined by FE.
- 19 **Section 4.3.4, Harmonics** - FE agrees with the requirements in IEEE 519 / 1547.
- 20 **Section 4.4.1, Unintentional Islanding** - FE agrees with the requirements in IEEE 1547 to the extent the 2 second time consideration does not conflict with normal FE reclosing practices. The DR may continue to supply their own load, provided sufficient controls and protection are installed for restoration once the FE system returns to normal.

Larger generation increases the possibility of inadvertent islanding with customer load. High speed looped network tripping combined with automatic reclosing may

result in out of synchronism reclosures. Provisions for hot line checking or synch-check may be required at remote terminals at additional cost to prevent this.

- 21 **Section 4.4.2, Intentional Islanding** – FE does not support any standardization for intentional islanding. FE may consider islanding for larger DR on a case by case basis as part of its system restoration practices.
- 22 **Section 5.1, Design Test** - FE does not anticipate larger DR, particularly rotating equipment being subject to a representative sample, factory, or laboratory testing and reserves the right to require full commissioning testing where necessary.
- 23 **Section 5.2, Productions Tests** - FE does not anticipate production testing being applicable to larger DR, particularly rotating equipment and reserves the right to require full commissioning testing where necessary.
- 24 **Section 5.3, Interconnection Installation Evaluation,** - FE expects larger DR facilities will require full commissioning tests.
- 25 **Section 5.3, Commissioning Tests** – The protection equipment for larger DR will typically be made from a collection of field installed individual components and not factory tested as a complete assembly. This type of installation does not lend itself to the ‘system’ type of tests. Full field commissioning tests will likely be required for these installations.
- 26 **Section 5.5, Periodic tests** - FE agrees with the periodic testing requirements contained in the PJM standard.