

VIII. Inspection, Testing, & Acceptance

I. Inspection, Testing, & Acceptance

- 1.0 Planning – Complete commissioning testing of all electrical equipment, components, and Systems for connection to the PJM Transmission System is a critical technical requirement. As such, this task is required to be carefully considered in the early planning and design stages of the project. Effectively conducted, pre-energization, and pre-interconnection inspection will minimize outage time during cut-in, as well as reduce the risk of creating or causing additional outages, whether during cut-in or at a later date. All work is required to be conducted following a detailed, approved, work plan. An acceptable work plan is recommended to include what is to be tested, how it will be tested, and what constitutes acceptable test results. The development of the work plan is recommended to be a joint effort with IC, TO, and PJM. Outage constraints are also able to impact design. It should also be recognized that testing often requires interfacing with existing in-service equipment and systems, such as relaying and telecommunications, and that such equipment and systems may require retesting prior to its return to service. Detailed plans and schedules are, therefore, also required for these interfaces. As such it should be recognized that plans will also have to be developed by the TO, IC and PJM, and that close coordination between the TO's and IC's work plans is required.
- 2.0 Pre-energization testing is required to be conducted to provide assurance of proper equipment operation and is critical to the operability and maintainability of the transmission system in a safe and reliable manner. In general, equipment factory testing performed by the equipment manufacturers prior to equipment shipment is not a substitute for on-site testing. It is recommended that pre-energization testing and the calibrating of relays be completed prior to the commencement of scheduled outages. If wiring is modified, temporarily disconnected, reconnected, etc., and/or if changes are made to equipment after it has been tested, retesting is required.
- 3.0 It is recommended that at strategic points during the installation joint walk downs/physical inspections involving all involved parties are performed to minimize problems and changes and to minimize outage time.
- 4.0 Inspection and testing are to be performed in accordance with all applicable TO standards, industry standards, Good Utility Practice, applicable PJM Manuals, and Applicable Technical Requirements and Standards.
- 5.0 It is the IC's responsibility to conduct all testing of its facilities. The TO reserves the right to witness this testing. The IC must furnish all test equipment and qualified personnel necessary to perform inspection and testing.
- 6.0 Testing is to be performed by qualified testing personnel. A NETA (National Electric Testing Association) accredited testing company with NETA certified testing personnel may be a source for qualified personnel. All testing equipment must be calibrated and certified and be used within its approved calibration period.
- 7.0 Documentation

7.1 General Documentation Requirements Documentation for interconnection facilities are required to be provided in an organized and indexed fashion as required by the TO(s) applicable technical requirements and standards. See TO(s) technical requirements and standards posted on PJM Website for specific types and quantities to be furnished. The documentation is required to include:

- a) Complete nameplate data of all new equipment.
- b) Copies of instruction books and all related documentation provided by the manufacturer.
- c) Test data including tests, test levels applied, and the results including the name and affiliation of tester and the specific test equipment used.
- d) Field-returned/as-built drawings including physical structural and electrical layout with dimensions, control, schematic, and wiring diagrams, cable pulling schedules and one-lines and protection functional control diagrams.

7.2 All testing documentation is required to be submitted to the TO. All reports are required to be certified and dated and should indicate the specific test equipment used. All discrepancies and/or deficiencies should be documented and immediate action taken to remedy these deficiencies prior to the equipment being placed into service. A punch list should be kept of any item requiring rework, re-testing, etc.

7.3 Documentation includes marking up prints and assuring that the field returns (“as built”) are shared in a timely fashion with all appropriate parties. Failure to do so may prevent approval of outages and energization of Interconnection Facilities.

7.4 Final drawings incorporating the “as built” mark ups are to be provided to the TO by the Interconnection Customer within 30 days after the interconnected facility is in-service.

8.0 Before the installation will be connected the TO’s electric system, the interconnection is required to be accepted by the TO.

II. Pre-Interconnection Inspection & Testing Standards

1.0 General

For TO specific inspection, testing, calibration and setting requirements for Interconnection Facilities and as otherwise required, refer to the TO(s) applicable technical requirements and standards. The IC is encouraged to discuss inspection and testing requirements with the TO(s) and establish a plan early in the project to minimize delay and cost.

- a) Equipment – As a minimum, all manufacturer’s recommended inspections, checks, and tests are required to be performed and documented.
- b) Relaying and Control – Proper operation of all relaying and controls is required to be verified by operation during commissioning activities. It is to be done both locally and remotely, in accordance with approved design drawings, and in compliance with all applicable standards.

- c) Systems – Systems, such as rigid bus, AC and DC station service and grounding, is required to be tested to verify conformance to system design specifications and to verify quality of installation. This would include activities such as thermography inspections under load conditions to detect hot-spots, ground resistance, and current injection testing, verification of automatic throw-over schemes, battery capacity/discharge tests, etc.
- d) Refer to the V.1 Substation Operation & Maintenance document for typical testing requirements and guidance.