ITC FACILITY CONNECTION REQUIREMENTS FOR GENERATION, TRANSMISSION AND END-USER FACILITIES CONNECTED TO THE ITC HOLDINGS TRANSMISSION SYSTEMS

*			
	Category:	Planning	
	Type:	Reference	
	Document:	PLA-0008	
	Owner:	Ruth Kloecker, Manager, Planning Policies	
	Date Published/Rev. #	11/15/2022	002
	Effective Date	11/15/2022	

***** References to ITC are references to ITC Holdings Corp. together with all of its subsidiaries, unless otherwise noted.

Contents

1. Introduction and General Comments

This version replaces PLA-0008 Rev 001 dated 07/12/2022 and titled "ITC Facility Connection Requirements for Generation, Transmission and End-User Facilities Connected to the ITC Holdings Transmission Systems".

1.1. Scope

This document supports compliance with NERC Standard FAC-001 Facility Connection Requirements which requires Transmission Owners to document, maintain, and publish facility connection and performance requirements to avoid adverse impacts on transmission system reliability.

Technical requirements for Facilities (transmission, generation and end-user or load) interconnecting to the ITC Holdings ("ITC") transmission systems including the ITC*Transmission* ("ITCT"), Michigan Electric Transmission Company ("METC"), ITC Midwest ("ITCM"), ITC Great Plains ("ITCGP"), and ITC Interconnection ("ITCI") facilities are covered in this document. These are the minimum set of requirements for new connections or for modifications to existing connections. Additional requirements may be imposed by ITC to address reliability concerns identified during the interconnection study for a new or materially modified Facility.

The requirements contained in this document will be used as a guide by ITC when planning an interconnection; they are not design specifications and may not cover all details. Contractual matters such as cost, leasing options, scheduling, and billing are not the focus of this document; these matters are covered in contracts, interconnection agreements, operating agreements, and/or other legal documents applicable to each interconnection.

The planning of the ITC transmission systems takes place in an open and transparent manner through ITC's participation in the Midcontinent Independent System Operator ("MISO") Transmission Expansion Planning ("MTEP") process, the Southwest Power Pool ("SPP") Integrated Transmission Planning ("ITP") process, or the PJM Regional Transmission Planning ("RTEP") process. These processes verify that the system has been planned to achieve the required system performance as described in NERC TPL-001-4 Transmission System Planning Performance Requirements Standard and applicable Regional Reliability

Organization, subregional, Power Pool, and individual Transmission Owner planning criteria and Facility Connection Requirements throughout the planning horizon. All connection projects to the ITC transmission systems are included in the MTEP, ITP, and RTEP processes as part of our open and transparent stakeholder review.

These Facility Connection Requirements are subject to change and may be revised at any time by ITC Holdings. ITC will make a copy of the revised document available to the affected parties whenever any changes are made via ITC's web site

The sections of this document regarding generator interconnections supplement the MISO, SPP, and PJM Open-Access Transmission Tariff ("OATT") and other applicable MISO, SPP, and PJM manuals governing generator interconnections.

This document supplements but does not supersede (i) Regional Transmission Organization's (RTO) interconnection procedures, requirements or agreements for end-users, generation and transmission owning entities seeking to interconnect with ITC's transmission Facilities and (ii) existing interconnection agreements between ITC and end-users, generation and transmission owning entities.

1.2. Facility Connection Process

1. Customers seeking to interconnect generation, transmission, or end-user (load serving or distribution Facilities) should contact ITC as early as possible in the planning process with the details of their project.

    a) Generation connections are coordinated through MISO, SPP, or PJM and follow the appropriate MISO, SPP, PJM, or other FERC defined processes.

2. After receiving all pertinent information, ITC will perform studies of varying scope and complexity depending on the project. These studies will help determine the impact of the project on the Transmission System.

3. ITC requires at least 60 days to review new or materially modified load and transmission interconnections. The time is used to study the impact of these connections on the transmission system, identify any system upgrades necessary to accommodate customers' proposed interconnections, and to

propose a connection configuration. ITC may work with customers for these connections under special conditions when they are unable to provide the required 60 day review period. Customers should be able to demonstrate a need for the waiver of the 60 day review period.

4. Following the ITC review and after the final scope of the project has been agreed upon by all parties, a minimum of 12 months is typically required, for ITC to complete the required design, permitting, right-of-way acquisition, and construction of facilities. Conditions, such as the following, may require projects to take more than 12 months:

   a) The project requires significant ROW acquisition.

   b) The project is in a sensitive area where significant community opposition is present.

   c) The scope of the project is large or the impact of the project requires significant system upgrades.

   d) The scope of the project changes.

1.3. Connection Configurations

Connection requests to an ITC system will be evaluated in accordance with requirements or preferences herein and pursuant to the request type (i.e. generation, transmission, and load). Any waiver of the requirement herein will be at ITC's sole discretion and determined on a case-by-case basis. ITC uses various standard substation configurations and evaluates projects on a case by case basis to determine the appropriate connection and substation configurations based upon the following factors:

1. The project's location relative to existing ITC Facilities.
2. Project capacity or demand.
3. System protection requirements.
4. Length of line exposures.

5. Reliability requirements of the interconnecting customer as determined by the customer and communicated to ITC.

6. The ability of ITC to own, operate, and maintain facilities that impact system performance.

7. Other unique requirements of the project or the ITC system

8. Other economic considerations.

For all interconnection requests that could introduce a new source of short circuit current, ITC will require a connection to a new or existing switching station to avoid the creation of multi-terminal (more than two terminal) circuits.

A ring bus or breaker and a half bus will be required for all interconnections connected to the ITC 345 kV systems regardless of size. The maximum ring bus size at voltages of 230 kV and greater will consist of no more than three (3) connections. The maximum ring bus size for voltages below 230 kV is five (5) connections. Any variance will be evaluated on a case by case basis.

ITCM will generally require a line breaker, or set of breakers, at each line terminal where a customer is connected at 100 kV or above. Requests for temporary line taps to ITCM at 100 kV and above will be evaluated by ITC on a case by case basis. Temporary line taps will only be allowed while upgrades identified as necessary for interconnection are being constructed. ITC will require supervisory control of a breaker solely dedicated to the customer's interconnecting line for a temporary line tap to be considered at 100 kV or above.

ITC Facilities and interconnections to ITC Facilities implemented prior to the latest version of these Facility Connection Requirements may not adhere to the latest version of these Facility Connection Requirements. When changes are made to existing ITC Facilities, consideration will be given to upgrading the system to meet the latest version of ITC's Facility Connection Requirements. This will be done on a case by case basis considering the practicality and cost to do so.

1.3.1. Generating Facilities

New switching stations or new substations constructed for the purpose of providing a Point of Interconnection ("POI") for Generating Facilities will be sited on property owned by ITC or under other terms acceptable to ITC.

Lines from generation shall be protected by one or more circuit breaker(s) at the POI to isolate the generating Facilities from the ITC Transmission System for all faults or abnormal operating conditions and shall have a circuit breaker on the high side of the generator step-up (GSU) transformer. For connections which are extremely short, where the generator's Facilities are located adjacent to an existing line or station, ITC may, at its discretion, only require the circuit breaker on the high side of the GSU transformer as long as a separate ITC isolation device such as a disconnect switch is located at the POI.

ITC shall own a gang-operated isolation device, typically a disconnect switch or air break switch, at the POI to isolate the ITC system from generation Facilities. This device shall provide a visible air gap to establish clearances for maintenance and repair work of the ITC system.

1.3.2. Transmission Facilities

For networked Transmission interconnections, other transmission Facility owners shall provide a circuit breaker(s) or other three phase interrupting device(s) at the POI or other location as agreed upon by ITC to isolate interconnecting Transmission Owner transmission Facilities from the ITC transmission system for all faults or abnormal operating conditions.

If the connection is a radial line connecting to an existing bus, a new breaker will be required unless determined otherwise by ITC due to the station configuration and the amount of line exposure. For these exceptions, the isolation device may either be an air break switch or a disconnect switch associated with a breaker.

For radial connections tapping an existing line, the isolation devices will consist of air break switches on the ITC line sections on both sides of tap. ITC may also require a switch on the new transmission line tap. This dependence will be determined by various factors including but not limited to the length of the radial section. If the radial section has 2 miles or more of line exposure, ITC will require the installation of a switch on the radial line owned by the customer. This switch will be installed, owned and operated by the interconnecting customer unless they request it be owned by ITC for a specific reason. ITC will then determine the reasonableness of the request.

For certain applications, air break switches may need to be motor-operated, may need to be able to interrupt load current, and/or may need to be operated remotely

by supervisory control. Factors including but not limited to load magnitude, line exposure, and line reliability will be considered as ITC makes this determination.

1.3.3. End-User Facilities

End-user connections above 100 kV shall provide a three-phase circuit interrupting device on the high side of the distribution transformer, a three-phase close device, and a device that provides a visible air gap for all three phases. These device functions can be incorporated into one device or more than one device. The interrupting device shall isolate the interconnection customer or Distribution Facilities from the ITC transmission system for all faults or abnormal operating conditions. The interrupting device may consist of a circuit breaker, circuit switcher, or transrupter. The protection system must include both primary and backup protection schemes. Additionally, when a customer is connected at an ITC substation, the interrupting device shall have device failure protection and failure contacts shall be provided to ITC.

For load connections on ITC Facilities below 100 kV, ITC will make a determination on any requested deviation from the high side device requirements on a case-by-case basis. At a minimum, a deviation will not be approved unless ITC determines customer's protective devices (i.e. fuses) are coordinated with ITC's protective relaying.

Isolation device(s) for load connections will need to be installed at the POI to the ITC system. If the connection is a radial line connecting to an existing bus, a new breaker will be required at the POI. For radial connections tapping an existing line, the isolation devices will consist of air break switches on the ITC line sections on both sides of tap. ITC may also require a switch on the new end-user line tap. This dependence will be determined by various factors including but not limited to the length of the radial section. If the radial section has two (2) miles or more of line exposure, ITC will require the installation of a switch on the radial line to be owned by the customer. This switch will be installed, owned and operated by the interconnecting customer unless they request it be owned by ITC for a specific reason. ITC will then determine the reasonableness of the request.

For certain applications, air break switches may need to be motor-operated, able to interrupt load current, or operated remotely by supervisory control. Factors including but not limited to load magnitude, line exposure, and line reliability will be considered as ITC makes this determination.

For looped connections involving a single distribution transformer, either air break switches or disconnect switches associated with breakers will be required on the line supplies at the load ends.

For looped connections involving multiple transformers, line breakers will be required for each transmission line and section breaker(s) with disconnect switches will be required between each bus section. Additionally, for connections above 100kV, ITC will generally require a ring bus or breaker and a half configuration.

The use of breakers vs. load interrupting air break switches vs. circuit switchers will be evaluated for industrial load connections. These loads are defined as those loads that act only as sinks and never as a source serving primarily industrial type plants. The evaluation shall be based on a number of factors including the line exposures involved in connecting the substation to the grid.

2. Procedures for Coordinated Joint Studies of New Facilities and Their Impacts on the Interconnected Transmission Systems

2.1. Generating Facilities

ITCT, METC, and ITCM facilities are jurisdictional to the MISO OATT. ITCGP facilities are jurisdictional to the SPP OATT. ITCI facilities are jurisdictional to the PJM-OATT & Operating Agreement. Generation interconnections to ITC facilities will be evaluated and performed in accordance with the procedures of the appropriate OATT. ITC will determine appropriate mitigation solutions for constraints caused by generation interconnections. ITC does not consider installation of series reactors appropriate mitigation for constraints caused by new generator interconnections.

2.1.1. Generation Interconnections – MISO

ITCT, METC, and ITCM follow the MISO generation interconnection process for coordination of studies among MISO and Affected System Owners for evaluation of new Generating Facility interconnections or material modifications to existing Generating Facility interconnections as outlined in the MISO OATT Attachment X – Generator Interconnection Procedures. For details regarding the MISO Generation Interconnection Procedures, refer to the MISO OATT and the MISO Business Practice Manuals which can be found on the MISO public website (www.misoenergy.org).

2.1.2. Generation Interconnections – SPP

Generation connections to the ITC system where the ITC facilities are jurisdictional to the SPP OATT will follow the SPP Generation Interconnection Procedures (Attachment V to the SPP OATT). For details regarding the SPP Generation Interconnection Procedures, refer to the SPP OATT, which can be found on the SPP public website (www.spp.org).

2.1.3. Generation Interconnections – PJM

Generation connections to the ITC system where the ITC facilities are jurisdictional to the PJM OATT & PJM Operating Agreement will follow the PJM Generation Interconnection Procedures (Attachment S to the PJM OATT). For details regarding the PJM Generation Interconnection Procedures, refer to the PJM OATT, which can be found on the PJM public website (www.pjm.com).

2.2. Transmission Facilities

ITC follows the MISO MTEP, the SPP ITP, and the PJM RTEP process to facilitate the coordination of studies for new or materially modified transmission to transmission interconnections and their impacts on the interconnected transmission system. Customers desiring to connect new transmission Facilities or to materially modify existing transmission Facilities must provide a written notification containing project details and modeling information sufficient for ITC to initiate required planning studies. Planning studies will determine if the transmission interconnection to the ITC Transmission System causes any reliability violations on the interconnected Transmission System. If the proposed Facility causes any Transmission System violations, ITC will determine appropriate mitigation solutions to accommodate the connection. ITC does not consider series reactors appropriate mitigation for constraints caused by the interconnection of new transmission Facilities. All applicable NERC, Regional Reliability Organization, subregional, Power Pool, and individual Transmission Owner planning criteria, and facility connection requirements shall be considered.

2.3. End-User Facilities

ITC follows the MISO MTEP, SPP ITP, and PJM RTEP processes to facilitate the coordination of studies for new or materially modified end-user facilities and their impacts on the interconnected Transmission System. Customers desiring to connect new end-user facilities or to materially modify existing end-user facilities must provide a written notification or application containing project details and modeling information sufficient for ITC to initiate required planning studies. Planning studies will determine if the requested facility connection to the Transmission System causes any reliability violations on the interconnected Transmission System. If the proposed facility causes any Transmission System

violations, ITC will determine appropriate mitigation solutions to accommodate the proposed connection. All applicable NERC, Regional Reliability Organization, subregional, Power Pool, and individual Transmission Owner planning criteria, and facility connection requirements shall be considered.

3. Procedures for Notification of New or Modified to Others (Those Responsible for the Reliability of the Interconnected Transmission Systems) As Soon As Feasible

3.1. Generating Facilities

ITC follows the MISO, SPP, and PJM processes for notification of new or modified facilities to others as found in the applicable Generation Interconnection Procedures. In addition to the postings on OASIS, all new or modified Generating Facilities having filed applications to MISO, SPP, or PJM are summarized in a Generation Queue posting on the MISO public website (www.misoenergy.org), on the SPP public website (www.spp.org), or on the PJM public website (www.pjm.com).

3.2. Transmission Facilities

ITCT, METC, and ITCM use the MISO MTEP process and Appendix A to notify others of new or materially modified transmission Facility plans within the MISO region. The SPP ITP process and corresponding ITP Appendix A and Appendix B, as well as the SPP quarterly project tracking report are used to notify others of new or materially modified transmission Facility plans in SPP. ITCI uses the PJM RTEP process to notify others of new or materially modified transmission Facility plans within the PJM region.

3.3. End User Facilities

ITCT, METC, and ITCM use the MISO MTEP process and Appendix A to notify others of new or materially modified transmission Facility plans due to end-user connections within the MISO region. The SPP ITP process and corresponding ITP Appendix A, Appendix B, as well as the SPP quarterly project tracking report are used to notify others of new or materially modified transmission Facility plans due to end-user connections in SPP. ITCI uses the PJM RTEP process to notify others of new or materially modified transmission Facility plans due to end-user connections within the PJM region

4. Voltage level and MW and MVAR capacity or demand at point of connection

4.1. Generating Facilities

The voltage level and MW and MVAR capacity of Generating Facilities are provided as part of the required data submittal in the MISO, SPP, or PJM Interconnection Request. The Interconnection Customer will provide Generating Facility and Interconnection Facility data sufficient for ITC to determine the impact of the Interconnection Customer equipment upon the transmission system including but not limited to: generator machine parameters, generator step up transformer impedance and tap settings, and collector system or generator tie line positive, negative, and zero sequence impedance and charging up to the POI.

4.2. Transmission Facilities

The voltage level of a new transmission facility interconnection will be driven by the POI to the ITC system. The MW and MVAR capacity needs of the new facilities will be determined based upon joint studies.

4.3. End User Facilities

Any entity wishing to connect end-user facilities to an ITC system must fill out a load interconnection request which includes information such as but not limited to: in-service dates, project descriptions, location and voltage level of proposed interconnection, transformer size, real and reactive load projections, and project justification.

5. Breaker Duty and Surge Protection

5.1. Generating Facilities

All three phases of customer interrupting devices shall be interrupted simultaneously and the tripping control of the customer circuit breaker shall be powered independently of the Transmission System or facility AC sources in order to permit operation upon loss of the Transmission System connection or the Facility AC power supply. Isolation of Generating Facilities shall not result in the interruption of any ITC transmission line except as deemed acceptable by ITC.

Minimum ampacity requirements according to ANSI C37.5 standard for asymmetrically rated breakers and ANSI C37.010 standard for symmetrically rated breakers must be met. Facility equipment and interrupting devices shall be sized at a rating which exceeds the maximum available fault current at their location by a reasonable margin. ITC will not be responsible for the cost of upgrading

customer owned equipment should fault levels rise in the future due to system changes.

Surge protection shall be provided by surge arresters that shall be selected to coordinate with the BIL rating of major equipment components.

5.2. Transmission Facilities

All three phases of interconnected Transmission Owner's interrupting devices protecting the interconnected Facility shall be interrupted simultaneously and the tripping control of the circuit breaker(s) shall be powered independently of the Transmission System or Facility AC sources in order to permit operation upon loss of the Transmission System connection or the facility AC supply. Isolation of other transmission facility owner's facilities shall not result in the interruption of any ITC transmission line except as deemed acceptable by ITC.

Minimum ampacity requirements according to ANSI C37.5 standard for asymmetrically rated breakers and ANSI C37.010 standard for symmetrically rated breakers must be met. Facility equipment and interrupting devices shall be sized at a rating which exceeds the maximum available fault current at their location by a reasonable margin. ITC will not be responsible for the cost of upgrading other transmission facility owner's equipment should fault levels rise in the future due to system changes.

Surge protection shall be provided by surge arresters that shall be selected to coordinate with the BIL rating of major equipment components.

5.3. End User Facilities

For all three-phase interrupting devices employed, all phases shall be interrupted simultaneously and the tripping control of the interrupting devices shall be powered independently of the Transmission System or Facility AC power sources in order to permit operation upon loss of the Transmission System connection or the facility AC supply. Isolation of the end-user facilities shall not result in the interruption of any ITC transmission line except as deemed acceptable by ITC.

Minimum ampacity requirements according to ANSI C37.5 standard for asymmetrically rated breakers and ANSI C37.010 standard for symmetrically rated breakers must be met. Facility equipment and interrupting devices shall be sized at a rating which exceeds the maximum available fault current at their location by a reasonable margin. ITC will not be responsible for the cost of upgrading end-user's equipment should fault levels rise in the future due to system changes.

Surge protection shall be provided by surge arresters that shall be selected to coordinate with the BIL rating of major equipment components.

6. System Protection and Coordination

No new Remedial Action Schemes ("RAS") will be installed on the ITC systems. ITC will not support the installation of a new RAS on another system where the purpose of the RAS is to mitigate a constraint on the ITC system.

6.1. Generating Facilities

In general, ITC will construct a protective relaying scheme to protect the Transmission System from faults occurring on a customer's Interconnection or Generating Facility and from faults occurring on the Transmission Owner's Interconnection Facilities ("TOIF") and the Transmission System. Reclosing of generation to the ITC transmission systems is typically not allowed. At the developer's request, reclosing may be considered by ITC provided the Operations of the system, the Protection of the system, and all other system constraints can be adjusted to accommodate the reclosing. This will be done solely at the developer's liability.

The Interconnection Customer will be responsible for providing protection for its Generating Facility from faults occurring on its facilities and from faults or other electrical disturbances occurring on either the ITC transmission system or any interconnected system. The Interconnection Customer will be responsible for removing any fault contribution of the Generating Facility to any short circuit occurring on the transmission system or any interconnected system not otherwise isolated by ITC's equipment, such that the removal of the fault contribution shall be coordinated with the protective requirements of ITC's system, as applicable. For example, when the only source behind a transmission line fault is the generator, local transmission line relaying may not trip and will require the generator to clear the fault.

Unless otherwise agreed upon and noted, under normal operation, Inverter Based Resources ("IBR") generating facilities shall operate in an "Active Current Priority" or an equivalent mode. During fault ride-through, IBR generating facilities shall switch to operate in a "Reactive Current Priority" or an equivalent mode. Post fault, the IBR generating facilities shall return to operating in an "Active Current Priority" or an equivalent mode.

Current Blocking has also been referred to as momentary cessation throughout the utility industry. Interconnection Customer's facilities shall continue current injection inside the "No Trip" zone of the frequency and voltage ride through curves of PRC-024. They also shall continue to inject current inside the "May Trip: zone of the frequency and voltage ride through curves of PRC-024 up to the capabilities of the Generating Facility. Current Blocking shall only be permitted if identified as necessary through Interconnection Studies.

For balanced faults, the IBR shall inject reactive current dependent on the terminal voltage. The difference between reactive current injection during a fault and pre-fault reactive current output shall be incremental and shall not be negative. (i.e. reactive current during a fault shall be higher than pre-fault)

For unbalanced faults, the IBR shall inject both positive sequence reactive current as well as negative sequence current such that for Type 4 IBRs the negative sequence current leads the negative sequence voltage between 90 – 100 degrees. For Type 3 IBRs the negative sequence current leads the negative sequence voltage between 90 – 150 degrees.

All relays specified by the Interconnection Customer for the protection of the ITC system shall be approved by ITC and be connected to instrument transformers with acceptable accuracy. The protection or relay inputs the Interconnection Customer shall provide include but are not limited to relaying for over- and under-frequency protection, over- and under-voltage protection, bus differential protection, and generator high-side circuit breaker failure protection.

In accordance with Good Utility Practice, Interconnection Customer shall design protection schemes such that no single component failure will prevent the isolation of faults and failed equipment. Meeting this requirement generally means providing redundant or backup protective schemes, with separate sensing sources, separate trip paths, dual trip coils on breakers, breaker failure, separate control power supplies, etc., provided that Interconnection Customer will provide only one battery system. If the Interconnection Customer only has one battery, it shall be monitored for open circuit and low voltage.

The interconnecting generation short circuit equivalent shall provide an effective ground source to the transmission system. Effective grounding will ensure that the generator's ground reference is not lost during switching scenarios which may result in damage to ITC's equipment and affect the safety of ITC's personnel. Effective grounding shall be provided by connecting the Generator Step-Up (GSU) transformer or the interconnecting grid transformer (if one is connected downstream of the GSU) in Wye – Delta or Wye- Wye-Delta with a Grounded Wye connection to the transmission side.

Per IEEE 142-2007 effectively grounded is defined in as:

$$For\ all\ system\ conditions:$$
$$\left(\frac{X_0}{X_1} \leq 3.0\right) and\ \left(\frac{R_0}{X_1} \leq 1.0\right)$$
$$where$$
$$X_1 = \text{equivalent system positive sequence reactance}$$
$$X_0 = \text{equivalent system zero sequence reactance}$$
$$R_0 = \text{equivalent system zero sequence resistance}$$

ITC reserves the right to modify these requirements on a case by case basis.

ITC may determine instances when high speed line relaying or transfer trip protection scheme(s) are required to adequately protect its system as a result of the generator interconnection. Communication equipment will then need to be installed along with communication channels. Fiber optic cable is the preferred means of communication for new installations. ITC reserves the right to determine, based on geographical location and system constraints, when a specialized relaying scheme is necessary and to specify the type of communication channel in order to ensure compatibility with existing protection schemes.

If not already supplied by the generator, ITC may require the use of power system stabilizers for certain generators (depending on the plant size, excitation system type and settings, facility location, area transmission system configuration, and other factors).

Using guidance stated in IEEE1547 as a basis, an anti-islanding relay scheme shall be required if the nameplate MVA of generation in a potential island of generation with transmission connected distribution load exceeds one third of the identified island's minimum load. This ensures that if the load to generation ratio in an island is not sufficiently imbalanced so as to trigger the operation of the generator's over/under voltage or frequency protection, the island will still get disconnected by the anti-islanding scheme. Prolonged uncontrolled voltage and frequency in the island could lead to fluctuations posing a potential safety hazard or potential equipment damage and/or reliability issues.

6.2. Transmission Facilities

Specific protection requirements are contingent upon the final configuration as mutually agreed upon by the connecting transmission Facility owners and ITC.

ITC shall be solely responsible for the design and definition of protective relaying for the ITC transmission system. Other transmission facility owners shall assume complete responsibility for the protection of their facilities.

Protective relaying systems designed by other transmission facility owners shall be coordinated with ITC to ensure that the proposed relaying permits satisfactory protective system coordination at the POI.

6.3. End User Facilities

Specific protection requirements are contingent upon the final configuration as mutually agreed upon by end-user facility owners and ITC.

ITC shall be solely responsible for the design and definition of protective relaying for the ITC transmission system. End-user facility owner assumes complete responsibility for the protection of its facilities.

The end-user facility owner will be responsible for providing protection for its end-user facility from faults occurring on its facilities and from faults or other electrical disturbances occurring on either the ITC transmission system or any interconnected system. The end-user facility owner will be responsible for removing any fault contribution of the end-user facility to any short circuit occurring on the transmission system or any interconnected system not otherwise isolated

by ITC's equipment, such that the removal of the fault contribution shall be coordinated with the protective requirements of ITC's system, as applicable.

The protective relaying systems designed by end-user facility owners are subject to ITC review and approval. ITC shall determine whether the proposed relaying provides satisfactory protective system coordination at the POI. End-user facility owner shall obtain ITC approval prior to ordering protective equipment.

ITC shall specify the design and all settings for those end-user owned relays required for the protection of the ITC transmission system. The end-user facility owner is to obtain prior approval from ITC, which will not be unreasonably withheld or delayed, for any revision to the specified relay settings.

7. Metering and Telecommunications

As part of specifying metering equipment, settings, and requirements, ITC shall determine that any new or materially modified transmission Facilities resulting from any Generator, Transmission, or End-User Facility connections to ITC's transmission system are within the appropriate Balancing Authority Area's metered boundaries. Such determinations shall be corroborated by, but not limited to, Generator Interconnection requests processed through an RTO's generator interconnection process, a local balancing authority agreement, transmission agreement specifying balancing authority boundaries, other types of agreements delineating balancing authority provisions, or written confirmation from affected parties. For areas where ITC is not the Balancing Authority, the applicable Balancing Authority or Local Balancing Authority metering requirements shall be followed by the interconnecting party.

7.1. Generating Facilities

ITC will not own, supply or maintain revenue meter(s). The Interconnection Customer shall supply, install and maintain revenue class, wound-type current transformers and potential transformers as well as revenue meters that are acceptable to ITC. The accuracy of the instrument transformers shall be 0.3 percent or better, and the accuracy of the meters and transducers shall be 0.2 percent or better. The Interconnection Customer shall provide to ITC records of meter testing and accuracy for each interconnection point upon request.

Interconnection Customers will comply with the metering requirements of the applicable RTO's Tariff and Generator Interconnection Agreement. Metering equipment shall typically be placed on the Interconnection Customer side of the POI to minimize its effect on the operation of the Transmission System and the effects of ferro-resonance. Metering shall be loss compensated to the POI.

Telemetry/SCADA is required for the monitoring, control, and status of Interconnection Customer's and ITC equipment. Interconnection Customer shall install and pay the installation cost and monthly communication costs of all required telemetry equipment. Telemetry equipment will generally consist of all required transducers, remote terminal units (RTU), modems, telecommunication lines, and any other equipment of the same function. A reliable, dedicated communications circuit meeting the approval of ITC shall be utilized to transmit SCADA information from the generating facility site. The communications circuit typically consists of leased phone line, microwave channel, or fiber-optics. Details of the specific telemetry requirements will be provided during the detailed design of the facilities. In general, ITC requires continuous telemetry of the following where applicable:

- Status of all circuit breaker(s) capable of disconnecting the Generating Facility from the ITC system.
- Instantaneous MW and MVAR of each generating unit.
- Instantaneous revenue quality MW and MVAR and cumulative revenue quality MWhr and MVARhr at all (or possibly corrected to) Points of Interconnection and from the Generating Facility.
- Transfer trip communication and generation site transfer trip communication status.
- As applicable, each IBR shall monitor and retain Plant SCADA records and digital fault recorder recordings that will include but not be limited to logging of all breaker statuses, relaying trips, and control operations throughout the plant per IEEE 2800-2022 Section 11. Refer to Figure 1 of IEEE 2800-2022 for what is included as "Plant".

As stated in Section 6, telecommunication channels may also be required for pilot relay/high speed protection or for direct transfer trip schemes. The types of communication links can include, but are not limited to, power line carrier, fiber optic cable, radio, and pilot wire. ITC reserves the right to specify the type and characteristics of the communication channel to ensure compatibility with its existing protection.

7.2. Transmission Facilities

Metering and telecommunications requirements of a new transmission interconnection shall be mutually agreed upon as part of the interconnection study process. Data points such as status of transmission facility owner's equipment and real and reactive flows on the line will be expected to be included in the telecommunications (SCADA) design.

Except where prior agreements exist, ITC will own revenue meters at:

- Tie lines between an ITC Balancing Authority and other Balancing Authorities
- Tie lines between CONS and DECO Local Balancing Authorities.

ITC will not own revenue meters at:

- Tie lines with other Balancing Authorities where ITC is not a Balancing Authority (e.g. on the ITC Midwest, ITC Great Plains, and ITC Interconnection systems)
- Tie lines with municipalities or cooperatives

For Interconnection Customer owned metering connecting to the ITC Balancing Authority, the Interconnection Customer shall supply, install and maintain revenue class meters and revenue class, wound-type current transformers and potential transformers that are acceptable to ITC. The accuracy of the instrument

transformers shall be 0.3 percent or better, and the accuracy of the meters and transducers shall be 0.2 percent or better. The Interconnection Customer shall provide to ITC records of meter testing and accuracy for each interconnection point upon request.

Unless otherwise agreed upon, the location of the metering equipment shall be at the POI. For approved cases where the metering point and the POI differ, the metering equipment shall account for losses occurring between the two points.

7.3. End User Facilities

Except where prior agreements exist, ITC will not own revenue meters at any end-user Facilities.

For interconnections to the ITC Balancing Authority, ITC may require the end user to supply, install and maintain revenue class meters and revenue class, wound-type current transformers and Potential Transformers that are acceptable to ITC. The accuracy of the instrument transformers shall be 0.3 percent or better and the accuracy of the meters and transducers shall be 0.2 percent or better. The Interconnection Customer shall provide to ITC records of meter testing and accuracy for each interconnection point upon request.

Unless otherwise agreed upon, the location of the metering equipment shall be at the POI. Meters shall typically be placed on the Interconnection Customer side of the POI to minimize their effect on the operation of the Transmission System and the effects of ferro-resonance. For approved cases where the metering point and the POI differ, the metering equipment shall account for losses occurring between the two points.

Telecommunications/SCADA of the following data may be required at the end-user facility:

- Net real and reactive power flow from the ITC system to the end-user facility.
- Status (open-closed) of the end-user transformer primary protection device and secondary breaker.

8. Grounding and Safety Issues

The grounding system design shall be in accordance with IEEE Standard 80. The facility must have a ground grid that is solidly connected to all metallic structures and other non-energized metallic equipment and which maintains coordination with ITC protective relaying systems.

9. Insulation and Insulation Coordination

Equipment insulation and insulation coordination must be designed according to Good Utility Practice. In general, Facilities shall be protected against lightning and switching surges. This typically includes station shielding against direct lightning strikes, surge arresters, and shielding on all incoming transmission lines. Basic Impulse Level (BIL) ratings of interconnected facilities shall be equal to, or exceed, the BIL ratings of ITC equipment.

10. Voltage, Reactive Power, and Power Factor Control

10.1. Generating Facilities

In general, all synchronous generators are responsible for regulating the voltage and reactive flow at their POI to the ITC transmission system. The generators may be asked to maintain a prescribed voltage schedule to support voltage and VAR requirements in their local area. The voltage schedule is subject to change by ITC at any time to meet transmission system requirements. Automatic Voltage Regulating (AVR) equipment is required on all synchronous generators.

Similar to synchronous facilities, all non-synchronous Generating Facilities will be required to maintain a prescribed voltage schedule to support voltage and VAR requirements in their local area. As such, non-synchronous generators shall have continuous monitoring and remote adjustment capabilities of their reactive compensation facilities to insure that prescribed voltage schedules are maintained in a timely manner as system conditions fluctuate.

All synchronous generation Facilities must be able to maintain a composite power delivery at all power output levels at the POI at a power factor within the range of 0.95 leading to 0.95 lagging. This power factor range standard shall be dynamic.

All non-synchronous generation Facilities must be able to maintain a composite power delivery at all power output levels at the high-side of the generator substation at a power factor within the range of 0.95 leading to 0.95 lagging. This power factor range standard shall be dynamic.

Generating Facilities will be designed to not cause voltage criteria violations at both zero and full generator output. In addition, generation, both synchronous and non-synchronous, should be designed to eliminate reactive power injection into or withdrawal from the system during times when the generator is not producing real power. This includes reactive injection caused by generator Facilities such as wind farm collector systems.

In cases where multiple projects are connected via shared facilities to a common POI, the reactive compensation necessary for the collective operation of the projects for the Interconnection Customer(s) will be coordinated by the Interconnection Customer of the last interconnected project in order to provide the Transmission Owner with a single point of contact for necessary reactive power contributions at the common POI.

10.2. Transmission Facilities

Each Party recognizes and agrees that it has a responsibility for maintaining voltage and VAR support at each Interconnection Point in accordance with applicable regulatory requirements. ITC is responsible for maintaining Transmission System voltage and VAR flows on its system. Transmission facility owners are responsible for controlling Transmission System voltage and VAR flows on their respective systems. Each Party shall use a combination of static and dynamic reactive sources at various locations to address reactive power supply issues. Each Party shall operate its system in such manner that the voltage levels on the system are maintained at reliable levels.

HVDC facilities connected to ITC facilities will have a minimum +/- .95 power factor capability at the POI.

10.3. End User Facilities

Each Party recognizes and agrees that it has a responsibility for maintaining voltage and VAR support at each interconnection point in accordance with applicable regulatory requirements and subject to any specific requirements imposed in the relevant interconnection agreement between the two parties where applicable.

ITC is responsible for maintaining Transmission System voltage and reasonably compensating for reactive power losses on the transmission system. The end-user Facility owner is responsible for controlling end-user voltage and compensating for reactive power consumption and losses on the end-user Facilities. Each Party shall use a combination of static and dynamic reactive sources at various locations to address reactive power needs and minimize reactive power flow between the systems.

11. Power Quality Impacts

Interconnected Facilities shall not cause excessive voltage flicker or harmonic distortion on the electric facilities of ITC. IEEE Standard 519 provides definitions and limits on acceptable levels of voltage fluctuation and harmonic distortion. Facilities connecting to the ITC transmission system shall comply with the limits set by IEEE 519.

Switched loads, capacitor banks, and reactors shall not result in a voltage step change greater than 3% on the ITC transmission system, regardless of the frequency of occurrence.

Voltage unbalance shall not exceed 1.0% measured at the POI. The allowable limit applies to normal steady-state operating conditions and is measured by the formula:

Voltage Unbalance (%) = (Max. Deviation from Avg. Voltage ÷ Avg. Voltage) x 100

Average voltage is defined as the sum of the three phase voltages divided by three.

12. Equipment Ratings

Interconnection Customer or connecting Transmission Owner shall size their Facilities using applicable Reliability Standards, Good Utility Practice and the information provided in the evaluation of the interconnection in order to ensure that the interconnecting Facilities appropriately coordinate with ITC's Facilities.

Interconnection Customer or interconnecting Transmission Owner agrees to provide appropriately sized or short circuit-rated Facilities comparable to those required by Transmission Owner using applicable Reliability Standards, Good Utility Practice, and the information provided in the evaluation of the interconnection.

Equipment must meet minimum ratings required to operate the facility at full load under normal ratings of the equipment. This includes, but is not limited to, voltage class, ampacity, available fault current rating, fault closing rating, and basic impulse level (BIL).

The ratings for a jointly owned Facility shall be coordinated to determine the most limiting elements so that one set of ratings for the Facility can be obtained.

13. Synchronizing of Facilities

Generating facilities are responsible for providing the necessary controls to synchronize generation to the ITC system across any generating unit breaker or the POI to the ITC system. Generating Facilities will be required to have at least one functional synchronizing check relay that supervises the connection and prevents asynchronous closing.

Interconnecting transmission or end-user Facilities will be operated in synchronism at the POI.

14. Maintenance Coordination

Interconnected Facility owners shall maintain their interconnected Facilities (i) in a safe and reliable manner; (ii) in accordance with Good Utility Practice; (iii) in accordance with Applicable Laws and Regulations; (iv) in accordance with any

applicable interconnection Agreements; and (v) to reasonably protect other transmission systems from the adverse impact from the operation of their Facilities.

ITC and the interconnected entity shall confer regularly to coordinate the planning, scheduling and performance of preventive and corrective maintenance on the Interconnection Facilities. Each entity shall cooperate with the other in the inspection, maintenance, and testing of control or power circuits including, but not limited to, any hardware, control or protective devices, cables, conductors, electric raceways, secondary equipment panels, transducers, batteries, chargers, and voltage and current transformers that directly affect the operation of an entities' Facilities and equipment which may reasonably be expected to impact another entity. Each entity shall provide advance notice to the other entity before undertaking any planned work on Interconnection Facilities.

15. Operational Issues (Abnormal Frequency and Voltages)

ITC and the Interconnection Customer or interconnected Transmission Owner will work together to establish appropriate procedures, protocols and operating guides (if necessary) to account for and manage abnormal frequency, voltages or other operating limits in accordance with the ITC Planning Criteria, all appropriate industry standards, Mandatory Reliability Standards, and Good Utility Practice.

For interconnected Generators, voltage schedules shall be followed according to applicable Generator Interconnection Agreements and other applicable regulatory requirements. ITC may, at any time direct a change from the normal voltage schedule in response to system operating/security requirements.

Frequency changes shall be limited to ± 0.5 Hz.

End-user Facilities may be asked to participate in any UVLS (under voltage load shedding) or UFLS (under frequency load shedding) programs as needed for system security.

16. Inspection Requirements for Existing or New Facilities

16.1. Generating Facilities

Interconnection Customer and ITC have rights to inspect Facilities. Each Party shall have the right, but shall have no obligation to: (i) observe Transmission Owner's and Interconnection Customer's tests and/or inspection of any of their respective System Protection Facilities and other protective equipment, including power system stabilizers; (ii) review the settings of the System Protection Facilities and other protective equipment; and (iii) review the maintenance records relative to the Interconnection Facilities, the System Protection Facilities and other protective equipment.

16.2. Transmission Facilities

ITC shall have the right, but no obligation or responsibility to inspect that portion of the other transmission owner's electrical system that connects directly to ITC Facilities and transmission system. ITC shall provide reasonable notice to the Transmission Owner of its intent to perform an inspection. This includes, but is not limited to:

1. Witness operational tests of interconnection breakers and disconnects.

2. Witness operational tests of SCADA telemetry with the ITC Transmission Operations Center.

3. Witness operational testing of the other Transmission owner's protective relaying that is designed to clear faults from the ITC system to ensure that relays trip interconnection devices.

16.3. End User Facilities

ITC shall have the right, but no obligation or responsibility to inspect that portion of end-user's electrical system that connects directly to ITC Facilities and transmission system. ITC shall provide reasonable notice to the End User of its intent to perform an inspection. This includes, but is not limited to:

1. Witness operational tests of interconnection breakers and disconnects.

2. Witness operational tests of SCADA telemetry with the ITC Transmission Operations Center.

3. Witness operational testing of End-user's protective relaying that is designed to clear faults from the ITC system to ensure that relays trip interconnection devices.

4. Review on site test data of transformers directly connected to the ITC system.

5. Review on site test data of cables directly connected to the ITC system.

6. Inspection of the station ground grid and review of ground grid resistance test results.

17. Communications and Procedures During Normal and Emergency Operating Conditions

A communication link must be established between the interconnected Facility owner and ITC. This path will normally be via telephone, with phone numbers and contact personnel agreed upon by the interconnected Facility owner and ITC. ITC and the interconnected Facility owner shall identify the contact personnel and provide phone numbers for 24-hour, year-round contact capability.

The interconnected Facility owner will communicate with ITC prior to re-establishing connection to the ITC system after any interruption of the interconnection due to scheduled or unscheduled interruptions. ITC contact phone numbers will be provided.

18. Revision History

Date Published	Revision Number	Individual Making Edits	Reason / Comments
01/27/21	000	R Kloecker	Original version. Carryover- Renumbered Sections. Section 1 standardized connection configurations, Section 2 added language regarding series reactors, Section 6 Clarified protection language, Section 10.2 added HVDC power factor requirements.
07/12/22	001	R Kloecker	Annual review . Revised document for potential waiver or variance of requirements.
11/15/22	002	M. Fleck	Added Inverter Based Resources requirements in Section 6.1. Added last bullet point in Section 7.1 regarding what is to be monitored at locations with Inverter Based Resources.