Contents

Acronyms

ANSI - American National Standards Institute
ASCE - American Society of Civil Engineers
AVR - Automatic Voltage Regulators
BES - Bulk Electric System
BIL - Basic Insulation Level
IEEE - Institute of Electrical and Electronics Engineers
NEET-MA - NextEra Energy Transmission – MidAtlantic
NERC - North American Electric Reliability corporation
NESC - National Electric Safety Code
OATT - Open Access Transmission Tariff
OHGW – Overhead Ground Wire
OSHA - Occupational Safety and Health Administration
PJM – PJM Interconnection
POI - Point of Interconnection
PSS - Power System Stabilizer
QSE – Qualified Scheduling Entity
RF - Reliability First
RTEP - Regional Transmission Expansion Planning
SCADA - Supervisory Control and Data Acquisition

1 PURPOSE

To avoid adverse impacts on the reliability of the Bulk Electric System (BES), Transmission Owners must document and make facility interconnection requirements available so that entities seeking to interconnect will have the necessary information. This document is published in compliance with NERC Reliability Standard FAC-001 and FAC-002, with the purpose of establishing NextEra Energy Transmission – MidAtlantic (NEET-MA) requirements for interconnecting new and materially modified facilities. The objective of this document is to ensure compliance with NERC Reliability Standards, applicable Regional Reliability Organization, sub-regional and individual Transmission Owner planning criteria.

2 INTRODUCTION

This document has been prepared to comply with NERC Reliability Standard FAC-001 and FAC-002, Reliability First (RF), and PJM Interconnection (PJM) requirements to identify the technical requirements for interconnecting new and materially modified facilities to the NEET-MA transmission system to include transmission interconnections concerning generators, end-user delivery points or other transmission related interconnections. This document provides a general overview of the functional objectives and requirements to be met in the design of interconnecting facilities.

These requirements are written to establish a basis for maintaining reliability, power quality and a safe environment for the general public, power consumers, maintenance personnel, and associated equipment. The requirements and guidelines described in this document are consistent with those used by NEET-MA when interconnecting new and modified NEET-MA facilities. All interconnecting facilities, new and existing, requesting interconnection or interconnection upgrades to the NEET-MA transmission system shall be planned, designed and operated in accordance with these Facility Interconnection Requirements, Good Utility Practice, applicable regional, state and local laws and regulations.

2.1 Generation facilities

The generation facility interconnection requirements described in this document are general overviews of functional requirements for interconnecting new and materially modified generation facilities to the NEET-MA transmission system. Detailed, project specific requirements will be developed via the interconnection process in accordance with NERC Reliability Standards, applicable Regional Reliability Organization, sub-regional and individual Transmission Owner planning criteria and facility interconnection requirements.

2.2 Transmission Facilities

Transmission facility interconnection requirements described in this document are general overviews of functional requirements for interconnecting new and materially modified transmission facilities to the NEET-MA transmission system. Detailed, project specific requirements will be developed via the interconnection process in accordance with NERC Reliability Standards, applicable Regional Reliability Organization, sub-regional and individual Transmission Owner planning criteria and facility interconnection requirements.

2.3 End-User Facilities

End-user facility interconnection requirements described in this document are general overviews of functional requirements for interconnecting new and existing delivery points. Detailed, project specific requirements will be developed via the interconnection process in accordance with NERC Reliability Standards, applicable Regional Reliability Organization, sub-regional and individual Transmission Owner planning criteria and facility interconnection requirements.

3 SUMMARY OF PLANS TO ACHIEVE REQUIRED PERFORMANCE

The PJM Regional Transmission Expansion Planning (RTEP) process is utilized for "utility to utility" initiated interconnections. Generator and Transmission interconnection inquiries are referred to PJM, and the PJM interconnection process is followed. PJM Manual 14A summarizes the PJM interconnection process.

All requests for Generation facility interconnections must be submitted directly to PJM and processed through the PJM Interconnection process. The process is described in PJM Manual 14A.

PJM performs annual studies to evaluate system reliability as described in PJM Manual 14B. As part of the evaluation process, it may be determined that there is a need for additional system reliability support across multiple Transmission Owner facilities. Solutions to identify reliability issues are developed by the affected transmission owners in coordination with PJM. The study results and solutions identified are documented through the RTEP process and posted to the PJM website.

4 PROCEDURE FOR COORDINATED JOINT STUDIES

PJM coordinates joint studies of new Facilities or existing Facilities seeking to make a qualified change and their impact on the transmission system. The process is described in the PJM Manual 14 series of documents which are available on the PJM website.

PJM directs and coordinates the conduct of any studies that may be required to accommodate new interconnections. As such, NEET-MA's involvement with assessing the impacts of new interconnections is at the direction of PJM which ensures a regionally coordinated effort. PJM's practice includes the development of the unified planning and study plan to articulate the scope and detail of technical studies as part of the transmission process plan. The PJM RTEP assessment and approval process is designed to ensure that no adverse impacts to the operability or reliability of the PJM transmission system will result from such planned changes to NEET-MA's transmission system.

4.1 Procedure for Notification of New Facilities or Qualified Changes to Facilities to Others

Notifications will be conducted according to the PJM Manual 14 Series standards and PJM RTEP process, which may include public meetings and Market Notices.

4.2 Procedure for Confirming New Facilities or Existing Facilities seeking to make a Qualified Change are within the Balancing Authority Area's Metered Boundaries

Requests for facility interconnections shall be submitted directly to PJM. The process by which requests for new Facilities or existing Facilities seeking to make a qualified change are submitted is described in PJM Open Access Transmission Tariff (OATT), rules around the PJM Regional Transmission Expansion Process Manual 14B, and the New Services Request Process Manual 14A. PJM assesses facilities within its Balancing Authority Area metered boundaries.

5 VOLTAGE LEVEL, MW AND MVAR CAPACITY OR DEMAND AT POINT OF INTERCONNECTION

The Interconnection Customer should clearly describe the Point of Interconnection ("POI") and provide NEET-MA with the necessary information regarding the voltage level and MW and MVAR capacity or demand at point of connection, load ramp schedule, NEETMA, ramp schedules, etc. (See Appendix A: Load Interconnection Request Form). NEETMANEET-MA will perform studies and exercise engineering judgment to determine appropriate voltage levels, interconnection points, and system capabilities. The transmission system shall be planned such that voltages meet PJM requirements and adhere to NEET-MA's transmission planning criteria.

NEET-MA limits its transmission facilities to 100% of the applicable thermal rating of facilities. NEET-MA also provides Long-Term Emergency (LTE) and Short-Term Emergency (STE) limits in compliance with PJM requirements. The voltage level, MW and MVAR capacity or demand, ramp schedules at POI shall be compatible to, and coordinated with NEET-MA, and shall be in conformance with PJM voltage and reactive requirements. The metering and communication of such metered quantities shall be in accordance with PJM Guides and Protocols for Metering and Telemetering.

Metering equipment should be provided as close to the interconnection point as practicable. The interconnecting facility must be connected to the NEET-MA system through a primary

interrupting device.

Facilities interconnecting to the NEET-MA transmission system must have an isolating device installed at the POI. This isolating device, typically a circuit breaker and associated disconnect switch at a minimum, must be capable of physically and visibly isolating the facilities from the NEET-MA transmission system. This isolating device must be lockable in the open position by NEET-MA or its designated operating representative.

6 BREAKER DUTY AND SURGE PROTECTION

Valid studies shall determine the site specific short-circuit current available for the POI and shall be communicated to the appropriate interconnecting entities. Circuit breakers and interrupting devices at the POI shall have ratings that exceed the maximum available close-in fault current plus margin at the point of application.

NEET-MA standard is to shield substations and transmission lines from direct lightning strokes and to provide line entrance arresters at transmission line terminals. Surge arresters are also applied at major components and systems.

AC high voltage circuit breakers are specified by operating voltage, continuous current, interrupting current and operating time in accordance with ANSI/IEEE Standards C37 series, "Symmetrical Current Basis." These ratings are displayed on the individual Circuit Breaker nameplate. Breakers are scheduled for replacement when they exceed 100% of ANSI C37 Guidelines.

There may be cases where adding generation will increase the available fault current above the present interrupting ratings of the existing breakers at a substation or stations. When this occurs, breaker upgrades are to be considered as part of the interconnection project. Similarly, the connection of new generators to the transmission system may increase fault current to a level which exceeds the short time rating of overhead ground wires. The rating of overhead ground wires shall be in accordance with IEEE 80 Guide. If equipment ratings will be exceeded, the appropriate modifications must be performed prior to the new load or generation coming on-line.

7 SYSTEM PROTECTION AND COORDINATION

It is the responsibility of the facility owner to provide all devices necessary to protect its equipment from damage by abnormal conditions and operations that might occur on the interconnected power system. The facility owner shall protect its facilities, substations, generator and associated equipment from overvoltage, undervoltage, voltage transient and oscillation, overload, short circuit (including ground and line-line fault condition), open circuits, phase unbalance, phase reversal, surges from switching and lightning, over and under frequency conditions, and other injurious electrical conditions that may arise on the interconnected system.

The interconnecting facility owner shall design its system protection facilities to isolate any fault occurring on its system that would negatively affect NEET-MA's system at such POI in accordance with applicable PJM requirements, NERC Reliability Standards, and NEET-MA reliability standards. The protection schemes used by the Parties at the POI shall be determined by both Parties in a cooperative effort to achieve system coordination. Complete calibration test and functional trip tests shall be performed at each respective system protection equipment, including communication circuits between facilities, prior to commissioning of the POI to ensure performance and system safety.

NEET-MA designs and operates its transmission system to meet all applicable PJM guides and Protocols, Planning Guides and NERC Planning Standards.

System and generator stability is to be maintained for normal and delayed clearing of all faults. Normal clearing time is the time required by the protection system to detect and subsequently isolate the fault. This time includes contact parting time, relay operation and/or delay time, communication delays associated with tripping signals. A normally cleared fault can typically range between four (4) and nine (9) cycles (0.15 seconds) for circuit elements protected by breakers. It is recommended that the clearing time includes a ½ cycle planning margin to avoid borderline stability issues.

The power system must be stable for faults with the failure of a protection system component to operate. This includes clearing of a system fault with the simultaneous failure of a current transformer, protective relay, breaker, or communication channel. Three-phase faults with the failure of a protection system component to operate are to be considered in all design alternatives with adverse consequences to system stability minimized.

NEET-MA transmission circuits are protected with primary system relays that provide no intentional time delay when clearing faults for 100% of a line. A second high-speed relay system with communications and no intentional time delay is required if a failure of the primary system can result in instability when a fault is cleared by time delay backup protection. This can be the case for an end of line fault on a short line combined with a failed relay. Likewise, two independent high-speed protection systems may be required for bus protection if backup clearing results in instability.

7.1 System Protection and Coordination Requirements for Generation Facilities

Generators connecting to the NEET-MA transmission system are responsible for protecting those facilities from electrical faults and other hazardous conditions. Generator interconnections must be equipped with circuit breakers or other appropriate interrupting devices to protect those facilities. The generator owner must provide and own the primary circuit breaker or other interrupting device that protects the facility and disconnects it from the NEET-MA transmission system. The primary purpose of this interrupting device is to protect the generating plant facility. A joint use circuit breaker that protects both generating unit and transmission circuit facilities as its

primary function is highly discouraged.

Generators connected to the NEET-MA transmission system should be able to withstand certain temporary excursions in voltage, frequency, reactive and real power output without tripping in accordance with the PJM Standards and Planning Guides, Rules, Protocols and Procedures. This is required to support the grid and avoid cascading events.

Generators must be designed to remain on-line for normal clearing system faults within the close proximity to the plant switchyard. Control systems, contactors, motors and auxiliary loads that are critical to the operation of the plant must have ride through capability where needed to avoid generator tripping for close-in faults. Additionally, generator protection systems such as the Load Drop Anticipator, Early Valve Actuator or Power Load Unbalance should not be designed to trip a generator for normal clearing external faults or stable swings.

It is recognized that certain circumstances may necessitate the imposition of more stringent performance criteria than the default criteria specified above. Such circumstances shall be identified during the System Impact Study or Operational Studies for each generator or load with behind the meter generator under study.

7.2 System Protection and Coordination Requirements for Transmission Facilities

Utility grade, transmission level protective relays and fault clearing systems are to be provided on the interconnected power system. All protective relays should meet or exceed ANSI/IEEE Standard C37.90 and shall be consistent with protective relaying criteria described in PJM Requirements, NERC standards, and NEET-MA requirements. Adjoining power systems may share a common zone of protection between two Parties. Compatible relaying equipment must be used on each side of the point of ownership within a given zone of protection. The design must provide coordination for speed and sensitivity in-order to maintain power system security and reliability. When reasonably requested by NEET-MA, the interconnecting entity, at its expense, will provide corrections or additions to existing control and protective equipment required to protect the PJM, NEET-MA system or to comply with governmental and industrial regulations or standards.

All bulk electric systems are to have primary protective relaying that operates with no intentional time delay for 100% of the specified zone of coverage. On transmission circuits, this is accomplished through the use of a communication channel. A second high-speed protection system may be required on transmission elements or bus.

Backup protective systems should provide additional coverage for breaker and relay failure outside the primary zone. Specific breaker failure protection schemes must always be applied at the bulk transmission level. Specific relay failure backup must also be provided. Backup systems should operate for failures on either side of an interconnection point. Time and sensitivity coordination must be maintained to prevent mis-operations.

A power source for tripping and control must be provided at substations by a DC storage battery. The battery is to be sized with enough capacity and redundancy to operate all tripping devices after eight hours without a charger. An undervoltage alarm must be provided for remote monitoring by the facilities owners who shall take immediate action to restore power to the protective equipment.

Mechanical and electrical logic and interlocking mechanisms are required between interconnected facilities to ensure safe and reliable operation. These include, but are not limited to, breaker and switch auxiliary contacts, undervoltage and synch-check relays, and physical locking devices.

A transfer trip is required for many installations. It is used for backup protection and islanding schemes. Fiber optics is the preferred means of communication. Power line carrier or microwave also used in legacy applications but not preferred over fiber optic communication for new installations.

Automatic reclosing on interconnected transmission lines between utilities is handled based on mutually agreed upon policies and standards. High speed automatic reclosing must be avoided at generation substations.

Entities connecting to the NEET-MA transmission system shall investigate and keep a log of all protective relay actions and mis-operations. Entities will provide NEET-MA such logs upon request.

Entities connecting to the NEET-MA transmission system must have a maintenance program for their protection systems in accordance with NERC Standards, PJM requirements, and NEET-MA requirements. Documentation of the protection maintenance program shall be provided to NEET-MA, PJM and NERC upon request. Test reports as outlined in the maintenance program are to be made available for review by NEET-MA and PJM. At intervals described in the documented maintenance program and following any apparent malfunction of the protection equipment, the entity shall perform both calibration and functional trip tests of its protection equipment as outlined in the NERC standards and PJM requirements.

7.3 System Protection and Coordination Requirements for End-User Facilities

End-Users connecting to the NEET-MA transmission system are responsible for protecting end-user facilities from electrical faults and other hazardous conditions. End-User facilities must be equipped with circuit breakers or other appropriate interrupting devices to protect those facilities. End-User facilities must provide, own, and maintain the primary circuit breakers or other interrupting devices that protects and disconnects the facilities from the NEET-MA transmission system.

8 METERING AND TELECOMMUNICATIONS

All metering, telemetering and SCADA design, installations and maintenance shall be performed in accordance with PJM Operating Guides and Protocol requirements and NEET-MA requirements.

Primary power supply for SCADA or metering communication equipment is to be provided by the station battery. Office power systems and switching networks are not acceptable.

Each Party will promptly advise the other Party if it detects or otherwise learns of any metering, telemetry or communications equipment errors or malfunctions that require the attention and/or correction by the other Party. The Party owning such equipment shall correct such error or malfunctions as soon as reasonably feasible in accordance with PJM Requirements.

Any changes to the meters, telemetry equipment, voltage transformers, current transformers, and associated panels, hardware, conduits and cables, which will affect the data being received by the other Party must be mutually agreed to by all the Parties.

8.1 Metering and Telemetry Requirements for Generation Facilities

All generating plants and loads with generation connected to the NEET-MA transmission system must meet the applicable requirements as prescribed by PJM protocols and metering guidelines and NEET-MA requirements.

8.2 Metering and Telemetry Requirements for Transmission Facilities

Metering equipment may be located at either end of the transmission line but should be installed at the station closest to the change of ownership. Metering shall be designed and installed in accordance with Good Utility Practices, applicable PJM operating and metering guidelines, and NEET-MA requirements.

8.3 Metering and Telemetry Requirements for End-User Facilities

All end-user facilities connected to the NEET-MA transmission system are required to have meters at the POI. Metering shall be designed, installed, and maintained in accordance with Good Utility Practices, applicable PJM operating and metering guidelines, and NEET-MA requirements.

9 GROUNDING AND SAFETY ISSUES

Each interconnection substation must have a ground grid that solidly grounds all metallic structures and other non-energized metallic equipment. This grid and grounding system shall be designed to meet the requirements of ANSI/IEEE 80, IEEE Guide for Safety in AC Substation Grounding and ANSI/IEEE C2, National Electrical Safety Code. The transmission line overhead

ground wire (OHGW) shall be connected to the substation ground grid.

If the interconnection substation is close to another substation, the two grids may be isolated or connected. If the ground grids are to be isolated, there may be no metallic ground connections between the two substation ground grids. There must also be sufficient physical separation to limit soil conduction. If the ground grids are to be interconnected, the interconnecting cables must have sufficient capacity to handle the fault currents, duration, and duty. NEET-MA must approve any connection to a NEET-MA substation ground grid.

9.1 Grounding Requirements for Transmission Facilities (Source Systems)

All transmission line structures must be adequately bonded and grounded to control step and touch potential in compliance with the NESC, and to provide adequate lightning performance. All transmission lines should have a continuous ground wire, not relying on earth as the primary conductor, to transfer fault current between structures and to substations and plant switchyards. Any exceptions to a continuous ground wire shall be verified with a system study. All ground wires and bond wires must be adequately sized to handle anticipated maximum fault currents and duty without damage.

Transmission interconnections may substantially increase fault current levels at nearby substations and transmission lines. Modifications to the ground grids of existing substations and OHGWs of existing lines may be necessary. The Interconnection Studies will determine if modifications are required and the scope and cost of the modifications.

Interconnections between NEET-MA transmission system and other transmission systems are normally operated in parallel unless otherwise agreed. However, if any operating condition or circumstance creates an undue burden on the NEET-MA Transmission System, NEET-MA shall have the right to open the interconnection(s) to relieve its system of the burden imposed upon it. Prior notice will be given to the extent practical. Each Party shall maintain its system and facilities as to avoid or minimize the likelihood of disturbances which might impair or interrupt service to the customers of the other Party.

The NEET-MA System Operations group and PJM shall be notified prior to any maintenance work on a transmission interconnection in alignment with NERC Reliability Standards, PJM operating requirements, and NEET-MA requirements. NEET-MA switching and safety procedures shall be strictly adhered to when maintenance is being performed on an interconnection.

9.2 Grounding Requirements for Generation Facilities (Source Systems)

When various switching devices are opened on an energized circuit, its ground reference may be lost if all sources are not effectively grounded. This situation may cause an overvoltage that can jeopardize personnel safety and cause equipment damage. This is especially true when one phase becomes short circuited to ground. Therefore, the interconnected transmission power system is to be effectively grounded from all sources. This is defined as X0/X1< 3 and R0/X1<1. Interconnected generators should provide effective system grounding of the high side transmission equipment by means of a grounded high voltage transformer.

Safety is of utmost importance. Strict adherence to established switching, tagging and grounding procedures is required at all times for the safety of personnel. Any work carried out within a facility shall be performed in accordance with all applicable laws, rules, standards and regulations and in compliance with Occupational Safety and Health Administration (OSHA), National Electric Safety Code (NESC), PJM operating requirements, NEET-MA requirements and good utility practice. Automatic and manual disconnect devices are to be installed for electrical isolation of all elements of the power system. Only trained operators shall perform switching operations within a facility under the direction of the responsible transmission system operator or designated person as outlined in the PJM Guides and Protocols and in the National Electric Safety Code.

Each generating facility shall provide a point of contact to NEET-MA. This contact person shall have the authority and capability to operate the facility according to the instructions of NEET-MA to ensure that the reliability of the transmission system is maintained. A point of contact shall be reachable and available through telephone or other agreed upon means of communication at all times.

Generating facilities connected to the NEET-MA transmission system must follow all applicable NEET-MA operating and reliability requirements, NERC Reliability Standards and PJM Operating and Planning Guides, Rules, Protocols and Procedures.

9.3 Grounding Requirements for Transmission Facilities (End-User)

End-Users shall, in accordance with all IEEE Standards including but not limited to IEEE Standard 80, ground their equipment at the POI with the NEET-MA transmission system.

10 INSULATION AND INSULATION COORDINATION

Insulation coordination is the selection of insulation strength. Insulation coordination must be done properly to ensure electrical system reliability and personnel safety. Basic Surge Levels (BSLs), surge arrester, conductor spacing, and gap application, substation and transmission line insulation strength, protection, and shielding shall be documented and submitted for evaluation as part of the interconnection plan.

The arrester rating must be selected such that the maximum continuous power system voltage applied to the arrester is less or equal to the arrester's continuous voltage capability. An arrester of the minimum practical rating is preferred for its greatest margin of protection of the equipment.

The surge arrester must be coordinated with the Basic Insulation Level (BIL) of the protected equipment to be effective.

Interconnection facilities to be constructed in areas with contamination shall be properly designed to meet or exceed the performance of facilities not in a contamination area with regards to contamination caused outages.

11 VOLTAGE, REACTIVE POWER, AND POWER FACTOR CONTROL

Entities interconnecting their transmission system with the NEET-MA transmission system shall comply with applicable NEET-MA requirements, PJM protocols, guides, procedures and NERC standards regarding reactive power control.

For synchronous generators, the facilities shall be designed, operated and controlled to provide reactive power requirements consistent with policies and standards of PJM. Induction generators shall have static capacitors that provide magnetizing current requirements of the induction generator field consistent with policies and standards of PJM.

12 POWER QUALITY IMPACTS

Power quality requirements are applicable to all generation facilities, transmission facilities and end-user facilities connected to the NEET-MA system. Generation of harmonics should be limited to values prescribed by IEEE Standard 519 when measured at the interconnection point of ownership. Additionally, the NEET-MA transmission system should not be subjected to harmonic currents in excess of 5% of a transformer's rated current as stated in ANSI/IEEE Standard C57.12.00.

Unbalanced currents and voltages are to be controlled by each Party on their respective side of the interconnection. However, it should be taken into consideration that the switching devices, such as breakers and switches, are three-phase devices and can fail with only one or two poles closed. It is the responsibility of the facility owner to protect their own equipment such as generators or transformers from damaging negative sequence currents or voltage.

To protect NEET-MA equipment, the contribution from the new facilities at the connection point shall not cause a voltage unbalance greater than 1% or a current unbalance greater than 5%.

Phase unbalance is the percent deviation of one phase from the average of all three phases. System problems such as an open conductor on a transmission system can result in extended periods of phase unbalance. It is the interconnecting entity's responsibility to protect any of their connected equipment from damage that could result from such an unbalanced condition.

13 EQUIPMENT RATINGS

All substation and transmission facility equipment ratings shall be in accordance with the NEET-MA Facilities Rating Methodology.

Equipment rating requirements are applicable to all generation facilities, transmission facilities and end-user facilities connected to the NEET-MA system. All circuit breakers and other fault interrupting devices shall be capable of safely interrupting fault currents for any fault they may be required to interrupt. Application of circuit breakers shall be in accordance with ANSI/IEEE C37 standards. For facility and equipment ratings, reference the NEET-MA-adopted NextEra Energy Bulk Electric Facility Rating Methodology document. Interconnection facility ratings shall be compatible with those of connected NEET-MA facilities.

14 SYNCHRONIZING OF FACILITIES

It is the responsibility of the facility owner to provide for the orderly re-energization and synchronizing of their high voltage equipment to other parts of the electric system. Appropriate operating procedures and equipment designs are needed to guard against out-of-synch closure or uncontrolled energization. Each facility owner is responsible to know and to follow all applicable standards, regulations, industry guidelines, safety requirements, and accepted Good Utility Practice for the design, operation, and maintenance of the facility.

14.1 Generation Facilities

- Operators of generating facilities must notify PJM and NEET-MA whenever applicable and obtain approval before synchronizing the facility to or disconnecting the facility from the NEET-MA transmission system. Disconnection without prior approval is permitted only when directed by system operator or necessary to prevent injury to personnel or damage to equipment. Generators must not energize a deenergized NEET-MA transmission circuit unless such actions are directed by NEET-MA (or its designee), or PJM or are provided in an interconnection agreement between NEET-MA and the interconnection customer.
- All synchronous generators connected to the NEET-MA transmission system are to be equipped with automatic voltage regulators (AVR). Generators must operate with their excitation system in the automatic voltage control mode unless otherwise approved by PJM and/or NEET-MA. Generating equipment owners shall maintain a log which records the date, time, duration, and reason for not being in the automatic voltage control mode when operating in parallel with the NEET-MA system. Generating equipment owners shall make this log available to PJM and/or NEET-MA onrequest.
- All synchronous generators connected to the NEET-MA transmission system must maintain a network voltage or reactive power output as specified by PJM. Generating equipment owners shall maintain a log which records the date, time, duration, and reason for not

meeting the network voltage schedule or desired reactive power output when injecting into or energized with the NEET-MA system. Generating equipment owners shall make this log available to NEET-MA on request.

- The generator step-up and auxiliary transformer tap settings shall be coordinated with PJM and this information shall be provided to PJM in accordance with PJM MOD process in accordance with NERC, PJM, and NEET-MA requirements.

- The AVR's control and limiting functions must coordinate with the generator's short time capabilities and protective relay settings. The generating equipment owner shall provide NEET-MA with the AVR's control and limiter settings as well as the protection settings which coordinate with AVR control and limiting functions.

- The installation of new generating plants has the potential to aggravate existing modes of oscillation or create new modes. All new large-scale generators as defined in the PJM OATT shall be equipped with a Power System Stabilizer (PSS). Technical evaluations of oscillatory stability will be conducted for the interconnection of new generating plants per PJM OATT requirements. New generators that cause a decrease in the damping of an existing mode of oscillation or cause a poorly damped mode of oscillation will be required to operate with the PSS in service. The determination of the PSS's control settings will be coordinated with PJM and NEET-MA. Typically, this coordination would be to provide NEET-MA with preliminary PSS settings prior to the stabilizer's field commissioning tests with the final settings provided after the field commissioning tests.

- Where stabilizing equipment is installed on generating equipment for the purpose of maintaining generator or transmission system stability, the generating equipment owner is responsible for maintaining the stabilizing equipment in good working order and promptly reporting to the PJM and NEET-MA any problems interfering with its proper operation.

All new generators connected to the NEET-MA transmission system shall be equipped with a speed/load governing control that has a speed droop characteristic in accordance with the PJM Operating Guides and Protocols. Unless otherwise requested by PJM, the preferred droop characteristic setting is 5% as this is the typical setting for generators. Notification of changes in the status of the speed/load governing controls must be provided to the PJM and NEET-MA.

15 MAINTENANCE AND SWITCHING COORDINATION

The maintenance of facilities is the responsibility of the facility owner of those transmission, generation, or end-user facilities. Adjoining facilities on the interconnected power system are to be maintained in accordance with Good Utility Practice, accepted industry practices and procedures and with all applicable NEET-MA requirements, NERC and PJM standards, protocols, guides, policies, rules, and procedures. Each Party is to have a documented maintenance program ensuring the proper operation of equipment. NEET-MA will have the right to review maintenance reports and calibration records of equipment that could impact the NEET-MA system if not properly maintained. NEET-MA and PJM are to be notified as soon as practicable about any out-of-service equipment that might affect the protection, monitoring, or operation of interconnected facilities.

Maintenance of facilities interconnected to the NEET-MA transmission system shall be done in a manner that does not place the reliability and capability of the NEET-MA transmission system, or other portions of the PJM transmission system at risk. Planned maintenance must be coordinated and scheduled with NEET-MA and PJM System Operations and requirements must be in accordance with PJM procedures.

Prior to interconnecting to the NEET-MA transmission system, each Party will adopt formal switching procedures that govern safety related issues concerning the operation of its switches connected to the POI and will provide a copy of those procedures to the other Party. Each Party will agree to and comply with the aforementioned switching procedures of the other Party and will notify the other Party in writing at least ten days prior to implementation of any changes to its procedures.

16 OPERATIONAL ISSUES (ABNORMAL FREQUENCY AND VOLTAGES)

Operational procedures are to be established in accordance with all applicable NESC, OSHA, NEET-MA, PJM, and NERC standards and requirements. Each Party shall designate operating representatives to address lines of communications, maintenance coordination, actions to be taken after de-energization of interconnected facilities, and other required operating policies. Interconnecting Parties are to provide NEET-MA with most recent station operating diagrams, one-line, and three-phase transmission diagrams. Common, agreed upon nomenclature is to be used for naming stations, lines, and switches. Updated diagrams are to be provided when changes occur to interconnected facilities.

The operator of facilities interconnecting to the NEET-MA transmission system shall not perform any switching that energizes or de-energizes portions of the NEET-MA transmission system or that may adversely affect the NEET-MA transmission system without prior notice to NEET-MA System Operations or its designated operating representative, and without prior authorization from PJM or NEET-MA. Operators of facilities interconnecting to the NEET-MA transmission system will notify NEET-MA System Operations, or its designated operating representative before performing any switching that would significantly affect voltages, power flows or reliability in the NEET-MA

transmission system.

The owner and/or operator of facilities interconnecting to the NEET-MA transmission system are responsible for installing and maintaining necessary protection to safeguard its facilities from abnormal voltages or frequencies.

17 INSPECTION REQUIREMENTS FOR EXISTING OR NEW FACILITIES

In situations, where equipment owned by NEET-MA is located within the interconnecting facility owner's property such as metering, installed equipment owned by NEET-MA will be clearly identified as such on the appropriate station drawings, on the reference documents and at the site. Site access is to be provided to NEET-MA employees or its other representatives where NEET-MA equipment is located within the interconnecting facility owner's property. Inspection requirements for existing or new facilities are applicable to all generation facilities, transmission facilities and end-user facilities connected to the NEET-MA system. Interconnecting facilities shall be made available for on-site inspection for the purpose of demonstrating conformance to the requirements set forth in this document. Requests for inspection will be provided in writing at least 14 days in advance. Emergency situations may arise where access may be required with less than 14 days of advance notice. In such situations, NEET-MA will coordinate with all parties to gain access to site.

18 COMMUNICATION AND PROCEDURES DURING NORMAL AND EMERGENCY OPERATING CONDITIONS

Communication requirements during normal and emergency operating conditions are applicable to all generation facilities, transmission facilities, and end-user facilities connected to the NEET-MA system.

All operating entities within the PJM are responsible for maintaining voltage and frequencies within agreed upon limits. All operators of facilities interconnected to the transmission systems in PJM are required to communicate and coordinate with PJM and neighboring operators to coordinate normal and emergency operating actions. During emergency conditions, the facility operator shall raise or lower generation, adjust reactive power, switch facilities in or out, or reduce end-user load as directed by PJM in coordination with NEET-MA System Operations as required. Within the PJM System, PJM has overall responsibility for the secure operation of the interconnected transmission systems. All facility owners are expected to follow all applicable NERC and PJM standards, protocols, guides, policies, rules, and procedures.

19 ADDITIONAL FACILITY INTERCONNECTION REQUIREMENTS

19.1 GENERATION

This section addresses the technical requirements for connecting new generation to the NEET-MA transmission system or materially modifying existing generating facilities connected to the NEET-MA transmission system. General overviews of functional requirements are described in this section. Detailed, project specific requirements will be developed as part of an Interconnection Feasibility Study, System Impact Study or a Facilities Study, or are referenced in other documents such as the NERC Planning Standards, the NERC Operating Standards, and the PJM Interconnection or Change Request Procedure.

19.2 Applicability

This section applies to all interconnections with the NEET-MA system where generation is installed behind the interconnection point and is capable of operating in continuous parallel with the NEET-MA transmission system.

19.3 Configuration

New generating plants that are to be connected to the NEET-MA transmission system are to be designed to minimize the impacts of the maintenance or unplanned outages on existing facilities by new generator and any new lines, transformers, circuit breakers, buses or other equipment related to the interconnection of such new generation facility. The potential adverse effects of maintenance and equipment outages must be considered in the design of the generating plant and its connection to the NEET-MA transmission system.

19.4 Generator Testing

a) Prior to commercial operation, the generating equipment owner shall provide NEET-MA with open circuit, step-in voltage test results. Recording of generator terminal voltage and field voltages shall be clearly labeled so that initial and final values can be identified in physical units.

b) Generating equipment owners shall annually test the gross and net dependable summer and winter capability of their units. These test results shall be provided to the QSE and PJM in accordance with all applicable rules and procedures.

c) Generating equipment owners shall test the gross and net reactive capability of their units on intervals as required by PJM and QSE rules and procedures. These test results shall be provided to QSE and PJM.

Generating equipment owners shall test the AVR control and limit functions of their units on intervals as required by QSE and PJM rules and procedures. An initial test result shall be provided to NEET-MA prior to commercial operation and every test year thereafter. The initial test results shall include documentation of the settings of AVR control and limit functions. Typical AVR limit functions are maximum and minimum excitation limiters and volts per hertz limiters. Documentation of the generator protection that coordinates with these limit functions shall also be provided. Typical generator protection of this type includes overexcitation protection and loss of field protection.

19.5 Generator Data

The generator data filed by the generator owner to PJM must be supplied for all new generators connected to the NEET-MA transmission system in accordance with PJM and NEET-MA's MOD submittal process.

20 TRANSMISSION

This section addresses the technical requirements for connecting new transmission lines to the NEET-MA transmission system as well as for new and existing delivery points. A utility/customer may elect to connect to NEET-MA through a "delivery point" connection or an "interconnection point" connection.

A "delivery point" is an interconnection point between NEET-MA's transmission system and another entity's system or facilities which ultimately delivers the power to individual customers' loads. Two characteristics are generally used to distinguish delivery points from interconnections: i) the protective schemes of the integrated transmission system shall be designed to either entirely or partially suspend service to a delivery point by disconnecting a transmission facility that serves such delivery point from the transmission system; ii) power normally flows only in one direction across the delivery point (i.e., from the transmission system to the delivery point), and thus the protective schemes at the delivery point shall be designed taking this into account.

An "interconnection point" is a point of connection between two entities' respective transmission systems. Protection systems for interconnection points shall be designed to prevent and/or minimize the possibility of an event within one of the systems affecting or cascading into the other system.

20.1 Applicability

This section applies to all interconnections with the NEET-MA transmission system and includes utility- to-utility (entity) type interconnections used for power interchanges. Detailed, project specific requirements will be developed as part of a System Impact Study, a Facilities Study or are referenced in other documents such as but not limited to the NERC Planning Standards or the National Electrical Safety Code. All requests for transmission service shall be made in accordance with the terms and conditions of the NEET-MA and PJM protocols and guidelines.

20.2 Configuration

The interconnection point between utilities is typically through a transmission line or lines. The change of ownership is usually at a transmission line or substation structure. The neighboring utility must have an effectively grounded transmission system.

Three source terminal interconnection configurations of transmission lines are to be avoided within the NEET-MA transmission system. This is due to problems associated with protective relay coverage from in-feed, sequential fault clearing, out-feed or weak source conditions, reduced load flow, and automatic reclosing complications. Extensive studies are necessary to evaluate all possible implications when considering three terminal line applications or any other non-standard line configuration.

New connections to the NEET-MA transmission system may require one or more NEET-MA transmission circuits to connect to the new facility. The design, ratings, and configuration of the new facilities and the transmission lines into them shall not restrict the capability of the NEET-MA transmission facilities or impair NEET-MA contractual or tariff transmission service obligations.

Any new interconnection configuration should be designed in such a way to minimize the likelihood that NEET-MA would be prohibited from taking a NEET-MA transmission facility out of service for a just cause. NEET-MA shall not be forced to open a transmission facility for an adjacent interconnected generator or transmission line to obtain an outage, other than during approved scheduled outage periods as such are coordinated with NEET-MA and PJM, and approved by PJM or in the case of an emergency. Manual switching or clearing electrical faults within the non-NEET-MA facility shall not curtail the ability of NEET-MA to transmit power or provide transmission service to PJM customers.

Reliable station and breaker arrangements will be used when there are new or material modifications to existing NEET-MA substation(s). In general, transmission substations must be configured such that line and transformer, bus and circuit breaker maintenance can be performed without degrading transmission connectivity. This generally implies a breaker-and-a-half or double-breaker-double-bus configuration. A ring bus arranged in a breaker-and-half configuration may be used when a limited number of transmission lines are involved.

All substation and transmission facility equipment ratings shall be in accordance with NEET-MA FAC-008 requirements.

20.3 Structures

Transmission and substation structures for facilities connected to the NEET-MA transmission system shall be designed to meet the National Electrical Safety Code (NESC). Substation bus systems shall be designed to comply with ANSI/IEEE Standard 605, IEEE Guide for the Design of Substation Rigid-Bus Structures.

In addition, for both transmission and substation, structural load criteria shall meet all requirements as specified by "Minimum Design Loads for Buildings and Other Structures", ANSI 7-02, published by American Society of Civil Engineers (ASCE). Proper structural category shall be determined based on ANSI 7-02, Table 1-1.

Structural strength criteria shall comply with applicable industrial standards such as "Design of Latticed Steel Transmission Structures" (ANSI 10, published by ASCE), "Manual of Steel Construction" (published by American Institute of Steel Construction Inc.), or Building Code Requirements for Structural Concrete (ACI-318, published by American Concrete Institute).

21 END-USER FACILITIES

This section addresses the technical requirements and information required to be provided to connect end-user facilities to the NEET-MA transmission system.

21.1 Customer Data

The Customer must provide all applicable information as outlined in the Appendix-A: Load Interconnection Request Form. NEET-MA:

For very large loads, a dynamic load model may be required. This will be determined during the interconnection process.

21.2 Applicability

This section applies to all interconnections with the NEET-MA transmission system. Detailed, project specific requirements will be developed as part of a System Impact Study, a Facilities Study or are referenced in other documents such as but not limited to the NERC Planning Standards or the National Electrical Safety Code. All requests for transmission service shall be made in accordance with NEET-MA requirements, terms and conditions of the PJM protocols and guidelines.

21.3 Configuration

Some new connections to the NEET-MA transmission system may require one or more NEET-MA

transmission circuits to be looped through the new facility. The design and ratings of the new transmission facilities to the point of interconnections to the costumer facility shall not restrict the capability of the transmission circuits or impair NEET-MA contractual or tariff transmission service obligations.

Any new interconnection configuration should be designed in such a way as to minimize the likelihood that NEET-MA would be prohibited from taking a NEET-MA transmission facility out of service for a just cause. NEET-MA shall not be forced to open a transmission facility, other than during approved scheduled outage periods as such are coordinated with NEET-MA and PJM as directed by PJM in the case of an emergency. Manual switching or clearing electrical faults within the non-NEET-MA facility shall not curtail the ability of NEET-MA to transmit power or provide transmission service to PJM customers.

Reliable station and breaker arrangements will be used when there are new or material modifications to existing NEET-MA substation(s). In general, transmission substations must be configured such that line and transformer, bus and circuit breaker maintenance can be performed without degrading transmission connectivity. This generally implies a breaker and a half or double breaker, double bus configuration. A ring bus with a breaker-and-half configuration may be used when a limited number of transmission lines are involved.

All substation and transmission facility equipment ratings shall be in accordance with NEET-MA FAC-008 requirements.

21.4 Structures

Transmission and substation structures for facilities connected to the NEET-MA transmission system shall be designed to meet the National Electrical Safety Code (NESC). Substation bus systems shall be designed to comply with ANSI/IEEE Standard 605, IEEE Guide for the Design of Substation Rigid-Bus Structures.

In addition, for both transmission and substation, structural load criteria shall meet all requirements as specified by "Minimum Design Loads for Buildings and Other Structures", ANSI 7-02, published by American Society of Civil Engineers (ASCE). Proper structural category shall be determined based on ANSI 7-02, Table 1-1.

Structural strength criteria shall comply with applicable industrial standards such as "Design of Latticed Steel Transmission Structures" (ANSI 10, published by ASCE), "Manual of Steel Construction" (published by American Institute of Steel Construction Inc.), or Building Code Requirements for Structural Concrete (ACI-318, published by American Concrete Institute).

22 COMMON REQUIREMENTS

This section addresses the technical requirements that are common to the connection of generation, transmission, and end-user delivery point facilities to the NEET-MA transmission system. General overviews of functional requirements are given in this section. This document is not intended to be a comprehensive design specification. This document references, and therefore is supported by other current, applicable industry standards. Specific design and construction of the electrical facilities are to be in accordance with Good Utility Practice and these standards which include, but are not limited to the following:

- PJM Requirements
- NEET-MA's transmission planning criteria
- NEET-MA FAC-008 requirements
- NFPA – National Fire Protective Association
- NFPA 70 – NEC - National Electrical Code NESC – National Electrical Safety Code NEMA SG-6 – Power Switching Equipment ASTM – American Society of Testing Material
- AISC – American Institute of Steel Construction ACI – American Concrete Institute
- IEEE – Institute of Electrical and Electronic Engineers, Inc. UL – Underwriters Laboratories, Inc.
- EPA - Environmental Protective Agency
- ASME – American Society of Mechanical Engineers ASCE – American Society of Civil Engineers
- NRMCA – National Ready Mixed Concrete Association CRSI – Concrete SI – Concrete Reinforcing Steel Institute ANSI – American National Standards Institute
- ICEA – Insulated Cable Engineers Association
- OSHA – Occupational Safety & Health Administration

The facility designs shall comply with all applicable federal, state and local laws and regulations. Final design of facility connections to the NEET-MA transmission system will be subject to PJM and NEET-MA review and approval on a case-by-case basis conforming to any PJM/NEET-MA responsibilities.

22.1 FERRORESONANCE

Ferroresonance occurs on the power system under certain system configurations that may damage high voltage equipment. This phenomenon is usually caused when power transformers (PT)'s are tied to a bus or line stub that may be energized through breakers having capacitors in parallel with the main contacts. Since interconnection facilities may contain shared equipment, such as metering PT's and high voltage breakers, any configurations that could cause ferroresonance should be avoided. Where such configurations cannot be avoided, detailed studies must be performed prior to installation to ensure ferroresonance will not occur.

22.2 BALANCING AUTHORITY

NEET-MA will confirm with PJM as part of the interconnection process that any new or modified facilities are contained within the metered boundary of the PJM Balancing Authority.

23 Revision History

Version Number	*Description of Change*	*Revised by*	*Approver*	*Signature/ Approval Date*
0	Document Creation	Raul Perez Guerrero	Andrew Taylor	11/1/2021
1	Added FAC-002 Editorial changes	Khan Adnan	John Mcdonald Ryan Dolan	12/01/2024
2	Annual review	Sushil Silwal	John Mcdonald Ryan Dolan	01/15/2026

Appendix – A: Load Interconnection Study Data Request

Category	Task Description	Data Input	Comments
Load Request	Anticipated in-service date of the load		
	Physical Location of Load		
	Requested POI		
	Projected peak load MW requested		
	Initial MW request and anticipated Load ramp by month, if applicable		
	Anticipated Power factor		
	Seasonal (Summer/Winter) peak loads		
	Load Serving Voltage (kV) level		
	Load type (data center, crypto, hydrogen, industrial, other)		
	Is the project co-located		
	Approximate distance from POI (single or double feeding from transmission station)		
Load Composition for CMLD model (Stability study)	Load CMLD Model		Interconnection Customer to provide CMLD model of load or provide breakdown of load types and equipment list
	Motor A (3 phase compressor motor %)		
	Motor B (3 phase fan motor %)		
	Motor C (3 phase pump motor %)		
	Motor D (1 phase compressor motor %)		
	Electrical Load (%)		
	Other Loads		
345/138 kV or 345/other voltage Station Transformers	Number of station transformers		
	Transformer size and ratings (MVA)		
	Transformer voltage rating		
	Transformer impedance(+,-,0)and x/r ratio		
138/13.8 kV or 138/ other Voltage Station Transformers	Number of station transformers		
	Transformer size and ratings (MVA)		
	Transformer voltage rating		
	Transformer impedance(+,-,0)and x/r ratio		
Feeder transformers (if available), otherwise, we will use equivalent model at the load serving station	Number of load serving transformers		
	Transformer size and ratings (MVA)		
	Transformer voltage rating		
	Transformer impedance(+,-, 0)and x/r ratio		
Any behind the meter generation			

Note: Load interconnection customer will be required to provide project's equivalent load model, project's seq. data and dynamic data in PSSE format.

Load study request should include the following additional information:

1. Detailed site map of the project area with the project location clearly identified.
2. One-line schematic diagram of the proposed facility.
3. KMZ that shows the project area, load tie and the POI
4. Details of any non-conforming load that may significantly impact the NEET SW system. For example: Harmonic producing loads
(ASD's, SCR's, etc.), Flicker producing loads (large motors, arc furnaces, etc.).
6. Details on any proposed power factor correction equipment.
7. Description of any generation that is to be operated in parallel (including momentary, soft shutdown, and peak shaving) with the FE power system