vermont electric power company

VELCO

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Facility Connection Requirements

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I. INTRODUCTION

This document describes the requirements for connecting a facility to the Vermont Transco, LLC (VT Transco)[1], and Vermont Electric Power Company (VELCO) service territory in Vermont. These requirements address connection requirements for Generation facilities, Transmission facilities, and End-User facilities. For ease of use, the paragraph headings in this document use the requirement numbers in alignment with the current version of the NERC FAC-001 standard, herein after referred to as FAC-001.

VT Transco is a Participating Transmission Owner (PTO) pursuant to the ISO-New England (ISO-NE) Transmission Operating Agreement (TOA). ISO-NE is authorized by the Federal Energy Regulatory Commission (FERC) to be the transmission provider under the ISO-NE Open Access Transmission Tariff (OATT) of non-discriminatory, open access transmission services over the transmission facilities of the PTOs. As such, the interconnection process and requirements for the entire New England transmission system, including system impact studies and facility connection requirements, are outlined in the ISO-NE Tariff. The ISO-NE web site https://www.iso-ne.com/participate contains all agreements, Tariff provisions, and interconnection documents. Some of those documents are provided below for convenience.

- Open Access Transmission Tariff (OATT) is intended to provide for comparable, nondiscriminatory treatment of all similarly situated Transmission Owners and all Transmission Customers, and it shall be construed in the manner which best achieves this objective.
- Transmission Service Agreement (TSA) is a template for Transmission Service Agreement for Regional Network Service entered into by and between ISO-NE and said "Transmission Customer"
- Schedule 20 – Other Transmission Facilities and Service details the terms and conditions for transmission service over the Other Transmission Facilities, which are currently limited to transmission service offerings under Schedule 20A – Phase I/II HVDC Transmission Facility Service.
- Schedule 21 – Local Service provides for the terms and conditions for Local Service from the various Local Transmission Owners, such as VT Transco.
- Schedule 22 – Standard Large Generator Interconnection Procedures provides the terms and conditions for interconnecting Large Generating Facilities (more than 20 MW) to the Administered Transmission System.
- Schedule 23 – Standard Small Generator Interconnection Procedures provides the terms and conditions for interconnecting Small Generating Facilities (20 MW or less) to the Administered Transmission System.

[1] VT Transco, LLC owns Vermont's high voltage electric transmission system (115 kV and above) and provides service under applicable tariffs to VT's electric distribution utilities, and loads throughout New England through ISO New England. The Vermont Electric Power Company **(VELCO)** manages VT Transco LLC, and in that capacity, operates and maintains Vermont's electric transmission system.

- Schedule 24 – Incorporation by Reference of NAESB Standards provides for the Incorporation by Reference of North American Energy Standards Board ("NAESB") Wholesale Electricity Quadrant ("WEQ") Standards.

- Schedule 25 – Standard Elective Transmission Upgrade Interconnection Procedures provides the terms and conditions for new Pool Transmission Facility, Merchant Transmission Facility or Other Transmission Facility to the administered transmission system. An Elective Transmission Upgrade is not a Generator Interconnection

- Related Upgrade, a Regional Transmission Upgrade, or a Market Efficiency Transmission Upgrade.

VT Transco is a transmission-only utility, which does not own any generation or distribution facilities, and does not serve any retail or wholesale customers. Any interconnection over the VT Transco system will utilize the regional transmission system administered by ISO-NE. For this reason and consistent with the Transmission Operating Agreement (TOA), all Generation and Transmission interconnection requests should be directed to ISO-NE. End-User interconnection requests should also be directed to ISO-NE unless the End-User elects to be served by a Vermont distribution utility, which will follow the existing Vermont Interconnection Agreement[2] that governs transmission service provided by VT Transco to Vermont distribution utilities. A service map can be found at https://publicservice.vermont.gov/content/electric-utility-maps.

II. DISCLAIMER

The information contained in this guide is not intended to capture each and every specific equipment and installation requirement. It represents a typical installation. The minimal requirements specified in this document may need to be modified to meet the needs of unique installations. The intent of the requirements is to address all types of interconnections. As such, not all of the requirements will necessarily apply to all types of interconnections. VT Transco reserves the right to determine which requirements apply to any specific requested interconnection. Specific requirements necessitated by the type of interconnection and the intended point of interconnection will be communicated to the Interconnection Requestor prior to the construction phase of the project.

III. REQUEST ADMINISTRATION

ISO-NE will administer the request based on the appropriate Tariff Schedule, e.g. Schedule 25, depending on the nature of the interconnection request. The interconnection process can be described briefly as follows. In case of discrepancy, the information of the ISO-NE web site takes precedence.

Once an interconnection request is submitted, ISO-NE will review the application for completeness. ISO-NE will communicate with the requester to indicate that the

[2] http://www.vermonttransco.com/library/document/download/1473/1991transmissionagreement2010.pdf.

application has been received and deemed complete, or will request the information necessary for a complete application. ISO-NE will inform VT Transco of the interconnection request. Pursuant to the Tariff, ISO-NE will schedule a scoping meeting with the requestor, VT Transco and affected entities. ISO-NE will conduct Feasibility Studies or System Impact Studies as selected by the requestor. ISO-NE will coordinate with VT Transco and affected entities throughout the study process, including the review of scopes, results and draft report. If system concerns are identified, ISO-NE will work with VT Transco and affected entities to resolve the concerns and prepare a good faith cost estimate. ISO-NE will submit the report to the requestor for review, and schedule a meeting to address any questions and discuss next steps. If the requestor selected a Feasibility Study, the next step is to conduct a System Impact study. If the requestor selected a System Impact Study, the next step is either a Facilities Study or the requestor can elect to skip the Facilities Study and proceed to the Interconnection Agreement process. Following the completion of the System Impact Study and acceptance of the report by the requestor, the requestor will submit Proposed Plan Applications for the interconnecting facilities, and VT Transco and the affected entities will submit Proposed Plan Applications for the system changes required to reliably connect the proposed interconnection and to address the identified system concerns.

End-User facilities are treated the same way as Elective Transmission Upgrades (ETU) processed through Schedule 25 of the ISO-NE Tariff. An ETU includes not only Merchant Transmission, but also upgrades or changes to an existing transmission facility that is part of or interconnected to the Administered Transmission System. The only difference is the purpose of the interconnected facility, which is to serve an End-User that has elected to follow the ISO-NE interconnection process. Alternatively, the End-User can request service from the local distribution utility, which will follow the process laid out in the Vermont transmission Agreement. In that case, VT Transco, the End-User and the local utility will agree on the design of the facilities, VT Transco will conduct the studies and coordinate with ISO-NE and affected entities to ensure no adverse impact to the electric grid pursuant to the ISO-NE, NPCC and NERC criteria, guides, requirements and standards.

Facilities that are connected to the VT Transco system must comply with ISO-NE criteria, guides, requirements and standards. Depending on the actual location of the interconnection, the interconnecting facilities must also comply with NERC and/or NPCC criteria, guides, requirements and standards. Below are the relevant ISO-NE documents. Refer to the ISO-NE web site for a complete list of interconnection documents.

Planning Procedures:
PP3: Reliability Standards for the New England Area Pool Transmission
PP5-0: Procedure for Reporting Notice of Intent to Construct or Change Facilities in Accordance with Section I.3.9 of the ISO New England Tariff
PP5-1 and its Attachments: Procedure for Review of Governance Participants' Proposed Plans
PP5-3: Guidelines for Conducting and Evaluating Proposed Plan Application Analysis
PP5-6: Interconnection Planning Procedure for Generation and Elective Transmission Upgrades

Operating Procedures:

OP12: Voltage and Reactive Control
OP14: Technical Requirements for Generators, Demand Response Resources, Asset Related Demands, and Alternative Technology Regulation Resources
OP16: Transmission System Data
OP18: Metering and Telemetering Criteria

IV. RESPONSIBILITIES OF THE INTERCONNECTION REQUESTOR

The Interconnection Requestor is responsible for designing, installing, operating, and maintaining its own equipment in accordance with Good Utility Practice(s), the National Electrical Code (NEC), the National Electrical Safety Code (NESC), North American Electric Reliability Corporation (NERC), any applicable independent system operator, and all applicable laws and regulations. This includes installing, setting, and maintaining all protective devices necessary to protect the customer's facilities. The requirements specified in this document are designed to only protect VT Transco facilities and to maintain transmission system reliability. The interconnecting customer is responsible to coordinate with VT Transco during the engineering / detailed design phase of the project in order to ensure coordination of protective relay devices.

V. REQUIREMENTS AS SET FORTH IN NERC RELIABILITY STANDARD FAC-001

A. R1. Interconnection Customer

The Interconnection Customer (IC) includes Generation Facilities (R.1.1.), Transmission Facilities (R.1.2.) and End-user Facilities (R.1.3.). The IC is responsible for coordinating the design of its own facility with ISO-NE and VT Transco. VT Transco's functional relay requirements will be provided to the IC during the detailed design phase of the project. The information for the specific project will indicate the protective functions for which the IC is to provide relays and related equipment. The IC will indicate the specific relay type(s) and range proposed for each function. The IC must also provide proposed current and potential transformer ratios, connections, and locations as related to the electrical one-line diagram. Before proceeding with construction under the option to build, the IC must furnish six sets of final design documents to ISO-NE and VT Transco for review and acceptance. IC design documents (electrical prints, relay settings, etc.) will be reviewed by VT Transco in coordination with ISO-NE. Project delays due to untimely submittal of complete design documents are the responsibility of the IC. When submitting an interconnection request to VT Transco, the requesting Entity should provide as much of the following information as possible to help expedite the design or review process.

- One-line diagram showing the connections between the Transmission Customer and the VT Transco system
- Three-line diagrams showing current and potential circuits for protective relays
- Physical arrangements of existing and proposed facilities
- Geographic location of the proposed interconnection, including maps showing

land ownership and zoning – if available. If near a VT Transco transmission line, indicate adjacent structure numbers

- Description of the proposed routing, approximate lengths and conductor size of transmission line additions or modifications, and dimensions and configurations of new structures. Proposed transmission route(s) and service arrangements between resources and loads.
- Description and ratings of any proposed transformers, winding connections, impedances, circuit breakers, switches, metering, associated communications, relaying and other related equipment.
- Description of the generating resources or loads to be served by the interconnection and the proposed transmission route(s) and service arrangements between resources and associated loads, where applicable. The description should include the following:
    - Power output or load requirements, including 10-year projections, by delivery points, or winter and summer peaks for loads served or generation supplied through the point of interconnection;
    - Size, type and ratings of large equipment;
    - Reliability and special operation requirements; impedance, frequency, voltage, real and reactive power and protective relaying characteristics of the interconnecting resource or load.
- Appropriate revenue and telemetering equipment specifications. The data should include load control boundary metering, current and potential transformer ratios and register and contract initiator ratios and multipliers.
- Copies of relevant planning or operational studies and proposed construction schedule.
- Copies of relevant environmental impact assessments, permits, reports, or projections; or description of anticipated scope of environmental review.
- Relay tripping and control schematic diagram
- Instruction books for relays

Additional engineering meetings may be necessary to discuss the design documents. If changes are necessary, the IC must incorporate all changes and corrections and resubmit six sets of corrected prints to VT Transco before proceeding with construction.
The impact of the IC on the reliability of the interconnected transmission system shall be evaluated. Studies are performed as outlined in ISO-NE's Transmission Procedures noted above.

1.1 Generation, Transmission and End-User Interconnection Requests

These interconnection requests and associated studies are managed by ISO-NE as outlined in the ISO-NE OATT, Schedule 22 (Large Generator Interconnection Procedures), Schedule 23 (Small Generator Interconnection Procedures), Schedule 25 (Elective Transmission Upgrade Interconnection Procedures).

1.2 End-User Interconnection Requests through a local Vermont distribution utility

For End-Users that elect to be served by a local Vermont distribution utility, system performance is evaluated by VT Transco to determine if any system reliability impacts may result from the interconnection of the customer to the transmission system. If additional

system reinforcements are identified during the study, the results will be discussed with the local utility and the End-user, and solutions will be proposed to address the issue. System changes including the interconnecting facilities and required system upgrades will follow ISO-NE Planning Procedures PP3, PP5-0, PP5-1 and PP5-3 as described above.

B. R3.1 Procedures for Coordinated Studies for new interconnections or existing interconnections seeking to make a qualified change as defined by the Planning Coordinator and their impacts on affected systems

As a Participating Transmission Owner (PTO) pursuant to the ISO-New England (ISO-NE) Transmission Operating Agreement (TOA), VT Transco follows the ISO-NE planning procedures, which require coordination with ISO-NE and affected entities. Planning procedures PP 5-0 to PP 5-6 outline the coordination or Proposed Plan process allowing the review of system changes for new interconnections, or existing interconnections seeking to make a qualified change to demonstrate the effect on the stability, reliability or operating characteristics of the transmission Owner's transmission facilities, the transmission facilities of another transmission Owner, or the system of a Market Participant. The intention of the Proposed Plan process is to match study effort and review effort appropriate to the complexity of the proposed change. Proposed plans are discussed with ISO-NE early in the process. ISO-NE examines the proposed plans and evaluates the potential for significant adverse impacts, and advises VT Transco whether input should be solicited from other committees or any affected entity. ISO-NE engages potentially technically impacted Affected Entities during the conduct of the studies that will be used to support a Proposed Plan Application. Following the completion of the required studies and ISO-NE acceptance of those studies, VT Transco will submit a Proposed Plan Application for ISO-NE approval of the Proposed Plan. The Application is reviewed and discussed at a Reliability Committee meeting, where Governance participants advise ISO-NE with regard to the approval of the Proposed Plan. An ISO-NE approval of the Proposed Plan allows VT Transco to proceed with the construction of the Proposed Plan.

C. R3.2 Procedures for notifying those responsible for the reliability of affected system(s) of new interconnections or existing interconnections seeking to make a qualified change.

Any new interconnections or additions or modifications to existing facilities that have the potential to affect an interconnection require the customer to notify VT Transco as soon as feasible. VT Transco will assess the potential impact of the modifications and contact the appropriate affected parties. The customer also needs to notify ISO-NE pursuant to the ISO-NE tariff, Operating procedures and Planning procedures. ISO-NE will assess whether studies and mitigating measures are required. Planning procedures PP5-0 to PP5-6 outline the process for notifying ISO-NE of changes.

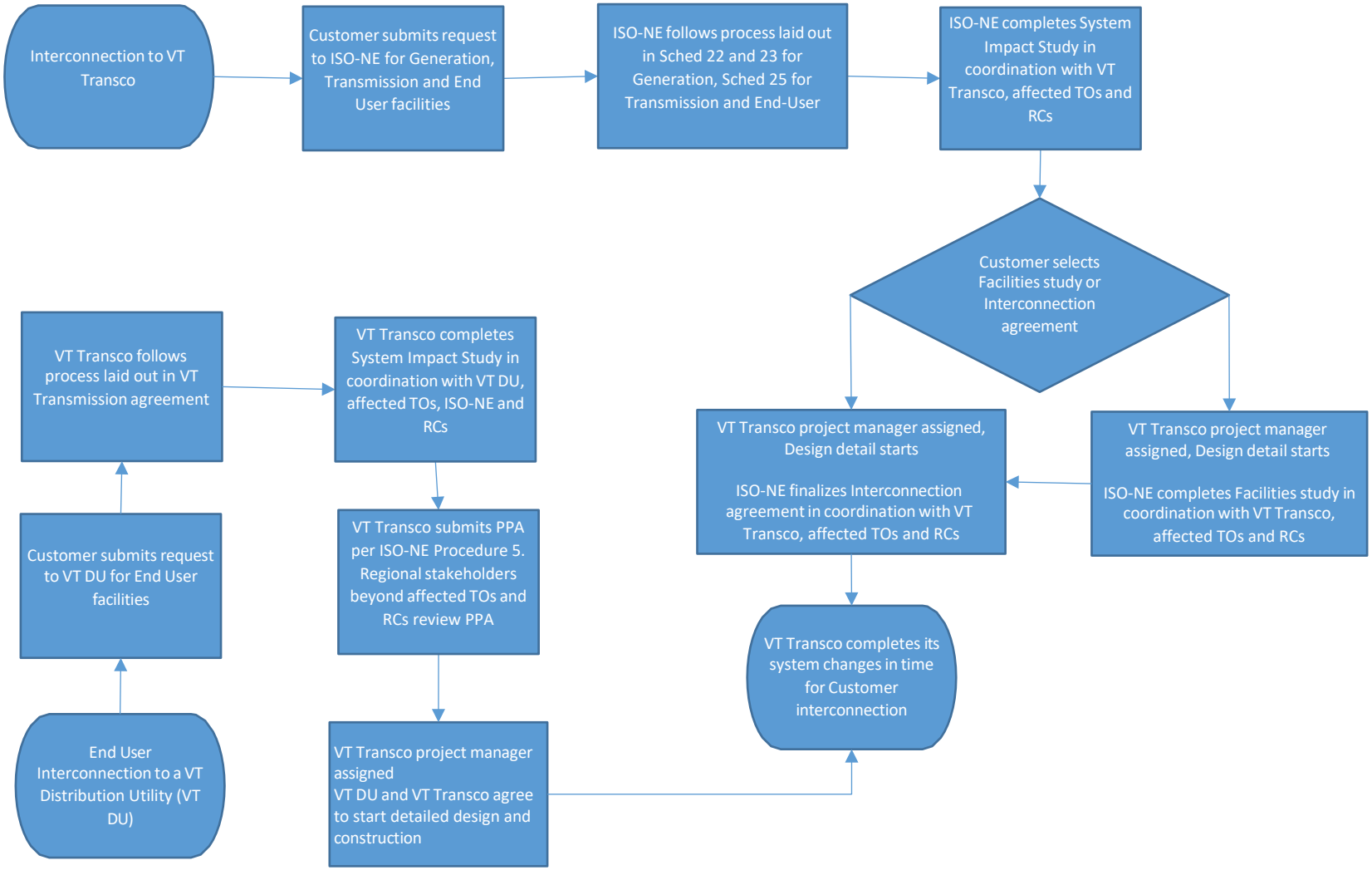
Any surveillance/testing activities of equipment located in, or associated with, the Substation/Switchyard that are performed by the interconnected customer that result in abnormal, irregular, or unusual conditions detected during such activities shall be promptly reported by the interconnected customer to the VT Transco Transmission System Operator. Notification of major/minor alarms received and protective relay targets (mechanical flags and indicating lights) detected, at the facility concerning the Substation/Switchyard, shall be reported by the interconnected customer to the VT Transco Transmission System Operator by telephone as soon as identified.

Periodic Technician tests of protective relay communication channels shall be conducted by the Interconnected Customer in accordance with written guidelines furnished by VT Transco and as reasonably requested by VT Transco in coordination with VT Transco Technicians at the remote end terminals of transmission lines. The Interconnected Customer shall record all test, alarm and relay target data as required and notify VT Transco of abnormalities as necessary. Sequence of event recording shall be made available to VT Transco upon request.

D. R3.3 Procedures for confirming with those responsible for the reliability of affected systems that new Facilities or existing Facilities seeking to make a qualified change are within a Balancing Authority Area's metered boundaries.

ISO-NE is the Balancing Authority for New England. ISO-NE determination that the interconnection request is complete includes confirmation that the new Facilities or existing Facilities seeking to make a qualified change are within its metered boundaries. VT Transco is wholly within the Balancing Authority Area's metered boundaries. Therefore, interconnections on the VT Transco's systems are within the BAA's metered boundaries

Facility Interconnection Process Flow Chart



VI. GUIDELINES AND TECHNICAL BASIS

A. Rationale for determining material modification

ISO-NE, as the Planning Authority for New England, determines when a change constitutes a material modification. In general, a 5 MVA change in capacity, a configuration change, or a control change is considered material as described in the ISO-NE Planning procedures. ISO-NE may require a material modification study to determine whether a Proposed Plan Application, supported by the appropriate level of studies, needs to be submitted for approval. The customer should contact ISO-NE for a determination of material modification.

B. Procedures for requesting a new interconnection or material modification

The procedures are described in section I (Introduction) of this document.

C. Data requirements

The data requirements are outlined in the ISO-NE interconnection procedures provided on its web site at https://www.iso-ne.com/participate/applications-status-changes/interconnection-process-guide

D. Voltage Level and MW and MVAR Capacity or Demand at Point of Connection

The data requirements include voltage level, MW, MVAr capacity or demand. Without this information, ISO-NE will consider the interconnection request incomplete.

E. Interconnection Bus Arrangement

All new interconnections with the VT Transco transmission system will be made through a standard VT TRANSCO substation where each element terminates in a designated bay position utilizing a bus arrangement consistent with the number and type (bulk power, non-bulk power, generator, transformer, etc.) of elements being connected and with ISO-NE Planning Procedures. At a minimum, all new connections (not at an existing station) will be made utilizing a three breaker ring bus configuration (Tap connections to VT TRANSCO transmission lines will not be allowed.) Other bus arrangements, such as breaker-and-a-half, may be required.

F. Breaker Duty- Surge Protection

All facilities and equipment must `exceed the fault duty capability necessary to meet system short-circuit requirements as determined through short-circuit analyses and should fully comply with the latest American National Standards Institute (ANSI)/Institute for Electrical and Electronics Engineers (IEEE) C37 collection of standards for circuit breakers, switchgear, substations, and fuses. In order to maintain transmission reliability, each fault-interrupting device must be rated for full fault-interrupting capability to satisfy the short-circuit level requirements at the point of interconnection. Full fault-interrupting capability is per the latest IEEE C37, C57, and C62 collections of standards. As a general rule, neither party should depend on the other for the protection of their respective equipment.

G. System Protection and Coordination

Protective relaying systems and associated communications systems for all facility interconnections shall be planned, designed, constructed, and maintained in accordance with applicable NERC, NPCC, and ISO-NE standards. Utility grade protective relays and fault clearing systems are to be provided on the interconnected power system. All protective relays shall meet or exceed ANSI/IEEE Standard C37.90. Adjoining power systems may share a common zone of protection between two parties. The design must provide coordination of speed and sensitivity in order to maintain power system security, stability, and reliability.

The protection system (protective relays, associated communication systems, voltage and current sensing devices, station batteries and DC control circuitry) arrangement selected by the customer must be compatible with the protections system used by VT Transco to protect the transmission grid. Compatible relaying equipment must be used for a given zone of protection. Compatibility includes protection application, redundancy, operating speed, communication type, and communication medium.

A power source for tripping and control must be provided for the protection system by a DC storage battery. The battery is to be sized with enough capacity to operate all tripping devices after eight hours without a charger, per IEEE standards. An under-voltage 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, synch-check relays, and physical locking devices.

The facility owner (generator, transmission, end-user) is responsible for providing a protection system that will protect its equipment against disturbances on VT Transco's system and minimize the effects of disturbances from its facilities on VT Transco equipment and transmission system. Entities connecting to the VT Transco transmission system shall investigate and keep a log of all protective relay actions and misoperations, as required by NERC and ISO-NE. In addition, the interconnecting entities must have a maintenance program for their protection systems in accordance with NERC. Documentation of the protection maintenance program shall be supplied to VT Transco, ISO-NE, NPCC, and NERC upon request. As outlined in the maintenance program, test reports are to be made available for review by VT Transco. At intervals described in the documented maintenance program and following any apparent malfunction of the protection equipment, the Interconnecting Customer shall perform both calibration and functional trip tests of its protection equipment as outlined by NERC.

1. Generator Protection Requirements

Generators connecting to the VT Transco 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 VT Transco transmission system.

The primary purpose of this interrupting device is to protect the generating plant facility.

Synchronous or wind turbine generators connected to the VT Transco transmission system shall be able to withstand certain temporary excursions in voltage, frequency, and reactive and real power output without tripping. A System Impact Study will determine if the generator will trip during temporary excursions. Generation must ride through temporary excursions to support the grid and avoid cascading events. It is recognized that certain circumstances may exist that necessitate the imposition of performance criteria that is considered more stringent than the default criteria specified above. Such circumstances shall be identified during the conduct of the System Impact Study or operational study for each particular generator.

2. Transmission Protection Requirements

All transmission power systems shall have a dual protective relaying scheme that provides both primary and backup coverage of the remote bus. Communications-aided tripping through the use of a dedicated communications channel may be required based on system stability determination. Communications redundancy may be required depending on critical clearing time. VT Transco utilizes a design approach, which achieves complete separation of the primary and backup schemes. A transfer trip may be required for backup protection and islanding schemes. Backup protective systems should provide additional coverage for breaker and relay failure outside the primary zone. Specific breaker failure protection schemes shall be applied as required to meet NERC requirements, and, where local/remote backup does not provide adequate sensitivity or speed, specific relay failure backup shall also be provided. Backup systems shall operate for failures on either side of an interconnection point. Time and sensitivity coordination must be maintained to prevent misoperations.

Fiber optics is the preferred means of relay communications; however, microwave and power line carrier may also be used. Audio tone over phone line is the least preferred method because it may not meet requirements for speed and reliability. Each fault-interrupting device must be rated for full fault-interrupting capability to satisfy the short-circuit level requirements at the point of interconnection. Neither party shall depend on the other for the protection of their respective equipment.

Metering and Telecommunications

Metered data shall be telemetered to a location designated by ISO-NE and location as designated by VT Transco unless alternate satisfactory telemetered locations are agreed to by VT Transco and the Interconnection Customer.

Interconnecting Customers that will be a market participant shall install metering that shall be of sufficient quality to meet the requirements as defined by VT Transco and ISO-NE per Operating Procedure OP18. All generation and auxiliary retail load metering shall have the ability to connect to an Automated Meter Reading (AMR) system.

Before the purchase or fabrication of revenue metering equipment, four sets of each of the following information must be submitted to VT Transco for review and acceptance:

- Overall Electrical Single-Line Drawing, showing location of revenue metering

equipment.
- Switchgear Single-Line Drawing, showing location of revenue metering transformer compartment.
- Physical Metering Transformer Compartment drawing, showing the layout of revenue metering current transformers and potential transformers.
- If the installation utilizes a stand-alone current transformer cabinet, the manufacturer's drawing, showing the catalog number and address at which its use is intended.
- Estimated generation capacity and auxiliary retail load

Revenue Metering Guidelines

For the purposes of this document, revenue metering shall refer to the meter or meters used for billing purposes and the associated current transformers and potential transformers (collectively known as "instrument transformers"), communications equipment, and wiring between these devices. The basic configuration consists of directional revenue grade metering (import and export) at each point of interconnection with the VT Transco system. Additional separate revenue metering for the gross output of the generation and for auxiliary retail loads may be required, depending on the generation capacity, telemetry requirements, applicable contractual provisions and associated tariffs. All generation and auxiliary retail load metering shall have the ability to connect to an Automated Meter Reading (AMR) system.

Before the purchase or fabrication of revenue metering equipment, four sets of each of the following information must be submitted to VT Transco for review and acceptance:

- Overall Electrical Single-Line Drawing, showing location of revenue metering equipment.
- Switchgear Single-Line Drawing, showing location of revenue metering transformer compartment.
- Physical Metering Transformer Compartment drawing, showing the layout of revenue metering current transformers and potential transformers.
- If the installation utilizes a stand-alone current transformer cabinet, the manufacturer's drawing, showing the catalog number and address at which its use is intended.
- Estimated generation capacity and auxiliary retail loads.

Grounding and Safety Issues

A safe grounding design must accomplish two basic functions:

- Ensure that a person in the vicinity of grounded structures and facilities is not exposed to critical levels of step or touch potential.
- Provide a path for electric currents into the earth under normal and fault conditions without exceeding any operating and equipment limits or adversely affecting the continuity of service.

Accordingly, each electrical facility must have a grounding system or grid that solidly grounds all metallic structures and equipment in accordance with standards outlined in ANSI/IEEE 80, IEEE Guide for Safety in AC Substation Grounding, ANSI/IEEE C2, National Electrical Safety Code (NESC).

Testing must be performed to ensure safe step and touch potential parameters have been

met in accordance with IEEE 80.

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 over voltages that can affect personnel safety and damage equipment. 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 for effective system grounding of the high-side transmission equipment by means of a grounded high-voltage generation step-up transformer.

Safety is of utmost importance. Strict adherence to established switching, Lock Out/Tag Out procedures, 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, and regulations and in compliance with Occupational Safety and Health Administration (OSHA), NESC, and good utility practice. Automatic and manual disconnect devices are to be provided as a means of removing all sources of current to any particular element of the power system. Only trained operators are to perform switching functions within a facility under the direction of the responsible dispatcher or designated person as outlined in the NESC.

H. Insulation and Insulation Coordination

Insulation coordination is the selection of insulation strength. Equipment basic impulse surge levels (BIL) shielding, surge protection and general insulation coordination shall be designed to meet the latest IEEE C62 and 1313 standards, along with VT Transco standards. Insulation coordination must be done properly to ensure electric system reliability and personnel safety. Basic switching surge levels, 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.

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

I. Voltage, Reactive Power, and Power Factor Control

1. Generation Facilities

ISO-NE is responsible for ensuring the stability and reliability of the electric grid. In turn, all Generation Facilities Customers (GFC) are responsible for operating their units in a stable manner while those units are connected to the VT Transco system. Generator excitation and prime mover controls are key elements in ensuring electric system stability and reliability. To meet its responsibility, ISO-NE must have the ability to establish voltage and governor control requirements for all generators connected to the system. These requirements may vary depending on the location, size, and type of generation installed.

GFCs are required to follow the current NERC and NPCC criteria, standards and procedures for generator operation, protection, and control.

- All synchronous generators connected to the interconnected transmission

systems shall be operated with their excitation system in the automatic voltage control mode unless approved otherwise by ISO-NE.

- ISO-NE/VT Transco shall be notified any time a voltage regulator is taken out of service.
- Generators shall maintain a network voltage or reactive power output as required by VT Transco, with governance by ISO-NE, within the reactive capability of the units. Generator step-up and auxiliary transformer shall have their tap settings coordinated with electric system voltage requirements.
- Temporary excursions in voltage, frequency, and real and reactive power output that a generator shall be able to sustain shall be defined and coordinated on a regional basis.
- Voltage regulator controls and limit functions (such as over and under excitation and volts/hertz limiters) shall coordinate with the generator's short duration capabilities and protective relays.
- Prime mover controls (governors) shall operate with appropriate speed/load characteristics to regulate frequency.

Power factor requirements for new generator interconnection requests and increase to existing generators are documented in the ISO-NE Planning Procedure PP5-6.

Specific requirements for voltage regulators, power system stabilizers, governor controls, and remote control and telemetry of such devices will be determined during the System Impact Study. The specific requirements for a generator will become part of the Interconnection Service Agreement.

2. Transmission Facilities

The transmission system must be capable of moving electric power from areas of generation to areas of load under a wide variety of expected system conditions. Adequate reactive power supplies are of paramount importance to the capability of the transmission system to reliably support a wide variety of transfers. Transmission facilities must be designed to minimize excessively high voltages during light transmission loading conditions, yet have adequate reactive supplies to support system voltage during heavy transmission loading conditions.

3. End-User Facilities

VT Transco will supply End-User facilities within the voltage requirements as stated in the applicable state tariffs. End-User facilities connected directly to the transmission system should plan and design their systems to not inject (leading) reactive power on the transmission system to prevent high voltages during light load conditions, and to operate at no less than 0.999 lagging (absorbing) power factor to minimize the reactive power burden on the transmission system during peak and off-peak load conditions.

J. Power Quality Impacts

At no time shall the operation of the IC facility, including associated generators or any of their auxiliary devices as applicable, result in an electrical output in which harmonic distortion exceeds the recommended limits contained in IEEE Standard 519, which defines voltage waveform and harmonic content.

K. Equipment Ratings

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 the ANSI/IEEE C37 collection of standards. All current-carrying equipment and devices shall be designed to carry the maximum loads that are predicted and used in load flow analysis tested against all applicable NERC standards, NPCC standards, ISO-NE and VT Transco Transmission Planning Criteria. Loads exceeding nameplate or normal design capacities are acceptable only when allowed by manufacturers' design documentation or standard industry practice.

Equipment BILs, shielding, and surge protective device application must meet requirements as determined by the latest IEEE C62 standards. VT Transco will provide the BIL for the system in the interconnection area. Also, equipment must meet all applicable ANSI/IEEE standards and specifications communicated by ISO- NE and VT Transco.

Voltage ratings shall be in accordance with the latest IEEE C84 standards.

L. Synchronizing of Facilities

The IC shall obtain ISO-NE's approval prior to either synchronizing with the transmission system or energizing, as applicable per the determination of ISO-NE, the Customer Facility or, except in an emergency condition, disconnecting the Customer Facility from the transmission system, and shall coordinate such synchronizations, energizations, and disconnections with VT Transco.

Protection personnel from VT Transco and the IC shall jointly develop protection schemes for inter-tie lines. Protective scheme prints, settings and tests are jointly shared and reviewed for coordination and fault-modeling information is exchanged.

If necessary synchronization points/locations shall be noted on the project plans or relay plans developed during the detailed design/construction phase of the project. The synchronization points are defined as locations that have the capability and are the preferred locations for synchronization for paralleling a synchronous generator or if needed during a recovery from a black start or islanding event. In addition to manual synchronization points, "synchro-check" relays shall also be noted on the project plans or relay plans. Synchronization shall be in accordance with the latest IEEE/ANSI 1547 standards.

M. Maintenance Coordination

The interconnection parties agree to confer regularly to coordinate the planning, scheduling and performance of preventive and corrective maintenance on the Customer Facility, the Customer Interconnection Facilities and any attachment facilities owned by VT Transco.

On occasion, VT Transco must remove its lines from service for maintenance. These planned outages are for purposes such as: testing relays, rearranging, modifying or constructing lines, and maintaining lines or station equipment. The IC, VT Transco, and ISO-NE will coordinate for these planned outages.

Operation and maintenance activities at interconnection facilities would be performed by VT Transco in accordance with an operations and maintenance (O&M) agreement between the IC and the VT Transco. See Appendix A for additional information.

Generation Facilities

On occasion, the GFC may not be allowed to operate in parallel with the VT Transco transmission system or, in the case of a GFC with multiple interconnection points, may be permitted to operate only in parallel with specific lines so VT Transco can perform "Liveline Maintenance" on the facilities serving the GFC. The GFC, VT Transco (and possibly ISO-NE) will coordinate with these conditions and requests.

N. Operational Issues (Abnormal Frequency and Voltages)

ISO-NE is the Regional Transmission Operator (RTO) for the VT Transco transmission system. The interconnection will be operated consistent with VT Transco requirements and procedures. Specific transmission conditions and procedures for operation of Transmission Facilities within VT Transco are in VELCO Operating Procedure OP-7 in accordance with ISO-NE Operating Procedure #7 used to determine actions in an emergency for voltage and frequency excursions.

Generation Facilities

A GFC shall implement under-frequency , over-frequency and under-voltage, over-voltage settings for the GFC as required by ISO-NE to ensure 'ride through' capability in the event of disturbances on the Transmission System. The GFC Facility is to stay connected to and synchronized with the transmission system during system disturbances within a range of under-frequency and over-frequency conditions, in accordance with Good Utility Practice and NPCC standard PRC-006-NPCC. The response of a GFC's Facility to frequency deviations of predetermined magnitudes; both under-frequency and over-frequency deviations are studied and coordinated with ISO-NE and VT Transco in accordance with Good Utility Practice NPCC standard PRC-006-NPCC.

O. Inspection Requirements for New or Materially Modified Existing Interconnections

Each party to the interconnection agreement shall perform routine inspection and testing of its facilities and equipment in accordance with good utility practice and regulatory requirements to ensure the continued interconnection of the facilities with VT Transco's transmission system.

Each party shall, at its own expense, have the right to observe the testing of any of the other party's facilities and equipment whose performance may reasonably be expected to affect the reliability of the observing parties' facilities and equipment. Each party shall notify the other party in advance of facility and equipment testing, and the other party may have a representative attend and be present during such testing. If a party observes any deficiencies or defects on or becomes aware of a lack of scheduled maintenance and testing with respect to the other party's facilities and equipment that might reasonably be expected to adversely affect the observing party's facilities and equipment, the observing party shall provide notice to the other party that is prompt under the circumstance, and the other party shall make any corrections required in accordance with good utility practices and as required by regulatory agencies.

VT Transco will review the general design of the protection scheme for an interconnection site. The IC is responsible for the design of protection that involves the customer's facilities.

The IC must furnish to VT Transco the proposed settings for relays specified. If requested, VT Transco will provide system data needed to determine the relay settings. Before parallel

operations with the VT Transco system, the installation must be witnessed and inspected by VT Transco. VT Transco will set the testing requirements. VT Transco has the right to witness the tests and inspect before energizing the equipment. The interconnecting customer must notify VT Transco fourteen (14) days before energizing the equipment. The IC is responsible for providing qualified personnel who will complete all required tests. VT Transco will not perform any of the testing unless contracted to do so.
The IC is responsible for ensuring that all circuit breakers, controls, relays and other protective devices are adjusted and functioning correctly. The IC shall provide test equipment and qualified personnel to perform the required tests. VT Transco will provide a list of proposed tests to be witnessed. The witness test list for a given site will be the ultimate governing document. Interconnecting representatives shall work with the VT Transco project team representatives to schedule resources for witness testing and review of testing documentation.

Initial energizing of high voltage circuits will not be allowed until the site design has been approved and all requirements of the ISO-NE Tariff have been satisfied. Energizing equipment without required approval may result in disconnection from the VT Transco system.

P. Communications and Procedures during Normal and Emergency Operating Conditions

Complete, precise, and timely communication is an essential element for maintaining reliability and security of a power system. Under normal operating conditions, the major link of communication to establish Interpersonal communications capabilities necessary the maintain reliability per NERC COM-001.

VT Transco and the IC shall maintain communications which shall include, but not be limited to:

- System paralleling or separation
- Scheduled or unscheduled shutdowns
- Equipment clearances
- Periodic load reports
- Maintenance schedules
- Tagging of interconnection interrupting devices
- Meter tests
- Relay tests
- Billing
- Other routine communication

In case of emergency or abnormal operating conditions, various communication channels may be used depending on the interconnect category. Emergency telephone numbers will be agreed upon by both parties prior to the actual connection date.

Each Interconnection Party shall notify the other parties promptly when it becomes aware of an emergency condition that may reasonably be expected to affect operation of the Customer Facility, the Customer Interconnection Facilities, the VT Transco Interconnection Facilities, or the transmission system.

Interconnection Customer Obligations

At the IC's expense and to comply with ISO-NE OP-14 (Technical Requirements for Generators), the IC shall install and maintain satisfactory operating communications with the

ISO- NE's control center or its other designated representative, and with the VT Transco control center.

The IC shall provide satisfactory operating communications at its facility control room through use of the public telephone system. The IC also shall provide and maintain backup communication links with both ISO- NE and VT Transco for use during abnormal conditions as specified by ISO-NE and VT Transco, respectively. The IC further shall provide the dedicated data circuit(s) necessary to provide IC data to ISO-NE and VT Transco as necessary to conform to applicable technical requirements and standards.

Outage and maintenance scheduling is arranged between the IC and VT Transco by using the VT Transco's transmission outage application system. VT Transco will then communicate scheduling to ISO-NE utilizing ISO-NE's Crow applications.

Each IC will be required to provide a contact name and method of communication within the IC's operation to VT Transco control center.

The IC shall also provide the dedicated data circuit(s) necessary to provide necessary generator/transmission/end-user data to VT Transco. The data circuit(s) shall extend from the IC Facility to a location(s) specified by VT Transco. Any required maintenance of such communications equipment shall be performed at the IC's expense.

The IC's operator is required to communicate to the VT Transco control center their intention to perform any operational step(s) that could have an influence on the transmission system. The IC's operator is required to follow VT Transco instruction during emergency conditions (e.g. restoration). Participation in drills conducted by ISO-NE or VT Transco is required upon request.

Advance Notification of IC Facilitated Equipment Status Changes

The IC's operator is required to communicate to the VT Transco Transmission System Operations/Control Center their intention to perform any operational step(s) that could have an influence on the transmission system. This notification is to be made prior to actually performing the configuration changes to their on-site equipment. This advance notification requirement also applies to 'bring a generator on' or 'taking a generator off' the bus. In the case of switching activities related to scheduled maintenance work, advance notice to VT Transco is required. Scheduled maintenance work must be coordinated with VT Transco to meet VT Transco advanced outage notification requirements, and in accordance with the applicable provisions of the ISO-NE's operating documents.

Appendix A – Operation and Maintenance

When new assets are installed for the benefit of the IC within an existing VT Transco facility, an operation and maintenance (O&M) fee will be established to address shared costs associated with the facility. The O&M fee shall be based on the installed costs of the new assets as a percentage of the gross plant at the facility. All maintenance work and associated costs shall be addressed through an O&M agreement.

In the situation in which the IC constructs a new transmission facility, the facility may be operated and maintained by VT Transco through an O&M agreement. The agreement will include, but is not limited to, budgeting timeframes, inspections and estimated yearly costs.

Appendix B CONSIDERATIONS FOR DER REQUIREMENTS

Introduction

In 2023, The VELCO territory experienced a historic shift from importing to exporting power across its tie lines. This was due to the significant penetration of Distribute Energy Resources (DER) that contributes to the local power generation to exceed the load in Vermont during the daytime off-peak period.

With such a considerable level of DER penetration that is continuing to grow, it is imperative that the reliability impact of DER on the VT Transco electric system is carefully assessed. A recent study from ISO-NE identified a risk of widespread loss of DER for certain faults in the ISO-NE system. This reinforces the concern that, without adequate interconnection studies of the aggregate DER, the reliable operation of the VT Transco BES is likely to be impacted.

This DER penetration trend has been experienced throughout the world and an increasing number of utilities are implementing requirements for Inverter-based DER (IBR-DER) settings to prevent adverse DER impact such as widespread tripping during disturbances on the BES.

In 12/6/2022, FERC issued a notice of proposed rulemaking, NOPR RM22-12-000b[(1)] , in which it states that current reliability standards are inadequate and directs NERC to update the reliability standards for the following:

- IBR and IBR-DER Data Sharing
- IBR and IBR-DER Data and Model Validation
- IBR and IBR-DER Planning and Operational Studies
- IBR and IBR-DER Performance Requirements

NERC issued a paper on DER strategy[(2)] and published a number of guidelines on DER data collection, modeling and model verification. NERC also initiated multiple projects to update the reliability standards with the specific goal of assessing and addressing the impact of DER on the BES. VELCO is following these NERC guidelines to establish DER requirements that will ensure reliable performance of the transmission system. These include

- sharing an appropriate level of DER information necessary to conduct studies
- DER performance to prevent adverse impact on the BES.
- Greater visibility into the operation of aggregate DER.

VELCO will coordinate with the local distribution utilities to meet these requirements. With respect to DER information sharing, VELCO is developing a process and tool that will allow distribution utilities to provide DER data in sufficient detail. Below are the critical data items that VELCO seeks to obtain.

(1) https://www.federalregister.gov/documents/2022/12/06/2022-25599/reliability-standards-to-address-inverter-based-resources
(2) https://www.nerc.com/comm/RSTC/Documents/NERC_DER%20Strategy_2022.pdf

DER Information sharing

The following requirements are based on NERC guideline on DER data collection[3] and addresses static, dynamic and short circuit data

Steady-State Power Flow Data Sharing Requirements

- Location, both electrical and geographic
- Type of DER (or aggregate type)
- Historical or expected DER output profiles Status
- Maximum and minimum DER active power capacity (Pmax and Pmin)
- Maximum and minimum DER reactive power capability (Qmax, producing vars; Qmin, consuming VARs); alternatively, a reactive power capability curve for the overall U-DER facility (this is specific to U-DERs, which are DERs modeled at the distribution substation)
- Distribution system equivalent feeder impedance (particularly for R-DERs, which represent DERs connected along distribution feeders, and load modeling)
- (U-DER) Reactive power-voltage control operating mode

If one or more DERs are represented as a U-DER with a generator record in the power flow, the Transmission Provider (TP) and Planning Coordinator (PC) may need the following specific information to accurately represent this element (based on their specific modeling practices):

- Facility step-up transformer impedances
- Equivalent feeder or generator tie line impedance (for large U-DER facilities) if applicable
- Facility or transmission-distribution transformer tap changer statuses and settings where applicable
- Shunt compensation within the facility

(3) *https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Reliability_Guideline_DER_Data_Collection_for_Modeling.pdf*

Short-Circuit Data Sharing Requirements

In cases where DER data may be necessary for short-circuit studies

• Continuous MVA rating of aggregate DERs

• Estimated vintage of IEEE 1547-2018 and settings applicable for DER tripping and momentary cessation (i.e., would the DER trip or cease current injection for fault events)

• Assumed effective fault current contribution at a specific time frame(s) during the fault

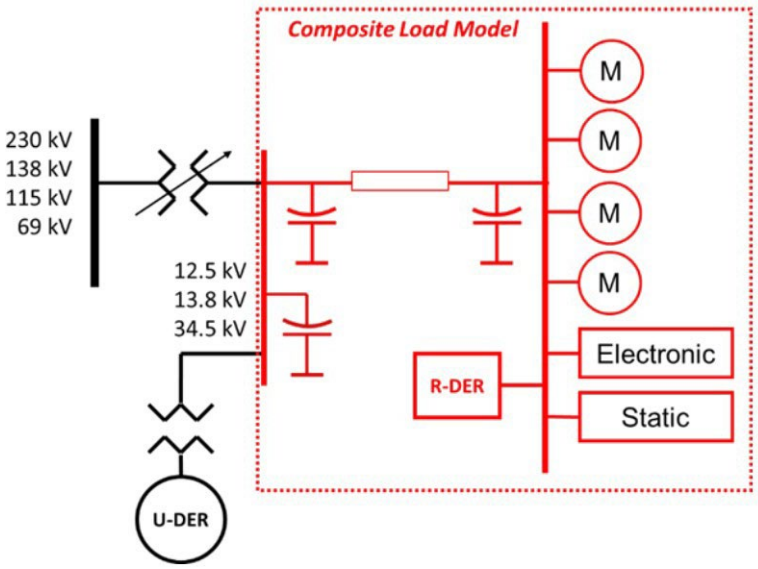
• Assumed phase angle relationship between voltages and currents

• ASPEN OneLiner short circuit model shall be integrated into the VELCO's Oneliner model. The generator shall use the recommended model type from ASPEN, IEEE or the NATF for the type of DER considered. Current limited synchronous generators models are prohibited for DER's with partial or full power converters (e.g., type-3 wind generators, PV solar, BESS).

• Each DER project shall aggregate its individual generators into a single (1) generator model at each point of connection to the transmission system. The DER project owner shall provide the generator model parameters and other equipment parameters (e.g., transformers, cables, lines, breaker ratings) that are owned or supplied by the DER project owner. Preliminary data shall be supplied within 5 months of the in-service date. Final data shall be provided to VELCO within 15 days of the in-service date of the project. Corrections shall be supplied to VELCO within 15 days of notifying ISO or VELCO.

Dynamics Studies Data Sharing Requirements

The DER_A dynamic model is the recommended model for representing inverter-based DERs. The DER_A model is appropriate for representing U-DERs and R-DERs as a standalone generator record or as a component of the load model (e.g., using the composite load model)


Composite Load Model
230 kV
138 kV
115 kV
69 kV
12.5 kV
13.8 kV
34.5 kV
M
M
M
M
Electronic
Static
R-DER
U-DER

DER Performance

In the last few years, NERC issued multiple disturbance analysis reports associated with events during which a number of IBRs (including DER) tripped unnecessarily. One of the main drivers for the IBRs tripping were unnecessarily sensitive settings related to:

- Momentary cessation
- Phase lock loop
- Over frequency/under frequency
- Overcurrent
- Over voltage
- Voltage phase angle change

Enhancing DER operating performance and control capability is the subject of the new IEEE 1547-2018 standard and adherence to the standard can help prevent adverse impact of DER on VT Transco's system.

NERC strongly recommended that the authorities governing the interconnections (AGIRs) adopt IEEE-1547-2018 standard for the interconnection of DER with the EPS. In addition, NERC recommended the following:

- The AGIRs should look into performance Category II and III as much as feasible since Category I does not provide sufficient bulk system support.
- The AGIRs should coordinate with the area (electric power system) EPS operator, the DER operator, and the RC and BA in order to ensure that DER performs appropriately during BPS fault events. In particular, DER operation in the permissive operation and momentary cessation region during abnormal voltage conditions
- The AGIRs should ensure that DER under frequency and over frequency trip settings are coordinated between the area EPS operator and the RC to ensure that DER tripping is coordinated with the BES UFLS operation and frequency response scheme.
- The RC should be informed of settings that differ from established defaults to ensure the DERs are accurately modeled in reliability studies
- TPs and PCs should understand if end-use load dynamics, such as motor stalling, could result in post-fault voltages remaining low such that DERs are unable to restore output for BPS fault events. This was observed in Fault-induced delayed voltage recovery (FIDVR) events where single-phase induction motor stalling (common in legacy air-conditioning systems) has occurred.
- The voltage phase angle ride-through capability and performance is strongly recommended for all DERs.
- AGIRs should ensure that return to service settings are coordinated among DPs, BAs, and RCs. Appropriate voltage and frequency limits, in additional to return to service time, should be coordinated with all entities. This is to prevent unexpected or large changes in DER output following the return to service after a disturbance
- The AGIRs should ensure DERs have communications capabilities defined in IEEE 1547-2018 as the visibility and control of DER operation may become necessary for BAs and other entities as DER penetration increases.

- The AGIRs should ensure that a standardized local DER communication interface is set in place to allow authorized entities (e.g., DPs or others) to perform monitoring and management or control (e.g., changing settings) of DERs that may be a critical need for managing systems with high DER penetration levels in the future.
- While not required, the following capability can be very useful to the BES
    - DERs with the ability to provide fast frequency response (FFR, also termed "inertial response" in IEEE 1547-2018) could provide an essential reliability service to the BPS that can be particularly valuable for low inertia systems.
    - Improvements to rate of change of frequency (ROCOF) ride-through, particularly for Category II and III DERs, will greatly improve the DER ability to ride-through imbalances in generation and load that may occur on the BES.
    - Ability for continued current injection during abnormal grid conditions helps mitigate transient and voltage stability issues on the BES. As such, DERs providing dynamic voltage support and continuing current injection to the grid during disturbance events provide useful support to the BES during disturbance events.

These recommendations and a detailed description of the categories can be found in NERC's Reliability Guideline Bulk Power System Reliability Perspectives on the Adoption of IEEE 1547-2018 [(4).]

In conjunction with IEEE 1547, The UL standard certification organization issued a conformance test standard to conform to IEEE 1547-2018. This includes the UL 1741 conformance standard and its Supplements SA and SB[(5)]. NERC determined that the AGIRs should initiate the stakeholder process early such that full implementation of IEEE 1547 requirements can align with the availability of UL 1741 certified equipment.

(4) https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Guideline-IEEE_1547-2018_BPS_Perspectives_PostPubs.pdf

(5) The ANSI/UL 1741 standard has incorporated a Supplement A (SA) to validate compliance for "grid support utility interactive inverters," and a Supplement B (SB) to validate compliance with grid protection and grid support functions

VII. REVIEW/REVISION HISTORY

Rev #	Rev Date	Purpose
0	04/06/2009	Original Document
1	09/01/2010	Main Document Review and Updates
2	12/05/2011	Main Document Re-write
3	12/26/2012	Annual Review. Verified and updated all hyperlinks.
4	09/12/2013	Annual Review. Verified and updated all hyperlinks.
5	10/17/2014	Annual Review. Added new Interconnection Bus Arrangement to Section III Part E. Reformatted and verified all hyperlinks.
6	12/22/2015	Annual Review. Verified all hyperlinks. Updated to align with FAC-001-2.
7	03/27/2017	Annual Review. Verified and updated all hyperlinks. Edited minor typo corrections and revisions to active standards.
8	3/20/2018	Annual review and verification of document links
9	12/31/2018	Update for FAC-001-3 standard
10	2/5/2020	Document update, format and content to reflect VELCO processes
11	8/08/2023	Update to include DER requirements
12	**12/02/2024**	**Update to reflect FAC-001-4 the new "Qualified Change" language in the standard**

VIII. GLOSSARY/DEFINITIONS

CELT – ISO-NE's annual 10-year forecast of capacity, energy, loads and transmission is a source for assumptions for planning and reliability studies.

Interconnection Customer (IC) –Refers to Generation Facility, Transmission Facility, and End-User Facility Interconnection Customer

FERC – Federal Energy Regulatory Commission

GFC – Generation Facilities Customer

Good Utility Practice – shall mean any of the applicable practices, methods and acts:

- Required by FERC, NERC, NPCC, ISO-NE, or the successor of any of them, whether or not the party whose conduct is at issue is a member thereof,
- Required by applicable law or regulation,

- Otherwise engaged in or approved by a significant portion of the electric utility industry during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in the light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practice, Reliability, safety and expedition. Good Utility Practice is not intended to be limited to optimum practice, method or act to the exclusion of all others, but rather is intended to include acceptable practices, methods, or acts generally accepted in the region.

IEEE – Institute of Electrical and Electronics Engineers

NERC – North American Electric Reliability Corporation

NPCC – Northeast Power Coordinating Council

NESC – National Electric Safety Code

Transmission System – Facilities owned, controlled, or operated by the Regional Transmission Owners, for the purposes of providing transmission service, including services under the ISO-NE Tariff and Interconnection Service.

Transmission Customer (TC) – Any entity requesting or utilizing transmission service on the VELCO Transmission System.

NERC Definitions:

BES – Bulk Electric System. All Transmission Elements operated at 100 kV or higher and Real Power and Reactive Power resources connected at 100 kV or higher. This does not include facilities used in the local distribution of electric energy

DER – distributed energy resource, any resource on the distribution system that produces electricity and is not otherwise included in the formal NERC definition of the Bulk Electric System (BES)

U-DER – DERs directly connected to, or closely connected to, the distribution bus or connected to the distribution bus through a dedicated, non-load serving feeder and with a capacity greater or equal to 0.5 MW

R-DER – DERs that offset customer load, including residential, commercial, and industrial customers. Typically, the residential units are single-phase while the commercial and industrial units can be single- or three-phase facilities.

DP – Distribution provider. Provides and operates the "wires" between the transmission system and the end-use customer. For those end-use customers who are served at transmission voltages, the Transmission Owner also serves as the Distribution Provider

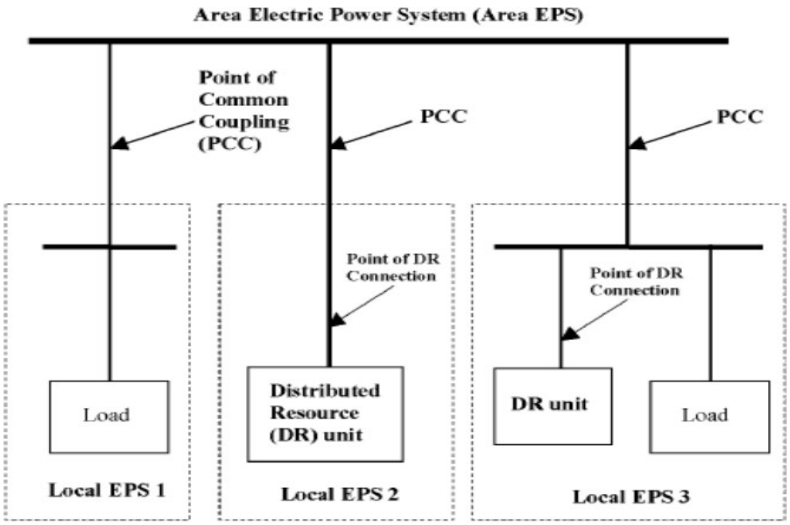
IEEE 1547 Definitions:

AGIR – authority governing interconnection requirements. Cognizant and responsible entity that defines, codifies, communicates, administers, and enforces the policies and procedures for allowing electrical interconnection of DER to the Area EPS. This may be a regulatory agency, public utility commission, municipality, cooperative board of directors, etc.

EPS – Electric Power System: Facilities that deliver power to the load

Area EPS – the electric system outside of the local EPS (i.e. the utility system)

Local EPS – The electric system directly serving the load



Note: Dashed lines are EPS boundaries. There can be any number of Local EPSs.