



NSTAR Electric Company and Western
Massachusetts Electric Company each d/b/a
Eversource Energy

Technical Specifications for
Distributed Generation Interconnection

Revision 1
September 18, 2015

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1.0 Scope

The purpose of this technical specification is to familiarize customers with the standards and policies associated with interconnecting a power generating Facility with the NSTAR Electric Company and Western Massachusetts Electric Company, each d/b/a Eversource Energy (“Eversource” or the “Company”) Electric Power Systems (“EPS”).¹ This document provides requirements relative to the safety, performance, reliability, operation, design, protection, testing and maintenance of the interconnecting facility.

Please note that this document is a guide and the Company reserves the right to change its policies, procedures and standards if deemed necessary to maintain the safety and reliability of the EPS, the Company’s customers, workforce and general public.

Eversource has established administrative processes for interconnecting all types and sizes of Distributed Generation (“DG”) installations. As the level of customer and developer interest advances beyond the initial inquiry phase, a formal review process takes place in which the potential impact of a given site on the Eversource EPS is reviewed. This review may include the execution of formal study agreements and may result in general and specific requirements for certain design aspects of the Facility. These requirements typically include electrical protection and control design and configuration, interface transformer configuration, required modifications to local Eversource facilities, metering and supervisory control and data acquisition (“SCADA”) requirements, and in some cases operating constraints for the proposed generation Facility.

The information contained within this technical specification is intended to help parties contemplating interconnection of DG facilities to better understand the general nature and extent of typical Eversource requirements for interconnection of Facilities of various types and electrical size.

It should be understood that no attempt has been made to identify all potential Eversource requirements for each and every possible type of DG source, technology, size and/or configuration. It should also be noted that generic Eversource metering and SCADA requirements are not included in the technical specification, other than by reference. This technical standard is not a design manual for untrained personnel nor is it to be a substitute for responsible engineering practice.

¹ For purposes of this document, the NSTAR Electric Company service territory shall be referred to as “Eversource Eastern MA” and the Western Massachusetts Electric service territory shall be referred to as “Eversource Western MA”.

1.1 Disclaimer

These technical specifications are in no way a substitute for the formal interconnection process and study reports which may be required for a given site, nor shall they supersede the provisions of the Company's respective Standards for Interconnection of Distributed Generation and other requirements noted in Section 2.1. Eversource will be able to advise the applicant during review of their application as to whether or not studies will be required. Where such a study is required, materials purchased and engineering performed to address Eversource requirements must be based on the details contained within the study report or related correspondence. Any commitments which are made by a Host Customer, Interconnecting Customer or Facility developer on the basis of the content of the Guidelines are made entirely at the customer's or developer's risk.

2.0 General Considerations

2.1 General Requirements

Any Interconnecting Customer seeking to interconnect a Facility to the Company EPS or modify an existing Facility interconnection must meet specifications set forth in this document and any other requirements which may be imposed by the Company, including without limitation:

Eversource distributed generation interconnection tariffs, Standards for Interconnection of Distributed Generation, M.D.P.U. No. 1039G for Eversource Western MA and M.D.P.U. No. 162D for Eversource Eastern MA (“Interconnection Tariff”). (Both documents are available on the Eversource website, www.eversource.com)

The latest approved version of the IEEE 1547 (Standard for Interconnecting Distributed Resources with Electric Power Systems) and associated IEEE 1547 standard and family of guidelines or recommended practices.

Latest approved version of UL (Underwriters Laboratories) 1741 (Inverters, Converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources.

2.2 Adverse Impact of Unintentional Islanding

Unintentional Islanding by the generating facility of all or part of the EPS (meaning a part of the EPS is kept energized by the generating facility after the area has been de-energized) is prohibited as it may result in unsafe conditions on the EPS.

2.3 Safe Operation and Maintenance

Interconnecting Customer shall operate and maintain the Facility in accordance with the applicable manufacturer’s recommended maintenance schedule, in compliance with all aspects of the Company’s Interconnection Tariff. The Interconnecting Customer must keep maintenance records that the Company may request from time to time for review.

The Interconnecting Customer will continue to comply with all applicable laws and requirements after interconnection has occurred. In the event the Company has reason to believe that the Interconnecting Customer’s installation may be the source of problems on the Company EPS, the Company has the right to install monitoring equipment at a mutually agreed upon location to determine the source

of the problems. If the Facility is determined to be the source of the problems, the Company may require disconnection as outlined in Section 7.0 of the Interconnection Tariff.

2.4 Facility Isolation

The Company may, without notice, deem it necessary to isolate a generator from the EPS. This may be due to abnormal system configurations, emergency repairs, maintenance or adverse impact cause by the generator. This disconnection may be done locally at the required lockable disconnect switch or remotely using an Eversource device.

2.5 Access

Both the Company and Interconnecting Customer shall each provide to the other and update as necessary a telephone number that can be used at all times to allow either Party to report an emergency.

In accordance with Section 6.4.2 and Exhibit I of the Interconnection Tariff, the Interconnecting Customer, and the owner of land (“Landowner”) on which the Company’s equipment or facilities are located in instances where the Interconnecting Customer is not the owner of such land, shall allow the Company access to the Company’s equipment located on the Interconnecting Customer’s or Customer’s premises.

The Company shall have access to the generation Facility isolation device. Any Customer-owned isolating device should be located within ten feet and visible sight of the revenue meter or at another mutually agreeable point that is accessible to Company personnel at all hours of all days. The device must have proper placards and signage indicating that it is for the generation facility. Signage must be of a permanent nature. Use UV stable materials and adhesive, suitable for outdoor environmental life cycle.

2.6 Future System Changes and Responsibilities

The EPS is dynamic and must be able to accommodate future load growth and system changes. Therefore, the Company may, at its discretion and cost, make upgrades to the EPS. Such upgrades may have an impact on existing generator Facilities. In order to ensure continued safe operations in compliance with an Interconnection Service Agreement or Simplified Process Interconnection Application and Service Agreement (each “ISA”), the generator Facilities, including any interconnection facilities, may need to be upgraded in accordance with the upgraded EPS. The interconnecting customer and the Company will work together and cooperatively to implement the appropriate changes, upgrades, etc. to attain the common goal of continued safe and reliable operation of the interconnection of the generator to the EPS.

3.0 General Design Requirements

3.1 Interconnection Transformer Winding and Grounding Considerations

In order to provide maximum operating flexibility for the generator and to minimize possible adverse effects on the Facilities of other Eversource customers, the generator shall provide, at its sole cost and expense, an interconnection transformer between the generating Facility and the Company-owned equipment, unless this requirement is waived by the Company in its sole discretion. When required, the generator shall propose to the Company an interconnection transformer and grounding configuration, which shall be subject to the approval of the Company at its sole discretion. The final winding connection and grounding configuration is subject to the approval of the Company at its sole discretion.

3.2 Power Quality Requirements

The generating facility shall not exceed Eversource established criteria for flicker which is based on the GE flicker limit curve.

Harmonic current injection into the EPS at the Point of Common Coupling (“PCC”) shall be consistent with limits established by IEEE 519.

The interconnection of the generating Facility shall not increase the potential for ferroresonance in the EPS.

The interconnection of the generator Facility shall not cause temporary undervoltages or overvoltages as determined by the Company when studying the proposed interconnection.

3.3 Voltage Regulation

The generating Facility shall not: (i) actively regulate the voltage of the EPS unless specifically agreed by the Company; (ii) cause the voltage at any point along the EPS to deviate from +5% / -5% of nominal; or (iii) cause any voltage deviations, which are objectionable to other customers of the Company as determined by the Company when studying the proposed interconnection.

The Company regulates the voltage on the EPS by employing load tap changing transformers, line voltage regulators or capacitors. Upgrades to these facilities may be required system modifications resulting from the facility interconnection.

3.3.1 Transformer Reverse Power Capability

Any proposed generation Facility that has the potential to cause reverse power flow through an Eversource substation transformer will require an Impact Study. The Impact Study will specifically address the ability of the transformer to accommodate reverse power flow. The following items will be evaluated:

System Voltage Control: The Impact Study shall determine if system voltage control can be maintained at various boundary conditions, and will evaluate excessive load tap changer (“LTC”) operation caused by intermittent DG sources.

LTC Design, Controller Type and Controller Settings: The Impact Study will evaluate the capability of the LTC and controller to accommodate reverse power conditions and to respond with appropriate control strategies.

Voltage and current inputs must be available to the LTC controller.

Any LTC controller configuration that is not appropriate for reverse power must be replaced with a suitable controller with both voltage and current inputs. The requirement to add a backup controller will also be evaluated. LTC upgrades may be required system modifications resulting from DG facility interconnection.

Controller settings will be determined on case-by-case analysis of DG type and penetration.

Capacity Limit: Intermittent reverse power flow will be permitted up to a level consistent with Eversource standards for transformer loading. The reverse power flow limit is based strictly on the transformer nameplate, with no consideration given to any forward power load on the transformer.

Reverse power flow that will significantly add to the transformer insulation loss of life on a routine basis, based on the transformer specification and the insulation aging description in the latest version of IEEE Std. C57.91, will be evaluated. Any required transformer upgrades will be included in system modifications required to interconnect the DG Facility.

DG Facilities must supply a balanced three-phase output such that there would never be a situation where a substation transformer could experience forward power flow on one or more phases while experiencing reverse power flow on the other phase(s).

As a part of the Impact Study process, projects will be reviewed on a case by case basis to determine if additional relays or other protection devices will be required. Any required protection devices will be included in system modifications required to interconnect the DG facility.

3.3.2 VAR (Power Factor)

All generators other than induction generators must operate at unity power factor unless an alternative range is specifically determined through studies performed by Eversource and as may be specified in the ISA.

3.4 Insulation Coordination

The generating Facility connected to the EPS (even in closed transition mode) must be able to withstand the normal steady state and abnormal transient voltages that can be experienced on the EPS. Lightning and switching of equipment are two common sources of high abnormal voltage transients. The generator shall be responsible for procuring equipment with a level of insulation and fault withstand capability compatible with the grounding method specified below.

3.5 BIL (Basic Impulse Insulation Level)

Equipment connected to the EPS must be designed with a certain minimum Basic Impulse Insulation Level (“BIL”). BIL, in general terms, is a measure of the ability of a piece of equipment to withstand normal and abnormal voltages.

The generator shall ensure that the BIL of all the installed equipment meets the applicable standards set forth above, as well as applicable UL, ANSI and IEEE standards. Furthermore, such equipment shall be installed in compliance with all applicable local, state and federal codes.

3.6 Grounding and Bonding

The grounding scheme of the generating Facility interconnection shall not cause overvoltages that exceed the rating of the Company’s equipment connected to the EPS and shall not disrupt the coordination of the ground fault protection on the EPS.

3.7 Arc Flash

The interconnection of a generating Facility to the EPS shall not increase available fault current and associated arc flash energy to a level where Company workers would have to use the next level of enhanced Personal Protective Equipment (“PPE”) and/or restrictive work methods above and beyond what the workers would normally use for work at the same location without the generating

Facility present. System modifications to address unacceptable increase in arc flash energy levels will be addressed in the Impact Study on a case by case basis.

3.8 Generation Facility Capacity

The generation Facility size is determined by the total aggregate maximum AC output of all generators as specified on the individual generator equipment specifications (“cut sheet”).

3.9 Design Changes or Additions

Contact the Company prior to designing any changes to existing interconnected generation Facility. Express authorization by the Company is required for the interconnection of any DG Facility. Once a design is approved for interconnection, no changes may be made without a subsequent approval by the Company of those changes. Failure to notify the Company of changes to approved designs may result in disconnection of the generating Facility.

3.10 External Disconnect Switch

The Company shall require an external disconnect switch (or comparable device agreed to by Company) at the PCC or at another mutually agreeable point that is accessible to Company personnel at all hours of all days and that can be opened for isolation if required. The switch shall be gang operated, have a visible air gap between switch contacts, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on Company side by Company personnel. The Company shall have the right to open this disconnect switch in accordance with the Interconnection Tariff.

3.11 Fault Interrupting Devices

The Customer shall install an interrupting device that has the capability to safely isolate the generator from the Company’s EPS. This device shall be capable of interrupting the full nameplate fault current of the generator system with consideration of X/R ratio including all AC and DC offsets at that point in the system. Such device may be subject to approval by Eversource, but such approval will be limited to the suitability of protecting the Eversource EPS.

3.12 Service Requirements

All generator interconnections must be consistent with applicable service requirements and standards. Requirements for Eversource East and Eversource West are available at www.eversource.com.

3.13 Clearances

When installing solar panels on the roof of a building, Facility must maintain a minimum of three feet from the service point of attachment and service mast.

3.14 Rights of Way (ROW)

3.14.1 Distribution and Transmission ROW's

Customers are not permitted to install equipment in Distribution or Transmission Rights of Way (ROW). Please contact Eversource prior to designing a project near a ROW. Please note that if your project will require you to access a ROW (such as by vehicle), you will be required to pay for a study to determine proper access to the site and modifications required for safe access and clearances. Services and equipment cannot be interconnected in or across a ROW.

3.14.2 Wind Turbine Setback from Distribution and Transmission ROW's

Each wind turbine proposed to be located near any Eversource Distribution or Transmission Right of Way (ROW) shall have a setback distance from the edge of the ROW that is the greater of the following: (1) a minimum of 1.5 times the wind turbine's maximum tip height (MTH)*; or (2) the minimum distance recommended by the applicable Ice Drop and Throw Evaluation Report during turbine operation; or (3) the minimum distance recommended by the wind turbine manufacturer for a turbine located in proximity to Eversource infrastructure on an ROW.

*Maximum Tip Height (MTH) is defined as the height of the wind turbine measured from natural grade to the tip of the rotor blade at its highest point.

4.0 Protection and Control Requirements

4.1 Classifications of Generator Interconnections

4.1.1 Purely Exporting Generator

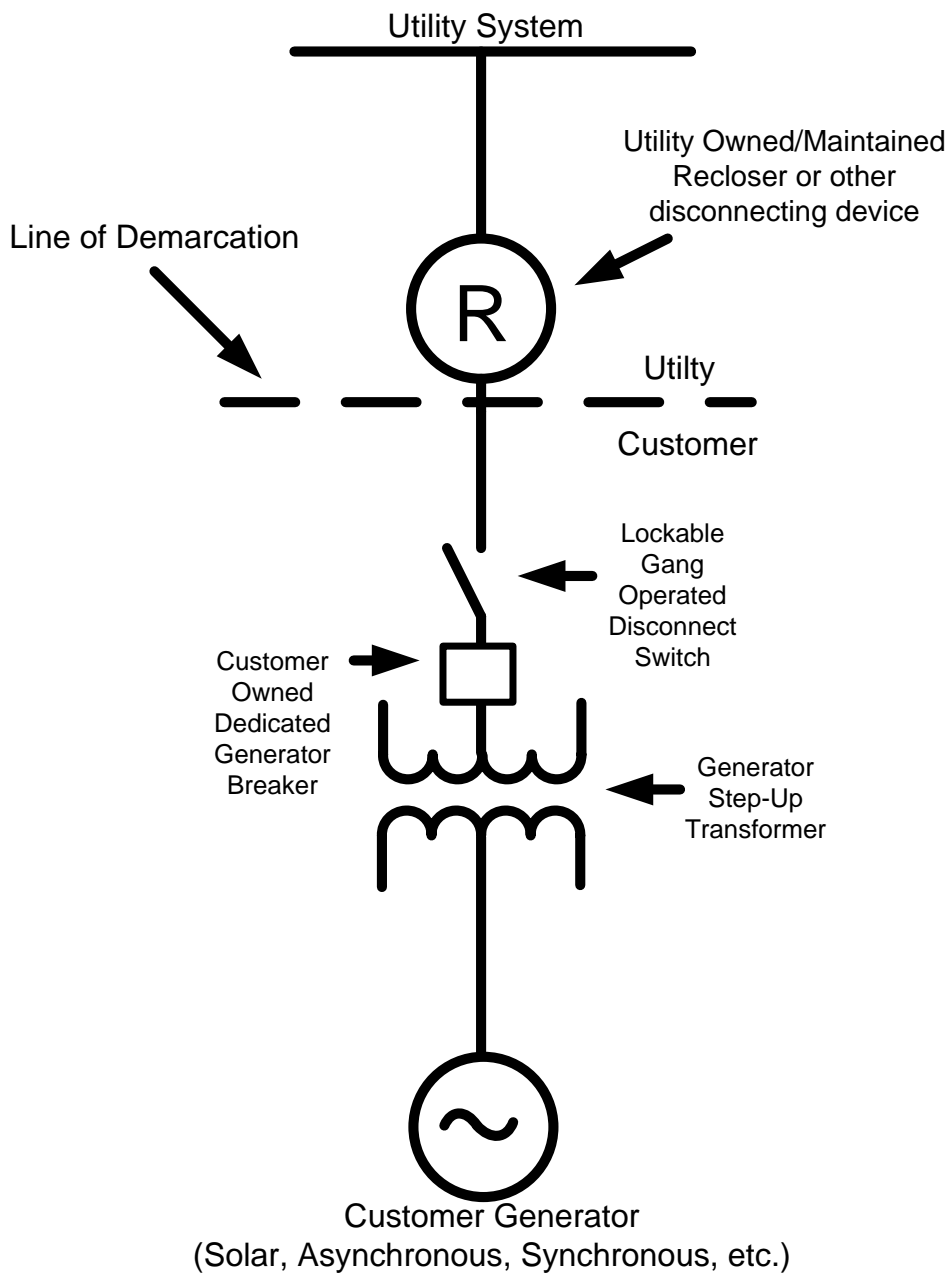
A Purely Exporting Generator or stand-alone generator within the context of this standard shall mean any DG that is installed with the purpose to provide power onto the Company EPS and also has little or no onsite customer load. The PCC will be defined in the ISA.

Under the context of this type of interconnection, the Company will regard the PCC Utility owned switch as the means to isolate the generator during times when the Company considers it unacceptable for parallel generation to operate.

The Company owned disconnecting device may be operated during off normal system configurations or any number of adverse conditions that may be brought to light in the Impact Study. This device may be operated manually, remotely or through the operation of a Company transfer trip scheme.

When deemed necessary, the Customer shall install and maintain a protection and control system. The Company disconnecting device shall not be considered as part of the Customer protection scheme.

Figure 1 – Purely Exporting Generator



4.1.2 Behind the Meter Exporting

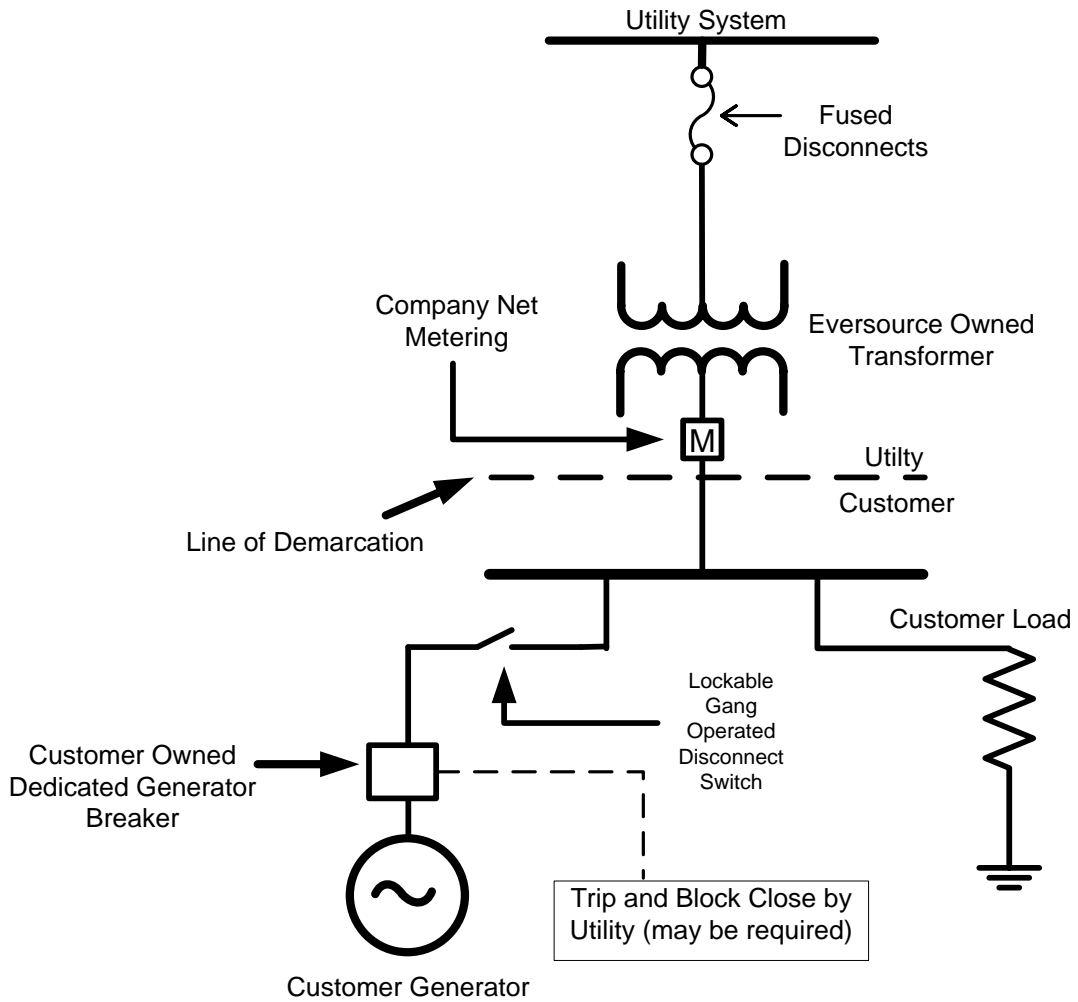
A Behind the Meter and Exporting Generator within the context of this standard shall be defined as any DG Facility that is installed with the purpose to provide power onto the Company EPS while there is also significant onsite customer load. For this type of installation the Company will consider the PCC as the metering location, when the Company owns the transformer and cable up to that point. For primary metered Customers, the same logic is applicable but the PCC becomes the primary metered location per PCC definition in the ISA.

The Company owned disconnecting device at the PCC may not be required in this case because the Customer load is present and may not be easily isolated along with the generator when the generator is tripped offline. In these cases, when the Company requires the Facility be isolated from the EPS, it will be necessary for the Company to trip and block close a protection device to be specified by the Company which may be owned by the Company or the Customer to disconnect the generator for the duration of that condition. The device may need to be operated during off normal system configurations or any number of adverse conditions the DG may cause on the Company EPS. This device may be operated manually, remotely or through the operation of a Company transfer trip scheme. This would require a communication interface between the Company and specified equipment.

4.1.3 Behind the Meter Non-Exporting

For Facilities connected in parallel with the Company EPS which are only intended to supplement onsite customer load (no power export to Company EPS) standard anti-Islanding protection in addition to minimum import protection shall be required. Minimum import protection (32 relay functionality) shall be set to trip a dedicated generator breaker and isolate the generator from the rest of the EPS any time power import at the metering location drops to 5% of the generator name plate MW value. For Facilities with multiple generators in parallel on site, the 'generator name plate' value will be considered the cumulative sum of all generator name plates on site.

**Figure 2 – Behind the Meter Generator Installation
(Example Configuration)**



4.2 Protection Requirements per Technology Size and Type

Relay requirements will vary according to size and technology type. The designations below organize protection requirements according to these considerations. The Company reserves the right to amend any of the following requirements if deemed necessary by Company engineering.

Note – All DG Facility interconnections shall also be required to have both Phase and Ground Overcurrent protection designed to isolate the generator from the Company EPS during any single/multiple phase(s)-to-ground, phase-to-phase, or three-phase faults on the Company EPS. Where applicable, the Company may require the Customer to also coordinate their Facility's Overcurrent protection scheme with the Company's upstream system protection. In this case the Company shall provide the Customer with the upstream relay settings. The Company may also require that the Customer submit a MA Professional Engineer Stamped coordination study of the Customer's facility to ensure coordination with the Company's upstream settings.

Inverter settings must be shown in a table on the MA PE stamped one line. When relays are required, relay settings must be shown in a table in definitive values on the the MA PE stamped one line.

4.2.1 Inverter Based Generators less than 500kW:

The Customer's relay system shall consist of UL1741 listed inverters with 27, 59, 81U and 81O relay functionality. Relay contactors may be used as the disconnecting means. A Company owned/maintained isolation device at the PCC may be required however the final determination of need will be at the sole discretion of the Company.

Inverter based systems smaller than 500kW may be allowed to utilize the inverter contactor to isolate during over/under voltage and over/under frequency. However, isolation for inverter overcurrent may require fuses or a dedicated Breaker if inverter contactors are not designed and rated to isolate during a nameplate fault current event.

The Company may require additional relay protection for systems 500 kW and smaller based on the Facility design, EPS and/or other factors determined during the review of the project.

4.2.2 Inverter Based Generators 500 kW or greater:

The Customer's relay system shall consist of UL1741 listed inverters and include one additional 'utility grade' relay (as defined by listed requirements in Appendix

A) with 27, 59, 59N, 81U and 81O relay functionality. A Company owned/maintained isolation device may be required at the PCC.

The Company may require additional relay protection based on the Facility design, EPS and/or other factors determined during the review of the project.

4.2.3 Asynchronous (induction) Generators under 300kW

The Customer's relay system shall consist of at least one utility grade relay with 27, 59, 81U and 81O relay functionality. Generators with built-in 'utility grade' relays with the functionality above may be adequate if UL1741 and IEEE1547 listed. A Company owned/maintained isolation device at the PCC may not be required however the final determination of need will be at the sole discretion of Company Engineering.

4.2.4 Asynchronous (induction) Generators, 300kW or greater or Synchronous of any size:

The Customer's relay system shall consist of at least two utility grade relays with 27, 59, 59N, 81U and 81O relay functionality. Generators with built-in utility grade relays with the functionality above may be adequate for primary protection. A Company owned/maintained isolation device at the PCC may be required.

4.2.5 Synchronizing Devices

4.2.5.1 The Customer shall designate one or more synchronizing device(s) such as motorized breakers, contactor/breaker combinations, or a fused contactor (if mutually agreeable) to be used to connect the generating Facility to the EPS. This synchronizing device may be a device other than the interconnection interrupting device. The synchronizing device must be capable of interrupting the current produced when the generating Facility is connected out of phase with the EPS consistent with IEEE 1547-2003, Section 4.1.8.3.

4.2.5.2 All synchronizing will be done by the generator at the generating Facility. The generating Facility shall not be used to energize a de-energized Company circuit.

4.2.5.3 In-line breakers, contactors, or switches without synchronizing devices require electrical or mechanical interlocks to prevent out-of-phase closing with the EPS.

4.2.5.4 All synchronizing schemes used for interconnecting a generating Facility with the EPS must conform to the synchronizing requirements within

the current version of IEEE 1547. Requirement for automatic synchronizing schemes are determined by the Company case by case basis.

4.2.6 Utility Grade Relay Equipment

All Customer-owned and maintained relays installed as part of generator protection scheme (Anti-Islanding, Overcurrent, Reverse Power, etc.) shall be 'Utility Grade'.

4.2.7 DC Power Backup

All protection and control functions required by the Company for protection of its EPS shall be designed in such a way that a loss of AC power will not compromise that protection. Acceptable methods include but are not limited to: undervoltage trip, DC battery systems, and Universal Power Supply ("UPS") systems. AC Capacitor trip devices are not permitted in any application that is required for the protection of the EPS.

4.2.8 Current Transformers

Current Transformer ("CT") ratios and accuracy classes for CTs as used in the generating Facility protection shall be consistent with ANSI and IEEE standards.

4.2.9 Voltage Transformers

The generating Facility shall be equipped with a direct voltage connection or a Voltage Transformer ("VT"), which shall be connected to the Company side of the interrupting device. For three-phase applications, a VT for each phase is required. If the interconnecting voltage transformer is ungrounded at the Utility voltage, this VT shall be a single three-phase device or three single-phase devices connected from each phase to ground on the Company's side of the generating Facility's interconnecting transformer, rated for phase-to phase voltage.

4.3 Transfer Trip Schemes

A Transfer Trip scheme may be required by the Company in order to ensure safe and reliable operation of our Distribution/Transmission System. A Transfer Trip scheme is a system that automatically isolates the Customer's generator during a potentially adverse condition where control and protection solutions located solely at the DG facility may not be able to detect the condition. If a transfer trip scheme is deemed necessary, Company engineering will explain the necessity and cost for implementing that solution with the customer. The scheme will be driven by a signal sent by the Company and received and acted upon by equipment designated by the Company to isolate the generator from the

Company EPS. The communication medium required to install the transfer trip scheme may vary due to application and may include radio, phone, power line carrier, or high speed fiber.

4.4 Generator Step-Up (GSU) Transformer Configurations

The Company may not specify Generator Step-Up (GSU) Transformer configuration type. However, the transformer high side must be compatible with the EPS. The protection requirements listed in Section 4.2 shall apply to all GSU types. It should be noted that the Customer's engineer shall design a protection scheme that is able to sense and isolate the Customer generation for all instances of Over/Under Voltage (27, 59), Over/Under Frequency (80/81) and Over Current (50/51) for BOTH sides of the GSU. Potential Transformers for relay application shall always be installed on the high voltage side of the GSU.

4.5 Closed Transition Generators

4.5.1 Momentary Parallel

A Facility not so designed may momentarily be paralleled with the Company EPS to provide disturbance free transfer of load to and from a generator for testing, peak shaving, load curtailment, or returning load to a utility supplied service. Interconnection requirements will be determined by the length of time the generation is paralleled with the EPS.

- a) Instantaneous Parallel [Less than 10 cycles (0.167 seconds)]. Additional Generator relaying in the following sections are generally not required, but may be specified, installed, and maintained at the discretion of the customer. The following conditions apply:
 - (1) The generator does not have to present a grounded-wye source to the EPS.
 - (2) The parallel and disconnecting operation must be automatic, instantaneous (switching time only) and less than 10 cycles (0.167 seconds) duration.
 - (3) A paralleled transfer must be blocked if the normal source to the load is not within +/- 10% of nominal voltage.
 - (4) The transfer scheme must be acceptable to the Company.
 - (5) The parallel operation must be monitored by a timing relay, which will trip the generators main breaker or contactor if the parallel

operation lasts longer than 0.5 seconds. The tripping voltage must be from a battery. Capacitor trip devices are not acceptable.

b) Transitional Parallel

- (1) The generator does not have to present a grounded-wye source to the EPS. If the generator does not present a grounded-wye source, Zero Sequence Over voltage Relays (59G) must be installed and wired to trip the generator(s).
- (2) The parallel, generator loading and disconnecting operations must be automatic. Parallel time must be kept to a minimum and must never exceed five (5) seconds.
- (3) A paralleled transfer must be blocked if the normal source to the load is not within +/- 10% of nominal voltage.
- (4) The transfer scheme must be acceptable to the Company.
- (5) The parallel operation must be monitored by a timing relay, which will trip the generator main breaker(s) if the parallel lasts longer than 5 seconds. The tripping voltage source must be from a battery. Capacitor trip devices are not acceptable
- (6) Over/under voltage and over/under frequency relays must be installed based on the size and type of generation being installed. Additional generator relaying is not required but may be specified, installed, and maintained at the discretion of the customer.
- (7) The Interconnecting Customer must receive permission from the Company's prior to making the parallel with the generator.

4.6 Open Transition Generating Facilities

Connection of a generating Facility does not require an Interconnection Application when the generating Facility's manual or automatic transfer switch will not allow any parallel operation of the generating Facility with the EPS. This electrical state (*i.e.*, open transition transfer) is typically referred to as "break-before-make," which means that the generating Facility's transfer switch must be designed and operated to prevent the EPS-provided power and the generating Facility-provided power from powering the Facility circuits (*i.e.*, load) at the same time. Consequently, this mode of operation will also prevent the generating Facility from potentially energizing the EPS.

5.0 Interconnecting Generators with Network Systems

5.1 Network Systems

A secondary network distribution system is supplied by at least two primary feeders where all the elements are tied together at the secondary level. By design, this configuration will not allow reverse power to flow out of the network back to the utility. Network protectors are designed to interrupt fault current flow to a feeder fault from the low voltage network. They are not designed to separate two dynamic systems, the utility system and Customer owned generation. For purposes of this policy, the terms secondary network, tertiary network and spot network are synonymous.

The Company will not permit parallel synchronous and induction generation on the load side of its network system. Interconnection to this area of the EPS utilizing network protectors can compromise system integrity and alternate measures must be explored.

The Customer can use its Facility to supply an isolated load. Under this condition the generator would not operate in parallel with the Company's secondary network system. A break-before-make throw over switch can be installed to provide power upon loss of the generator. The Customer can also request a non-network service.

5.2 Area Networks

Parallel generator Facility interconnections of inverter-based generation with area networks are allowed with limitations. The limits are required to prevent reverse flow of power or current through network protectors.

Only inverter-based generation will be allowed. No synchronous or induction generation will be allowed. Interconnection will be through a breaker on the customer's electrical panel.

The maximum DG size will be limited to 50 kilowatts ("kW") at any one location assuming that the load ratios do not adversely affect the ability to maintain reliable network protector closure under day to day loading. A location is defined as any manhole or service box. These criteria are needed to ensure that no more than 50 kW of distributed generation is located between the same set(s) of cable limiters.

The total, aggregate DG interconnected to an area network will be limited to the lesser of (a) three percent of the maximum network transformer connected kVA with the feeder supplying the largest number of area network units out of service (an N-1 event²), (b) 10% of the annual minimum load on the area network, or (c) 250 kW. In addition, a case by case review will be done to make sure that the generation on the area network is

² The N-1 KVA represents the connected KVA of the network units in a first contingency situation for loss of a primary distribution circuit which feeds the area network.

disbursed throughout the area network. If it is determined that additional generation in a section of the area network will be detrimental, Eversource will provide information on the cost of a service from a radial circuit to interconnect any additional generation.

Installations of 30 kW and larger will be required to use inverters with adjustable set points such as for voltage and frequency. This is necessary to ensure better fault detection and clearing times. The settings must be submitted with the application and will be reviewed by Eversource. Inverters over 10 kW must have adjustable settings.

Further, load monitoring and network protector operations readings and monitoring may be necessary at the Customer's expense.

If the primary feeders to the network come from substations with open tie breakers such that the voltage applied to the primary feeders at the source is different, or if the primary feeders come from different substations, no generation of any type shall be allowed on the area network.

For Solar Facilities, inverter settings meet the following criteria when installed on the network: (1) under and over voltage instantaneous (2 cycle) trip points; (2) if these points are factory set, the instantaneous under voltage should be set at 87% of rated voltage and the instantaneous over voltage should be set at 130% of rated voltage.

5.3 Spot Networks

Generator interconnections with spot networks are permitted.

6.0 Testing and Maintenance Requirements

All testing must be completed in accordance with the latest approved version(s) of IEEE 1547.

6.1 Witnessing of Commissioning Test

Company inspects completed installation for compliance with requirements. The Company reserves the right to require a Witness Test of all facilities as approved by the Company. The Interconnecting Customer will provide a proposed Witness Test procedure and all requisite supporting documentation for review by the Company once the Interconnecting Customer has completed the installation of the Facility.

Testing typically includes, but is not limited to:

- CT and CT circuit polarity, ratio, insulation, excitation, continuity and burden tests.
- VT and VT circuit polarity, ratio, insulation and continuity tests.
- Relay pick-up and time delay tests.
- Functional breaker trip tests from protective relays.
- Relay in-service test to check for proper phase rotation and magnitudes of applied currents and voltages.
- Breaker closing interlocks tests.
- Paralleling and disconnection operation.
- Anti-islanding function, if applicable.
- Non-export function, if applicable.
- Synchronizing Controls, if applicable.
- Proof of inability to energize deadlines.

Each commissioning test shall include both a calibration check and an actual trip of the circuit breaker or contactor from the device being tested. Visually setting a calibration dial, index or tap is not considered an adequate calibration

6.2 Periodic Testing

The Interconnecting Customer is responsible for the periodic maintenance of all relays, interrupting devices, control schemes, and batteries that involve the protection of the EPS. Batteries shall be load tested once every twenty four months, or more frequently based on the manufacturer's recommendations. The test cycle for protective relaying must not be less frequent than once every sixty (60) calendar months or the cycle recommended by the manufacturer, whichever is shorter. The Interconnecting Customer must provide copies of these test records to the Eversource upon request. The Company shall have the right to monitor the periodic maintenance performed.

Each routine check shall include both a calibration check and an actual trip of the circuit breaker or contactor from the device being tested. Visually setting a calibration dial, index or tap is not considered an adequate calibration.

6.3 Safe Operations and Maintenance

The Interconnecting Customer shall operate, maintain, repair, and inspect, and shall be fully responsible for the generating facility and any other associated facilities that it now or hereafter may own unless otherwise specified in the ISA. The Interconnecting Customer and the Company shall each be responsible for the maintenance, repair and condition of its respective lines and appurtenances on its respective side of the point of interconnection. The Company and the Interconnecting Customer and Customer shall each provide equipment on its respective side of the point of interconnection that adequately protects the EPS, personnel, and other persons from damage and injury.

All maintenance shall be performed as specified in the ISA as executed by the parties.

Appendix A

Utility Grade relay Requirements

Need for a utility grade protective relay system which meets the following standards:

- IEEE C37-90, .1, .2

- IEEE C39.90.1

- Environmental testing Standards Part 2 of: IEC 68-2-1, IEC 68-2-2, IEC 68-2-3, & IEC 68-2-30,

- Part 5 of IEC 255-5, Insulation tests for electrical relays. Section 6 Dielectric Tests.

- Part 21 of IEC 255-21-1, 2, 3, Sections 1, 2,& 3. (Vibration, shock, bumps.)

- IEC 255-22-1, 2, 3, 4 Section's 1, 2, 3 & 4, Electrical disturbance tests for measuring relays and protection equipment.

- IEC 255-5 Insulation (Impulse Voltage Withstand)

- IEC 801- 2, 3, & 4 Electromagnetic compatibility for Industrial-process measurement and control equipment parts 2, 3, and 4.

This requirement is to ensure that the protective relay system will work under a variety of environmental and operational conditions.