



GROTON UTILITIES

BOZRAH LIGHT & POWER

Interconnection Guidelines For Customer-Owned Generation

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1.0 Introduction

These Guidelines have been developed by the City of Groton Department of Utilities, Electric Division (GU) or (Division) to assist Customers wishing to generate power and to interconnect with the Division's Electric Power System (EPS).

GU Electric Division is responsible for the distribution of electric power throughout the City of Groton and portions of the Town of Groton, Connecticut. GU must ensure that any interconnections to the EPS are performed in a safe and reliable fashion. To this end, protocols and procedures are outlined in this Guideline document.

These Guidelines provide a means for the Customer and GU to work together toward the common goal of a successful interconnection. In working together, GU is always willing to consider case specific exemptions to the Guidelines due to changes of applicable regulations, advances in technology, etc.

GU will appoint an Engineer as the primary point of contact to facilitate the interconnection process. The Engineer will provide Guideline information and applicable forms, and Agreements. The initial point of contact shall be:

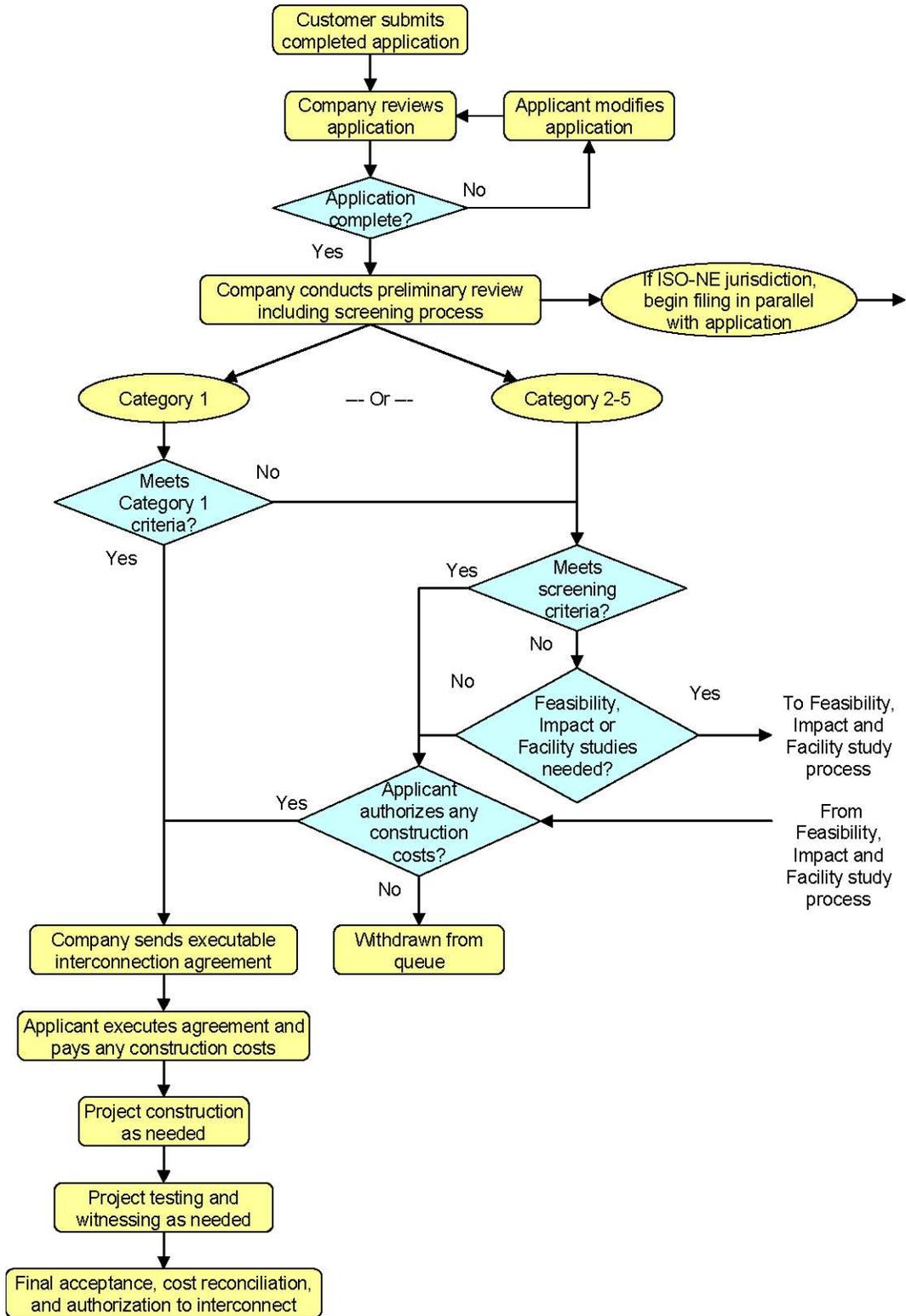
Designated Project Manager

Telephone (860) 446-4092
Fax (860) 446-4098
E-mail grotonutilities@yurservice.com

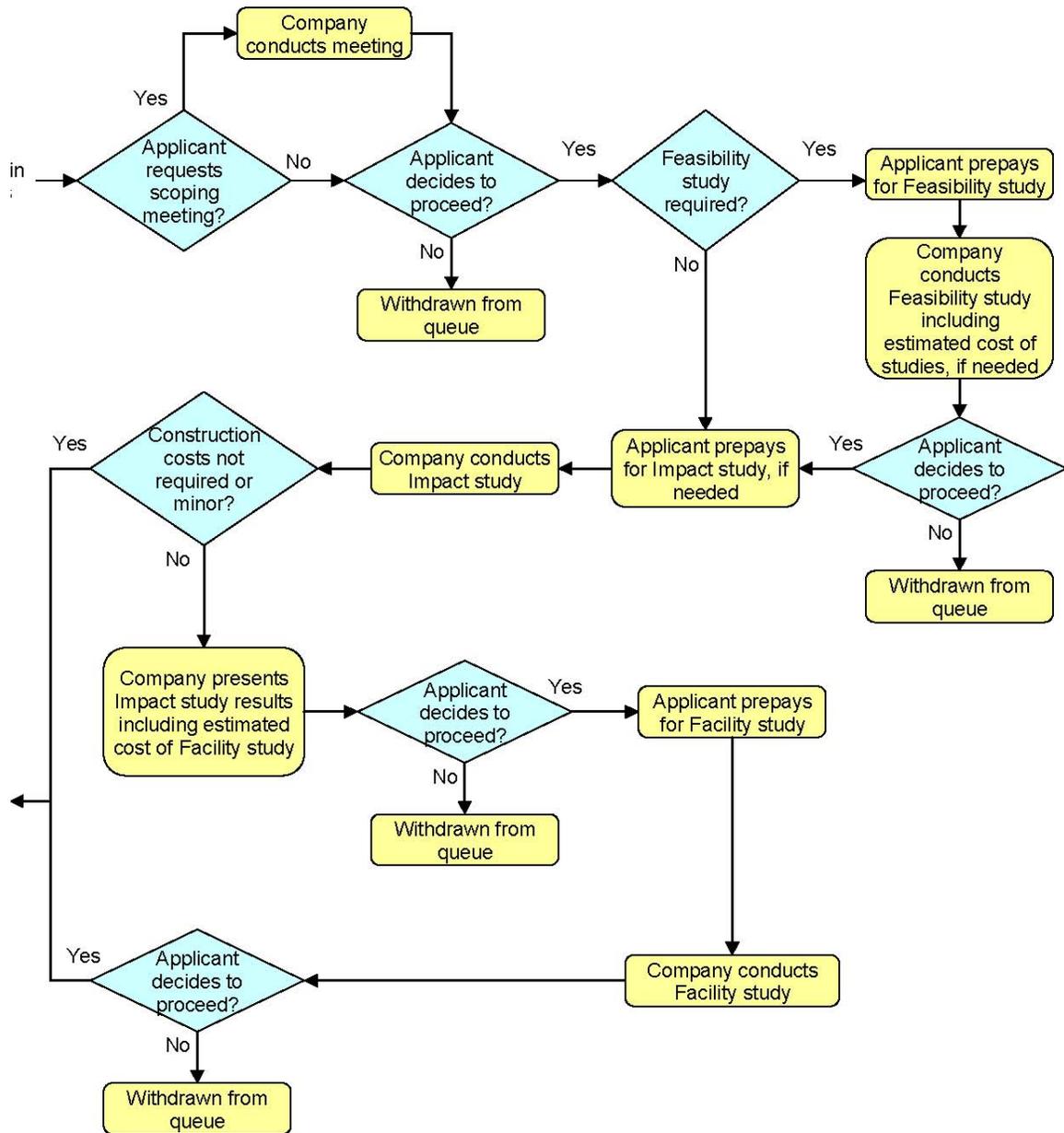
Mail

City of Groton Department of Utilities
Electric Division
295 Meridian St
Groton, CT 06340

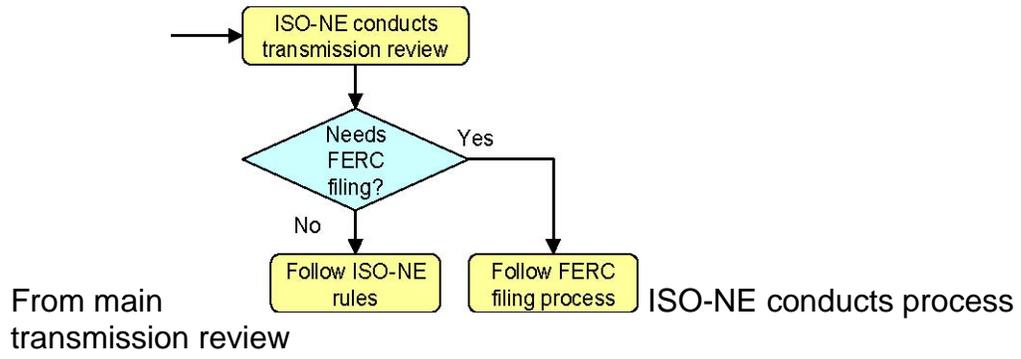
Main Interconnection Process Flow Chart



Feasibility, Impact and Facility Study Process Flow Chart



ISO-NE Process Flow Chart



DEFINITIONS

In this Guideline document, the following terms may be used:

Accredited, Nationally Recognized Testing Laboratory: A laboratory approved to perform the certification testing required for Generating Facilities.

ANSI: American National Standards Institute.

Applicant: The person or organization applying to interconnect a Generating Facility to the Electric Power System (EPS).

Application Review: A review by GU of the completed Interconnection Application Form to determine if a Feasibility, Impact and/or Facility Study are needed.

Business Day: Monday through Friday, excluding Federal, State and Local Holidays.

Calendar Day: Any day, including Saturday, Sunday, Federal, State and Local Holidays.

Company: The City of Groton Department of Utilities, Electric Division

Contract Path: A specific contiguous electrical path from a point of receipt to a point of delivery for which Electric Power System rights have been contracted.

Delivery Service: The services GU may provide to deliver capacity or energy produced by the Generator to a buyer to a delivery point(s), including related ancillary services.

Disconnect: To isolate a circuit or equipment from a source of electrical power.

Disconnect Switch: A mechanical device used for isolating a circuit or equipment from a source of electrical power.

Division: The City of Groton Department of Utilities, Electric Division.

Electric Power System (EPS): All electrical wires, equipment, and other facilities owned or provided by GU that are normally operated at voltages of 13.8kV and below, to provide distribution service to customers.

Facility Study: The study conducted by GU for Category 3, 4 & 5 Generating Facilities to determine the scope and costs of the required modifications and upgrades to GU's Electric Power System and/or the Generating Facility to provide the requested interconnection service.

Fault: An equipment failure, short circuit, or other condition resulting from abnormally high amounts of current from the power source.

Feasibility Study: A preliminary evaluation of the system impact and cost of interconnecting the Generating Facility to GU's Electric Power System.

FERC: Federal Energy Regulatory Commission.

Generator: The owner/operator of the Generating Facility.

Generating Facility: Any device producing electrical energy, i.e. rotating generators, wind, steam turbines, internal combustion engines, hydraulic turbines, solar, fuel cells, etc., including energy storage technologies. A system for the generation of electricity that is located near the point where the electricity generated will be used or is in a location that will support the functioning of the electric power distribution grid.

Good Utility Practice: Any of the practices, methods and acts 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 judgement in 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 practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather, to be acceptable practices, methods, or acts generally accepted in the region.

Guidelines: This document, prepared by the GU Electric Division to describe the protocols and procedures for interconnecting to the Electric Power System, *“Interconnection Guidelines for Customer-Owned Generation”*.

IEEE: Institute of Electrical and Electronics Engineers.

Impact Study: An engineering study that evaluates the impact of the proposed interconnection on the safety and reliability of the EPS. The study shall identify and detail the system impacts that would result if the Generating Facility were interconnected without project modifications or system modifications, focusing on the adverse system impacts identified in the Interconnection Feasibility Study, or to study potential impacts, including but not limited to those identified in the Scoping Meeting.

Independent System Operator (ISO): An entity supervising the collective transmission facilities of a power region; the ISO is charged with nondiscriminatory coordination of market transactions, system-wide transmission planning, and network reliability.

Induction Generator: An induction machine, when driven above synchronous speed by an external source of mechanical power, used to convert mechanical energy to electrical energy.

In-Service Date: The date on which the Generating Facility and system modification (if applicable) are complete and ready for service, even if the Generating Facility is not placed in service on or by that date.

Interconnection: The physical connection of a Generating Facility to the Electric Power System so that parallel operation can occur.

Interconnection Agreement (IA): A written agreement between a Generator and GU setting forth the mutual undertaking for an interconnection. An Interconnection Agreement is required to be signed by the Generator and GU before parallel operation of the Generating Facility can commence. (Interconnection Agreement forms are an attachment to these Guidelines).

Inverter: A machine, device or system that changes direct current power to alternating current power.

Islanding: A situation where electrical power remains in a portion of an electrical power system when GU's Electric Power System has ceased providing power for whatever reason (emergency conditions, maintenance, etc.). Islanding may be intentional, such as when certain segregated loads in a Generator's premises are provided power by a Generating Facility after being isolated from the Electric Power System after a power failure.

ISO-NE: The Independent System Operator established in accordance with the NEPOOL Agreement and applicable FERC approvals, which is responsible for managing the bulk power Generation and transmission systems in New England, or any successor organization to ISO-New England that is sanctioned by FERC.

Line Section: That section of the Electric Power System between two sectionalizing devices.

Metering Point: The point at which the billing meter is connected, or in the case of instrument transformer metering, the point at which the instrument transformers are connected.

NEPOOL: New England Power Pool.

Net Metering: The process, either by equipment or software, whereby the metered electrical energy production by a Generating Facility is subtracted from the metered GU electrical energy sales to the customer at the Generating Facility.

Non-Islanding: Describes the ability of a Generating Facility to avoid unintentional islanding through the operation of its interconnection equipment.

Point of Common Coupling (PCC): The point where the Generating Facility's local electric power system connects to GU's Electric Power System, such as the electric power revenue meter or premises service transformer.

Point of Delivery: See Contract Path.

Point of Interconnection: The point where the Generating Facility is electrically connected to the Generator's electrical system.

Point of Receipt: See Contact Path.

Pre-Certified, Pre-Certification: A specific generating and protective equipment system or systems that have been certified and documented as meeting applicable test requirements and standards relating to safety and reliability by a nationally recognized testing laboratory.

PUC: The Utilities Commission of the City of Groton.

Qualifying Facility (QF): A Generation Facility that has received certification as a Qualifying Facility from FERC in accordance with the Federal Power Act, as amended by the 1978 Public Utilities Regulatory Policies Act ("PURPA"). The standards for a "QF" are defined in Title 18, Code of Federal Regulations, Part 292 Subpart A-General Provisions and Subpart B-Qualifying Co-generation and Small Power Production Facilities.

Scoping Meeting: A meeting to discuss the interconnection application, review any existing studies relevant to the application, and discuss whether GU should perform a Feasibility Study, Impact or Facilities Study, or proceed directly to an Interconnection Agreement.

Switchgear: Components for switching, protecting, monitoring and controlling the Electric Power System or the Generating Facility electric system.

Synchronous Generator: A synchronous alternating current machine, which transforms mechanical energy to electrical energy. (A synchronous machine is one in which the average speed of normal operation is exactly proportional to the frequency of the system to which it is connected).

Telemetry: The transmission of Generating Facility data using telecommunications techniques.

Transfer Switch: A switch designed so that it will disconnect to transfer load from one power source to another source.

Utility Grade Relay: A relay that is constructed to comply with, as a minimum, the most current version of the following standards: ANSI/IEEE C37.90, ANSI/IEEE C37.90.1, ANSI/IEEE C37.2, ANSI/IEEE C37.90.3 and; IEEE C37.98 Seismic Testing (fragility) of Protective and Auxiliary Relays, ANSI C37.2 Electric Power System Device Function Numbers, IEC 255-21-1 Vibration, IEC 255-22-2 Electrostatic Discharge, and IEC 255-5 Insulation (Impulse Voltage Withstand).

GU: The City of Groton Department of Utilities, Electric Division.

2.0 Application Process

2.1 Definition of Generating Facility Size Categories

The following Generating Facility size categories are used in determining minimum protective requirements, commercial requirements and timeframes for processing. Size categories are listed according to nameplate ratings for each connection to the EPS. Generators must satisfy the general requirements and the minimum protective function requirements provided in this document for each Generating Facility category, as follow:

Category ¹	Application	Maximum Processing Time
Category 1 - 10kW or less Inverter or Induction based Pre-Certified Generating Facility	Attachment 1	20 Business Days
Category 2 - >10kW <101kW Non-Inverter or Non-Induction	Attachment 2	30 Business Days
Category 3 - >100kW<1,001kW	Attachment 2	40 Business Days
Category 4 - >1,000kW<5,001 kW	Attachment 2	120 Business Days
Category 5 - >5,000kW	Attachment 2 and ISO-NE / FERC Procedures	Based upon Complexity and application review

¹ All Categories are based on aggregate generation at the site.

Processing time begins with the receipt of a complete application and ends with the completion of processing procedure Step No. 9.

Processing time includes GU processing only. This does not include applicant turnaround response time or time lost as a direct result of the impact of system emergencies.

2.2 Application Process for Interconnecting Category 5 Generating Facilities

In addition to the application process described following (Section C), Application for Interconnection may also commence with ISO-NE.

Contact: Generator Interconnections
c/o Transmission Planning
One Sullivan Avenue
Holyoke, MA 01040
http://www.iso-ne.com/smd/transmission_planning/New_interconnections/

2.3 Application Process for Interconnecting Category 1-5 Generating Facilities

For a synopsis of the Application Process, the applicant is referred to the Process Flow Charts contained on pages 4 to 6 of these Guidelines.

Step 1 – Generator Submits Application

- 1.1 The process begins with the submission of a complete application to GU. The following must be included:
 - 1.1.1 A completed standard interconnection application based upon the category of the Generating Facility, as noted foregoing.
 - 1.1.2 A one-line electrical schematic drawing(s) depicting the complete proposed system design. The drawing(s) must show all electrical components and protective relaying proposed for the installation.
 - 1.1.3 General site plan of the proposed installation.
 - 1.1.4 Proposed schedule for the in-service date.
 - 1.1.5 Payment of the non-refundable application fee as set forth herein.
 - 1.1.6 Technical specifications for each piece of major electrical equipment utilized in the installation.

Note that any changes to the Generating Facility following filing of the application, including design changes and capacity increases may trigger a hold on the application pending completion of further review and new studies. Generator shall inform GU in writing of any design changes or capacity increases as soon as practicable.

Step 2 – GU Conducts Application Review

- 2.1 GU reviews the application materials to confirm that the application is complete. If information is lacking, GU will notify the applicant within 10 business days and identify what is needed. The application shall be placed “On Hold” pending receipt of all required information.

GU will review the application materials and may comment on various technical aspects, but GU is not responsible for the accuracy of the interconnection design, the drawings, or the technical specifications.
- 2.2 Following application filing, if requested, GU will host a scoping meeting with the applicant at a mutually acceptable date and time.
- 2.3 For all Category 1 applications, and Category 2 and 3 applications, which do not require System Impact or Facility Studies, the Applicant may proceed to Process Step No. 6.
- 2.4 If it is determined that an Interconnection Feasibility Study is required, GU will provide an Interconnection Feasibility Study Agreement including an outline of

the study and a non-binding, good faith estimate of the cost to perform the study. The Applicant must execute and return this Agreement for the process to continue. The application shall be placed “On Hold” pending receipt of the Agreement.

- 2.5 If the Applicant requests that the Interconnection Feasibility Study evaluate multiple potential points of interconnection, the applicant shall be financially responsible for additional evaluations.

Step 3 – GU Conducts Feasibility Study

- 3.1 The application will be entered into the queue when it has been determined that it is complete. An Interconnection Feasibility Study will include the following analyses for the purpose of identifying any potential adverse impact to the EPS that would result from the interconnection:

- Initial identification of any short circuit capability limits exceeded as a result of the interconnection.
- Initial identification of any thermal overload or voltage limit violations resulting from the interconnection.
- Initial review of grounding and system protection requirements.
- Description and a non-binding estimate of the cost of facilities placement or adjustment required to interconnect the Generating Facility to the EPS in a safe and reliable manner.
- Any/all other items deemed necessary on a case-by-case basis.

- 3.2 For all applications where Impact and Facility Studies are required, the following information will be provided to the Applicant by GU:

- Scope of the Impact and Facility Study required.
- Estimated cost of the Impact and Facility Study.
- Anticipated commencement and completion schedule.
- Any additional information required for the Studies.
- Study Authorization Agreements.

Step 4 – Applicant Authorizes Impact Study

- 4.1 If an Impact Study is required and the Applicant wishes to proceed, the Applicant shall provide to GU:

- Signed Study Authorization Agreement.
- Payment required by GU for completion of the Impact Study.
- Any/all additional Study data, if required.

- 4.2 The Study shall commence following receipt of the foregoing. If GU does not receive the Agreement, payment, or necessary Study data within two (2)

months, GU will place the application “On Hold” for up to four (4) months, after which it will be withdrawn from the queue.

- 4.3 Upon completion of the Impact Study, GU will provide the Applicant the following:
 - The results of the Impact Study.
 - Metering requirements for the proposed Generating Facility.
 - Cost estimate (+/-25%) for additions or modifications to the EPS if required.
- 4.4 The Applicant shall modify the interconnection design if required by the Impact Study, or provide an acceptable alternate design. Upon GU acceptance of the interconnection design, proceed to Step 5.
- 4.5 If the Impact Study determines that EPS modifications are not required and/or will be minor, a Facility Study will not be required, and the Applicant may proceed to Step 6.

Step 5 – Applicant Authorizes EPS Facility Study

- 5.1 If an EPS Facility Study is required and the Applicant wishes to proceed, the Applicant shall provide to GU:
 - Signed Study Authorization Agreement.
 - Payment required by GU for completion of the Facility Study.
 - Any/all additional Study data, if required.
- 5.2 The Study shall commence following receipt of the foregoing. If GU does not receive the Agreement, payment, or necessary Study data within two (2) months, GU will place the application “On Hold” for up to four (4) months, after which it will be withdrawn from the queue.
- 5.3 Upon completion of the Facility Study, GU will provide the Applicant with the construction cost estimate and anticipated completion date for any required modifications to the EPS.

Step 6 – Interconnection Agreement and Construction Agreement

- 6.1 The Applicant shall execute an Interconnection Agreement and Construction Agreement, thereby authorizing GU to perform the required work.
- 6.2 The Applicant shall provide payment to GU for the required work upon submittal of the Interconnection Agreement and Construction Agreement.

Step 7 – Project Construction

- 7.1 The Applicant and GU will construct the required interconnection facilities and Electric Power System modifications, in accordance with the design and engineering drawings, documents and the Interconnection & Construction Agreement.
- 7.2 GU will notify the Applicant if GU’s construction costs for Electric Power System modifications exceed 10% above the estimate as provided in the Construction Agreement and/or Facility Study. The Applicant shall be financially responsible to pay the actual costs of construction.

Step 8 – Commissioning and Pre-Parallel Testing

- 8.1 Prior to operating in parallel with the Electric Power System, the Generating Facility and associated interconnection equipment must be tested to assure proper operation.
- 8.2 The Applicant is to notify GU of a proposed date for commissioning testing, including a test procedure, at least ten (10) business days in advance of the proposed testing date.
- 8.3 If significant issues arise preventing conclusion of the testing, GU and Applicant will schedule a mutually acceptable retest date.
- 8.4 GU will charge the Applicant for GU’s representative to witness the commissioning testing as prescribed in the “Protection System Testing and Maintenance” section. Charges will be made for the first and any subsequent GU visits that are required for commissioning testing. The Applicant shall be charged only for those personnel necessary to witness the testing.
- 8.5 There will be no charge for GU representative to witness the commissioning testing of a Category 1 inverter-based Generating Facility, provided that the testing is completed in one visit. Charges shall be made for retests and/or necessary subsequent visits.

Step 9 – Final Acceptance, Cost Reconciliation, and Authorization to Interconnect

- 9.1 If the interconnection is not approved, the Applicant must take corrective action in order to obtain authorization to interconnect to the Electric Power System.
- 9.2 Prior to formal authorization of the interconnection, the Applicant will provide GU with updated documents and drawings showing the Generating Facility as approved for normal operation. The one line drawings must be “as built” and include all changes that were made during construction and testing.

GU may inspect the facilities to ascertain proper installation and settings of protective devices. The Applicant will provide GU a commissioning test report if requested.

- 9.3 The Applicant must obtain a passing inspection and release by the Municipal Electrical Inspector and/or authority having jurisdiction prior to parallel interconnection.
- 9.4 Upon approval of the interconnection, GU will provide a formal letter of acceptance stating that the Generating Facility is allowed to commence parallel operation to the Electric Power System.
- 9.5 GU will reconcile and audit all of its costs for the interconnection project and provide the Applicant a closure billing for any balance due or reimbursement for overpayment made.

3.0 General Requirements

3.1 Responsibility for Costs of Interconnecting a Generating Facility

3.1.1 **Fees:** During the conduct of the Feasibility Study, GU will determine if there is a need for an Impact or Facility Study. GU will provide the Applicant a non-binding estimate of the cost of any required Feasibility Study, Impact Study or Facility Study. Following are the applicable fee schedules:

<u>Category</u> ¹	<u>Application</u>	<u>Each Study</u>
Category 1 10kW or less Inverter or Induction based Pre-Certified Generating Facility	\$100	\$0
Category 2 >10kW <101kW Non-Inverter or Non-Induction	\$250	\$0
Category 3 >100kW<1,001kW	\$250	Actual Cost
Category 4 >1,000kW<5,001 kW	\$500	Actual Cost
Category 5 >5,000kW	\$1000 and per ISO-NE ²	Actual Cost

¹ All Categories are based on aggregate generation at the site.

² ISO-NE will maintain a generator queue for Category 5 Applicants.

3.1.2 **Interconnection Equipment Costs:** The Applicant is responsible for all interconnection equipment costs, including installation, construction, testing and commissioning.

3.1.2 **System Modification Costs:** The Applicant is responsible for all associated costs incurred by GU in designing, constructing, operating and maintaining modifications to the Electric Power System that are required to accommodate the interconnection.

Should GU's construction costs for Electric Power System modifications exceed 10% above the estimate as provided in the Construction Agreement and/or Facility Study, GU will notify the Applicant within 10 business days.

3.2 Agreements

An Applicant seeking to establish an electrical interconnection with the GU Electric Power System must execute all necessary agreements before parallel operation will be authorized.

The agreements an Applicant may expect to complete (depending upon the character of the Generating Facility) include:

- Study Authorization Agreement(s):
 - Interconnection Feasibility Study
 - Impact Study
 - Electric Power System Study
- Construction Agreement
- Interconnection Agreement, signed by the Applicant and GU before parallel operation can commence (required for all Generating Facilities)

3.3 Disconnection

3.3.1 Temporary Disconnection

3.3.1.1 Emergency Conditions: The Interconnection Agreement contemplates that GU and the Generator will cooperate to minimize disruptions in service. The Interconnection Agreement provides that GU will have the right to immediately and temporarily disconnect the Generating Facility, without prior notification, in emergencies and in cases of forced outage.

3.3.1.2 Routine Maintenance, Construction and Repair: The Interconnection Agreement allows for the disconnection of the Generating Facility from the EPS when necessary for routine maintenance, construction and repair: The Interconnection Agreement allows for the disconnection of the Generating Facility from the EPS when necessary for routine maintenance, construction and repair.

3.3.1.3 Forced Outages: The Interconnection Agreement provides that during any forced outage, GU shall have the right to suspend interconnection service to effect immediate repairs on the GU EPS. Disconnection of service may, or may not be, with prior notice. GU will use reasonable efforts to provide the Generator with prior notice if possible.

3.3.1.4 Non-Emergency Adverse Operating Effects: The Interconnection Agreement provides that GU may disconnect the Generating Facility if such facility is having an adverse operating effect on the EPS or on other GU customers.

3.3.1.5 Modifications of the Generating Facility: The Interconnection Agreement provides that GU may immediately suspend interconnection service in cases where the Generator has implemented modifications to the Generating Facility without prior written authorization from GU.

3.3.1.6 Re-connection: Any curtailment, reduction or disconnection shall continue only for as long as is reasonably necessary. The Generator and GU will cooperate to restore the Generating Facility and the EPS to their normal operating states as soon as reasonably practicable following the cessation or remedy of the event or condition that led to the temporary disconnection.

3.4 Permanent Disconnection

3.4.1 The Interconnection Agreement provides that the Generator may permanently disconnect at any time with 30 calendar days written notice to GU.

3.4.2 The Interconnection Agreement provides that GU may permanently disconnect the Generating Facility upon termination of the Interconnection Agreement. The Generator shall reimburse GU for all costs incurred by GU to accomplish the permanent disconnection.

3.5 Insurance

Generators interconnecting a Generating Facility to the EPS of the GU Electric Division shall maintain liability insurance in the amounts stipulated below, per interconnection. If the site owner or the operator is a different party than the Generator, they shall also maintain liability insurance in the amounts stipulated. The Generator shall maintain, during the term of the Agreement, general liability insurance with a combined single limit of not less than:

<u>Category</u>	<u>Nameplate Rating</u> ¹	<u>Minimum Liability Insurance</u>
Category 1	10 kW or less Facility	\$300,000
Category 2	Greater than 10 kW to 100 kW	\$500,000
Category 3	Greater than 100 kW to 1,000 kW	\$1,000,000
Category 4	Greater than 1,000 kW to 5,000 kW	\$2,000,000
Category 5	Greater than 5,000 kW	\$5,000,000

¹ All nameplate ratings are based on aggregate generation at the site.

3.5.1 Insurer Requirements and Endorsements

All required insurance shall be carried by reputable insurers, qualified to underwrite insurance in the State of Connecticut, that have minimum ratings of A+ from Moody's or Standard and Poors. In addition, all insurance shall:

- Include City of Groton-Department of Utilities as an additional insured for Categories 3, 4 and 5.

- Contain a severability of interest clause or cross-liability clause.
- Provide that GU shall not incur liability to the insurance carrier for payment of premium for such insurance.
- Provide for thirty (30) calendar days' written notice received by GU prior to cancellation, termination, or material change of such insurance.

3.5.2. Evidence of Insurance

Evidence of insurance required shall state that coverage provided is primary to any insurance or self-insurance maintained by GU.

For each year that the Interconnection Agreement is in force, the Generator shall provide GU certification of insurance in compliance with these guidelines.

Prior to GU commencing work on system modifications, the Generator shall have its insurer furnish to GU certificates of insurance evidencing the insurance coverage required above. The Generator shall notify and send to GU a certificate of insurance for any policy written on a "claims-made" basis. GU may at its discretion require the Generator to maintain tail coverage for three years on all policies written on a "claims-made" basis.

4.0 Technical Requirements

4.1. General Operating Requirements

The Generator shall operate and maintain the Generating Facility in accordance with Good Utility Practice and comply with all aspects of GU's Guidelines for Customer-Owned Generator Interconnection and tariffs. The Generator shall continue to comply with all applicable laws and requirements after the interconnection has commenced. In the event that GU has reason to believe that the Generating Facility may be a source of problem on the GU EPS, GU has the right to install monitoring equipment at a mutually agreed upon location to determine the source of the problem. If the Generator fails to take immediate action to correct a problem, GU may, at the Generator's expense, disconnect the Generating Facility per the disconnect provisions of these Guidelines. The cost of the monitoring equipment will be borne by GU unless the problem or problems are demonstrated to be caused by the Generating Facility or if the test was performed at the request of the Generator.

4.1.1 No Adverse Effects; Non-interference

GU shall notify the Generator if there is evidence that the operation of the Generating Facility could cause disruption or deterioration of service to other customers served from the same GU EPS or if operation of the Generating Facility could cause damage to the EPS or affected systems. The deterioration of service could be, but is not limited to, harmonic injection in excess of IEEE STD 519, as well as voltage fluctuations caused by large step changes in loading at the Generating Facility. Each party will notify the other in a timely manner of any emergency or hazardous condition or occurrence with its equipment or facilities which could affect safe operation of the other party's equipment or facilities. Each party shall use reasonable efforts to provide the other party with advance notice of such conditions. The Generator shall take immediate action to correct interference with GU's EPS. If the Generator fails to take immediate action to correct a problem, GU may, at the Generator's expense, disconnect the Generating Facility per the disconnect provisions of these Guidelines.

GU will operate the EPS in such a manner so as to not unreasonably interfere with the operation of the Generating Facility. The Generating Facility will protect itself from normal disturbances propagating through the GU EPS, and such normal disturbances shall not constitute unreasonable interference. Examples of such disturbances could be single-phasing events, voltage spikes or sags from switching or faults on the GU EPS, and outages of the EPS.

Islanding, on any part of the EPS, is to be avoided as it may result in unsafe and unreliable conditions on the EPS. The intent of the interconnection protection requirements is to prevent an unsafe and/or unreliable condition.

4.1.2 Safe Operations and Maintenance

Each party shall be responsible for the maintenance, repair and condition of the lines and appurtenances on its side of the PCC. GU and the Generator shall each provide equipment on its respective side of the PCC that adequately protects the GU EPS, personnel, and other persons from damage and injury.

4.2 Access

GU shall have access to the Disconnect Switch of the Generating Facility at all times.

4.2.1 GU and Generator Representatives

Each party shall provide and update as necessary the name(s) and telephone number(s) and other applicable contact information that can be used at all times (24/7) to allow the other party to report an emergency.

4.2.2 GU Right to Access GU-Owned Facilities and Equipment

The Generator shall at all times allow GU access to GU equipment and the GU facilities located on the Generating Facility's premises. To the extent that the Generator does not own all or part of the property on which GU is required to locate its equipment or facilities to serve the Generating Facility, the Generator shall, at the Generator's sole expense, secure and provide to GU the necessary rights for access to such equipment or facilities, including easements.

4.3 Metering, Monitoring and Communication

This section sets forth the rules, procedures and requirements for metering, monitoring and communication between the Generator and the GU EPS and the point at which the Generator exports power or is net metered or is otherwise subject to NEPOOL requirements. The Generator will be responsible for reasonable and necessary costs incurred by GU for the purchase, installation, operation, maintenance, testing, repair and replacement of its metering and supervisory control and data acquisition (SCADA) equipment. Facility metering (and data acquisition, as required) equipment shall conform to GU standards and operating requirements.

4.3.1 Metering – General Requirements

GU shall furnish, read and maintain all GU revenue metering equipment and metering required for rate administration. The Generator shall furnish and maintain all meter mounting equipment such as, or including, meter sockets, test switches, conduits and enclosures. GU shall own the revenue meter and the Generator shall pay the applicable GU tariff(s), as may be amended from time to time.

The Generator shall provide suitable space within the Generating Facility for installation and maintenance of the metering and communication equipment at no cost to GU.

All metering equipment installed, subject to these Guidelines and associated with the Generating Facility shall be routinely tested at such times as GU believes necessary by GU at the Generator's expense, in accordance with applicable GU procedures and standards. If, at any time, any metering equipment is found to be inaccurate by a margin greater than that allowed under applicable criteria, rules and standards, GU shall cause such metering equipment to be made accurate or replaced. The cost to replace the meter shall be borne by the Generator or by GU if owned by GU. Meter readings for the period of inaccuracy shall be adjusted so far as the same can be reasonably ascertained; provided, however, no adjustment prior to the beginning of the preceding month shall be made except by agreement of the parties. Each party shall comply with any reasonable request of the other concerning the sealing of meters, the presence of a representative of the other party when the seals are broken and the tests are made, and other matters affecting the accuracy of the measurement of electricity delivered from the Generating Facility. If either party believes that there has been a meter failure or stoppage, it shall notify the other party immediately.

If the Metering Point and the Point of Receipt or Point of Delivery are not at the same location, the metering equipment shall record delivery of electricity in a manner that accounts for losses occurring between the Metering Point and the Point of Receipt or Point of Delivery. Losses between the Metering Point and Point of Receipt will be reflected pursuant to applicable GU or NEPOOL rules or standards.

4.3.2 Metering and Related Equipment

The type of metering equipment installed at a Generating Facility shall be largely dependent on the size and character of the Generating Facility and how and if the Generator plans to export power or net meter. GU shall determine the necessary and proper metering equipment that shall be installed at the Generating Facility, as well as the location of the metering equipment. All metering equipment, including self-contained meters, instrument transformers and meters shall meet ANSI C12.1 Metering Accuracy Standards and ANSI C57.13 Accuracy Requirements for Instrument Transformers. Possible metering options include the following:

- **Category 1 and 2 Installations:** The electric service shall be metered for revenue purposes primarily using two watt-hour meters with detents or, if feasible, one two-channel, electronic, solid state meter that is capable of measuring bi-directional power flow.
- **Category 3 Installations:** The electric service shall be metered with an electronic, bi-directional, interval meter with remote access. Multiple registers will record active, kW interval data and

reactive, kVar interval data flowing in both directions, when the Generating Facility is exporting or importing power.

The Generator must provide and maintain a telephone connection to the meter for GU to read the meter.

- **Category 4 and 5 Installations:** The electric service shall be metered in similar fashion to the Category 4 installation; however, additional metering equipment shall be necessary to meet the access and communication requirements of ISO New England. All metering equipment included in this type of installation shall meet the requirements contained in NEPOOL Operating Procedure No. 18, “Metering and Telemetry Criteria” and further defined in NEPOOL Operating Procedure No. 14, “Technical Requirements for Generation, Dispatchable and Interruptible Loads”. The quantities to be telemetered may include, but not be limited to gross generation (Watts and VARS), tie line power flow (Watts and VARS – in and out), station service, line amps, bus voltage, circuit breaker status and generator status.

The Generator shall be responsible for providing all necessary leased communication (telephone, internet) lines and any necessary protection for leased lines and shall furthermore be responsible for all communication required by ISO-New England, or by ISO-New England’s designated satellite. The Generator shall maintain all communication and transducer equipment at the Generating Facility in accordance with ISO-New England criteria, rules and standards.

All metering equipment installed pursuant to these Guidelines and associated with the Generating Facility shall be routinely tested by GU at the Generator’s expense, in accordance with applicable GU and/or ISO-New England criteria, rules and standards. The Generator shall provide, install and own GU-approved or GU-specified test switches in the meter and transducer circuits.

As the amount of distributed generation on regional Electric Power Systems grows, the Generator may be required to install additional monitoring and communication equipment as may be required by ISO-New England, GU or other authority.

4.4 Protection Requirements

4.4.1 General Considerations and Requirements

4.4.1.1 Any Generator desiring to interconnect with the GU Electric Division's EPS or to modify an existing interconnection must meet the specifications of the following standards and the requirements specified by GU, where applicable:

- The Generator shall comply with all applicable National Electric Code (NEC) requirements [NEC Articles 690 and 705], local building codes, and shall obtain electrical permit(s) for the equipment installation.
- IEEE 1547-2003 Standard for Interconnecting Distributed Resources with Electric Power Systems as adopted and successor or related IEEE-approved standards.
- IEEE Std 929-2000 Recommended Practice for Utility Interface of Photovoltaic (PV) Systems
- Underwriters Laboratories (UL) Std 1741, Standard for Static Inverters and Charge Controllers for Use in Photovoltaic Systems.

4.4.1.2 The specifications and requirements herein are intended solely to mitigate possible adverse impacts caused by the Generating Facility to GU's equipment and to protect the safety of GU's personnel and other customers. They are not intended to address protection of the Generating Facility itself, or its internal load. It is the responsibility of the Generator to comply with the requirements of all applicable standards, codes, statutes and authorities to protect itself and its loads.

4.4.1.3 If requested by the Generator, GU will provide system protection information for the line terminal(s) directly related to the interconnection. This protection information is provided exclusively for use by the Generator to evaluate protection of its Generating Facility during parallel operation.

4.4.1.4 The Generator shall not operate a Generating Facility that superimposes a voltage or current upon the GU system that interferes with GU operations, service to other customers or communication facilities. If such interference occurs, the Generator must take immediate corrective action, within 8-hours of being notified by GU or first learning of the interference. If the interference cannot be corrected within 8-hours, GU may, at its option, require the Generator to cease parallel operation with the EPS. If the Generator does not correct the interference or cease parallel operation when directed to do so by GU, GU may, without liability, disconnect the Generating Facilities from GU's system.

4.4.1.5 Automatic reclosing of GU's circuits will usually occur following tripping operations, and the reclosing operation should not be limited by the Generating Facility's interconnection. The Generator shall take reclosing into consideration when designing the Generating Facility, so as to avoid possible equipment damage that may result from GU's circuit reclosing. Reclose-blocking relay schemes may be required to be added to GU breakers and/or line reclosers at the Generator's expense.

4.4.1.6 When the proposed interconnection may result in reverse load flow through GU's load tap changing transformer(s), or line voltage regulator(s), control modifications necessary to mitigate the effects may be made to these devices by GU at the Generator's expense, if practicable. If not practicable, the Generating Facility may be required to limit or discontinue its output so reverse load flow cannot occur, or provide reverse power relaying that trips the Generating Facility.

4.4.1.7 Per IEEE 1547-2003, Section 4.1.7, the Generator shall provide an external disconnect switch (or comparable device acceptable to GU) at the Point of Interconnection or at the Point of Common Coupling that can be opened for isolation. The switch shall be in a location easily accessible to GU personnel at all times. The switch shall be gang operated (if multiphase), have a visible break when open, be rated to interrupt the maximum Generator output, and be capable of being locked open by GU personnel. GU shall have the right to open the disconnect switch, without liability to GU, as may be required.

4.4.1.8 GU has adopted UL 1741 (including IEEE C62.41) for certifying the electrical protective functionality of independent power systems. GU also accepts inverter-based generating facilities which are installed in multiple packs and which have been certified to UL 1741 in this configuration. GU recognizes and accepts pre-certified interconnecting equipment listed and maintained on the New York and California Public Utility Commission web sites, and which is in compliance with UL 1741 and IEEE C62.41.

The requirements for UL 1741 may be applied to inverters with both photovoltaic and other electric energy sources, and applicable sections of UL 1741 for rotating machine equipment.

4.4.1.9 It is the Generator's responsibility to submit documentation that the proposed Generating Facility has been pre-certified.

4.4.1.10 Generating Facilities utilizing photovoltaic technology must be in compliance with IEEE 929.

4.4.1.11 Non-certified inverters must have either non-islanding or anti-islanding protection as defined by IEEE 929 and conform to the maximum harmonic

limits prescribed in IEEE 519. Non-certified inverters must be protected by certified or utility-grade relays, using settings approved by GU.

4.4.1.12 Unless otherwise approved by GU, protective relays required by these Guidelines must be either certified to UL 1741 and IEEE C62.41 or be utility grade. The time characteristics of these relays must be reviewed and approved by GU prior to purchase and installation by the Generator.

4.4.1.13 Settings for all relays, inverters or controllers must be submitted to GU for review and approval a minimum of four weeks prior to setting to insure coordination with GU's protective devices, and to assure adequate protection of GU's equipment.

4.4.2 Additional Requirements – Category 1 Facilities

Generating Facilities shall qualify for Category 1 Interconnection if said facility is an inverter-based or induction machine-based facility with power rating of 10 kW or less; is pre-certified to UL 1741; in compliance with NEC Articles 690 and 705 and IEEE Standard 929. In particular, this installation must provide for:

4.4.2.1 Power output control system shall automatically disconnect from the EPS upon loss of EPS voltage, and not reconnect until the EPS voltage has been restored for at least ten (10) minutes continuously.

4.4.2.2 Power output control system shall automatically initiate a disconnect from the EPS within six (6) cycles if the Generator's voltage falls below 60 volts rms to ground (nominal 120 volt rms base) on any phase.

4.4.2.3 Power output control system shall automatically initiate a disconnect from the EPS within two (2) seconds if the voltage rises above 132 volts rms phase to ground or falls below 104 volts rms phase to ground (nominal 120 volt rms base) on any phase.

4.4.2.4 Power output control system shall automatically initiate a disconnect from the EPS within six (6) cycles if the frequency rises above 60.3 Hz or falls below 59.3 Hz.

4.4.2.5 Generator's net metering output distortion shall be in compliance with IEEE Standard 519.

4.4.2.6 Generating system must be designed and operated so that islanding is not sustained on the radial distribution system as per IEEE 929.

4.4.2.7 The need for additional protection equipment shall be determined by GU on a case-by-case basis.

Solar Equipment

Solar equipment shall be in compliance with UL 1741, *Standard for Static Inverters and Charge Controllers for Use in Photovoltaic Systems*;

UL 1703, *Standard for Safety: Flat-Plate Photovoltaic Modules and Panels*; IEEE 1262-195, *Recommended Practice for Qualification of Photovoltaic (PV) Modules*; and the solar system shall be installed in compliance with IEEE Standard 929-2000, *Recommended Practice for Utility Interface of Photovoltaic Systems*.

4.4.3 Non-Pre-certified Generating Facilities

If Category 1 Generating Facilities are not using qualified, pre-certified inverters, the application shall be reviewed as a Category 2 Generating Facility.

4.4.4 Additional Requirements - Category 2, 3, 4 & 5 Facilities

General Requirements

All Category 2, 3, 4 & 5 Generating Facilities must meet performance requirements set forth in relevant sections of the IEEE 1547-2003 Standard and the additional requirements as determined by GU. Category 5 interconnections may fall within the jurisdiction of ISO-New England, and when so determined, shall be handled via all ISO-New England Generator Interconnection application requirements and procedures. Additional GU requirements are described follows:

4.4.4.1 Voltage Regulation (IEEE 1547-2003, Section 4.1.1)

Additional Requirement: This may also require modifications to the EPS, at the expense of the generator. The Generator shall not cause the EPS service voltage or other EPS customer's voltage, exceed the limits stated in Sections 16-11-114 and -115 of the Regulations of Connecticut State Agencies.

4.4.4.2 Non Export Power

This requirement pertains to installations where the proposed equipment does not include a certified non-islanding function to prevent contributing to unintended islanding. Generating Facilities which do not intend to export power to the EPS, but which may export power incidentally, must include, if applicable, a reverse power relay with a setting of 10% (export) of the aggregate generation, with a maximum two (2) seconds time delay, unless an under power protection function is utilized to insure minimum import of power at the PCC. Other methods that might mitigate the islanding concern include transfer trip, protective functions to detect phase and ground faults on the EPS, reclose blocking of the EPS equipment, or other means acceptable to GU.

4.4.4.3 Transfer Tripping

A direct transfer tripping system, if one is required by either the Generator or by GU, shall use equipment generally accepted for use by GU and shall, at the option of GU, use dual channels.

4.4.4.4 Communication Channels

The Generator is responsible for procuring any communications channels necessary between the Generating Facility and GU's stations and for providing protection from transients and over voltages at all ends of these communication channels. The Generator shall also bear the ongoing cost to lease or maintain these communication channels. Examples include, but are not limited to, connection to a line using high-speed protection, transfer tripping, (i.e., facilities located in areas with low fault currents, or back up for Generating Facility breaker failure).

4.4.4.5 Interconnection Transformers

In order to provide maximum operating flexibility for the Generating Facility, and to minimize possible adverse effects on other GU customer's facilities, a power transformer may be required between the customer's generator and the GU-owned equipment. GU reserves the right to require connection to its EPS through a dedicated transformer, and to specify the winding connections. This transformer is usually connected in such a manner as to isolate the zero sequence circuit of the generator from the zero sequence circuit of the GU system. The Interconnection Impact Study will determine the transformer connection and grounding configuration required. Replacement, at the Generator's expense, of the GU transformer to increase insulation levels, changing of winding connections and lightning arrester ratings to a higher voltage may be required due to the addition of the customer generation. In addition to requiring an isolation transformer, GU may require current limiting reactors, shunt connected or in series to limit short circuit current levels.

Additional Requirements for Induction and Synchronous Facilities

4.4.4.6 Interconnection Interrupting Device

An interconnection interrupting device such as a circuit breaker or contactor shall be installed to isolate the Generating Facility from the GU EPS. If there is more than one interrupting device, this requirement applies to each one individually. The interconnection interrupting device must be capable of interrupting the current produced when the Generating Facility is connected out of phase.

4.4.4.7 Synchronizing Devices

The Generator shall designate one or more synchronizing devices such as motorized breakers, contactor/breaker combinations, or a fused contactor (if mutually acceptable) to be used to connect the Generating Facility to the GU system.

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 GU's system, consistent with IEEE 1547-2003, Section 4.1.8.3.

All synchronizing will be done by the Generator at the Generating Facility. The generating Facility shall not be used to energize a de-energized GU circuit.

In-line breakers without synchronizing devices must use mechanical interlocks to prevent out-of-phase closing with GU's EPS.

Synch-check relays are not acceptable synchronizing devices and shall be used as such.

4.4.4.8 Transformers

GU reserves the right to specify the winding connections for the transformer between the EPS connection and the Generating Facility bus ("Step-Up Transformer") as well as whether it is to be grounded or ungrounded at GU's voltage. The use of grounded-wye connections on GU's side of the interconnection will not be allowed if the GU source is ungrounded at the PCC. In the event that the transformer winding connection is grounded-wye / grounded-wye, GU reserves the right to specify whether the Generator stator is to be grounded or not grounded. All grounded-wye / grounded-wye transformers must be of the five-legged core design to prevent overheating and may require separate neutrals. The Generator shall be responsible for procuring equipment with a level of insulation and fault withstand capability compatible with the specified grounding method.

4.4.4.9 Ungrounded Transformers

If the Generating Facility's step-up transformer winding connection is ungrounded on the GU side of the interconnection, the Generating Facility shall be equipped with a zero sequence overvoltage relay fed from the open delta of the three phase VT specified in the Voltage Transformers and Connections section. (See "Voltage Transformer and Connections" section).

4.4.4.10 Voltage Relays

Voltage relays shall be frequency compensated to provide a uniform response in the range of 40 to 70 Hz.

In addition, voltage relays, which are Utility Grade or certified and can be connected directly to the primary voltage without a VT are acceptable to GU.

4.4.4.11 Protective Relay Hard-Wire Requirement

Unless otherwise approved by GU, protective relays must be hardwired to the device they are tripping. Further, interposing computer or programmable logic controllers or the like are not permitted in the trip circuit between the relay and the device being tripped. Test switches are allowed in the tripping circuit.

4.4.4.12 Protective Relay Supply

Where protective relays are required by this protection guideline, their control circuits shall be DC powered from a battery/charger system or an Uninterrupted Power Supply (UPS). Solid-state relays shall be self-powered, or DC powered from a battery/charger system or UPS. If the Generator uses a non-latching interconnection contactor accepted by GU, AC powered relaying shall be allowed, provided the relay and its method of application is fail-safe. This means that if the relay fails, or if the voltage and/or frequency of its AC power source deviate from the relay's design requirements for power, the relay or a separate fail-safe power monitoring relay acceptable to GU will immediately trip the Generating Facility by opening the coil circuit of the interconnection contactor.

4.4.4.13 Current Transformers (CTs)

Current transformer (CT) ratios and accuracy classes shall be chosen such that secondary current is less than 10 amperes, and transformation errors are consistent with GU practices.

4.4.4.14 Voltage Transformers (VTs) and Connections

The Generating Facility may be required to be equipped with a direct voltage connection or a voltage transformer (VT), connected to the GU side of the interrupting device. For three phase applications, a VT for each phase is required. All three phases must be sensed either by three individual relays or by one relay that contains three elements. If the voltage on any of the three phases is outside the bounds accepted by GU, the unit shall be tripped. If the Generating Facility's step-up transformer is ungrounded at the GU voltage, the VT shall be a single three-phase device or three single-phase devices connected from each phase to ground on GU's side of the Generating Facility's step-up transformer, rated for phase-to-phase voltage. The secondary winding shall be connected in open delta, have a loading resistor to prevent ferroresonance. On one side of the relay/resistor, the connection should be grounded to enhance worker safety.

Utility-grade or certified relays, accepted by GU, which are capable of calculating zero-sequence voltages, and which may be directly connected at the utilization voltage, may be utilized in lieu of grounded-wye to open delta VTs.

4.4.4.15 Underfrequency Load Shedding

Existing underfrequency load shedding relay schemes on the GU distribution circuits will be reviewed by GU to determine whether or not the scheme will operate properly with the Generating Facility installation. Changes required to the load shedding scheme to provide proper operation will be at the Generator's expense.

Additional Requirements for Induction Generators

4.4.4.16 Relay Functions

Over/under voltage and over/under frequency relay functions are required.

If GU determines that self-excitation may occur, these relay functions would also be required for generators 100 kW and below. Settings will be as specified by GU, after review.

4.4.4.17 Starting

An induction generator may be connected and brought up to speed as an induction motor if it can be demonstrated that the initial voltage drop (visible flicker) is acceptable and within limits as defined by IEEE 519. When flicker occurs outside of the IEEE 519 limits, soft starting will be required, such a speed matching to within 1% of synchronous speed or other techniques.

4.4.4.18 VAR Support

The VAR requirement for induction generators will be supplied by the GU EPS for aggregate generation up to 100 kW. For Generators exceeding 100 kW, GU may require the Generator to install capacitors to limit the adverse effects of drawing reactive power from the EPS for excitation of the generator.

Additional Requirements for Synchronous Facilities

4.4.4.19 Relay Functions

Over/under voltage, over/under frequency, phase over current with voltage control, and either zero-sequence over voltage or neutral over current and synchronizing relay functions are required. Additional relay functions may be specified by GU. Settings will be as specified by GU after review.

The Generator is required to provide relaying functions to clear both phase and ground short circuit faults on GU's distribution circuit. The operating characteristics shall be reviewed and approved by GU.

4.4.4.20 High-Speed Protection

The Generating Facility may be required to use high-speed protection if time-delayed protection would result in degradation in the existing sensitivity or speed of the protection systems on the GU lines.

4.4.4.21 Breaker Failure Protection

The Generating Facility may be required to be equipped to provide local breaker failure protection which may include direct transfer tripping to GU's line terminal(s) in order to detect and clear faults within the Generating Facility that cannot be detected by GU's back-up protection.

4.4.4.22 Power Factor

The Generator is required to operate the Generating Facility at a relatively constant power factor during on- and off-peak hours. A power factor control capacity must be provided for each generator and it shall operate at unity power factor (1.0) on peak. During system emergencies, for Generators 1,000 kW and larger exporting power to the EPS, Generators shall be capable of operating at 0.85 power factor leading, supplying reactive volt-amperes (VAR's) to the EPS.

4.4.4.23 Regulators

The Generator must provide automatic voltage regulators for Facilities larger than 100 kW which are rated to operate within the maximum and minimum voltage levels prescribed by Sections 16-11-114 and -115 of the Regulations of Connecticut State Agencies. The Generator must also take into account that the EPS may reduce its voltage level an additional 5% during times of system capacity deficiency or during designated test periods.

5.0 Protection System Testing and Maintenance

GU shall have the right to witness the commissioning testing (pre-parallel testing) as defined in the IEEE 1547-2003, Section 5.3. GU must be notified ten (10) business days in advance of the testing so that it may, as an option, have representative(s) observe the testing, or inspect the installation. The Generator shall provide a copy of the test procedure and as-built electrical one-line and relay diagram (if applicable) in advance of the test day. An individual qualified in testing protective equipment (professional engineer, factory-certified technician, or licensed electrician with experience in testing protective equipment) must perform commissioning testing in accordance with the manufacturer's recommended test procedure to prove the settings and requirements of this guideline document. At the completion of the test, GU should receive a copy of the test report data.

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 interlock tests
- Paralleling and disconnection operation
- Ani-islanding function, if applicable
- Non-export function, if applicable
- Synchronizing Controls, if applicable
- Proof of inability to energize de-energized lines

Prior to final approval by GU or any time thereafter, GU reserves the right to test the Generator relaying and control related to the protection of GU's Electric Power System.

The Generator has the full responsibility for the proper periodic maintenance of its Generating Facility equipment and it's associated control, protective equipment and interrupting devices.

The Generator is responsible for the periodic maintenance of those relays, interrupting devices, control schemes, and batteries that involve the protection of the GU system. The test cycle for protective relaying must not be less frequent than once every 24 calendar months or the manufacturer's recommendation, whichever is less. The Generator must provide copies of these test records to GU. GU shall have the right to monitor the periodic maintenance performed.

GU reserves the right to install special test equipment as may be required to monitor the operation of the Generating Facility and its control or for evaluating the quality of power produced by the Generating Facility at a mutually agreed upon location.

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 check.

Inverters with field adjustable settings for their internal protective elements shall be periodically tested if those internal elements are being used by the Generator to satisfy the requirements of this protection policy.

6.0 Momentary Paralleling of Standby Facilities Requirements

The closed transition scheme and transition equipment used by the Generator shall be reviewed and approved by GU prior to operation of the generator. The closed transition scheme shall provide voltage, frequency and phase angle matching as appropriate to provide a smooth transition. It shall also provide maximum paralleling time protection. Upon loss of the EPS source, once a generator starts and the generator switch/breaker closes, paralleling the generator and the EPS, the line switch/breaker shall open within 0.5 seconds (maximum). After the utility power is restored, the scheme shall open the generator switch/breaker within 0.5 seconds after the line switch is closed paralleling the generator with the EPS.

Protection relays to isolate the Generating Facility for faults in GU's system are not required if the paralleling operation is automatic and takes place for less than 0.5 second. The maximum paralleling time protection shall be provided by a separate device from the equipment used for control and paralleling of the generator and operation of the transfer switch. A discrete timer (60 cycles) is required, powered by the generator battery, to trip an interrupting device, which may be the generator breaker. This requirement shall provide fail-safe operation should the control equipment fail.

If the paralleling operation takes place at greater than 0.5 second GU may, at its option and at the expense of the Generator, require the full compliment of relays required for a synchronous generator.

The Generator, as a minimum, must perform the following functional tests after the transfer equipment has been energized, but before the closed-transition transfer is allowed on the EPS as a normal operation:

- Voltage, frequency and phase rotation.
- Transfer test (maximum paralleling time must not exceed 0.5 seconds).
- Excessive parallel time test (when the GU source switch fails to open, the generator must be shut off, and vice versa).
- GU shall be notified not less than ten (10) working days in advance of the testing so that it may, as its option, have its representative(s) witness the testing, and/or inspect the installation.

Before the approval of closed-transition transfer is granted by GU, the Generator shall provide to GU a report attesting to the successful completion of the foregoing testing. Only after receipt of the approved test and inspection reports, and verification of the local Electrical Inspector's approval, GU will issue a written notice of approval of closed-transition transfer to the Generator.

7.0 Protection System Changes

The Generator must provide GU with reasonable advance notice of any proposed changes to be made to the protective relay system, relay settings, operating procedures or equipment that affect the interconnection. GU will determine if such proposed changes require re-certification of the interconnection per the requirements of this protection policy.

In the future, should GU implement changes to the Electric Power System to which the Generating Facility is interconnected, the Generator will be responsible at its own expense for identifying and incorporating any necessary changes to its protection system. These changes to the Facilities' protection system are subject to review and approval by GU. GU is responsible for notifying the Generator for changes to the Electric Power System that GU has implemented.

8.0 Certification of Generator Equipment Packages

Some Generator Equipment Packages have been certified. This facilitates the interconnection, as properly certified equipment need not be reviewed by GU in as much detail as non-certified equipment. This results in a faster, less costly review process for the Generator.

An equipment package is considered certified for interconnected operation if it has been submitted, tested and listed by a nationally recognized testing and certification laboratory for continuous utility interactive operation in compliance with the applicable codes and standards listed in Attachment 3. An equipment package shall include all interface components including switchgear, inverters, or other interface devices and may include an integrated Generating Facility.

If the equipment package has been tested and listed as an integrated package which includes a Generating Facility, it shall not require further design review, testing, or additional equipment to meet the certification requirements.

If the equipment includes only the interface components (switchgear, inverters, or other interface devices), then the customer must demonstrate that the Generating Facility being utilized is compatible with the equipment and consistent with the testing and listing specified for the package. Provided the Generating Facility combined with the equipment package is consistent with the testing and listing performed by the nationally recognized testing and certification laboratory, no further design review, testing, or additional equipment shall be required to meet the certification requirements.

A certified equipment package does not include equipment provided by GU, nor does certification exempt an equipment package or Generating Facility from installation testing required for commissioning and operation with the GU Electric Power System.