BULLETIN 86-01

REQUIREMENTS
FOR THE
INTERCONNECTION OF GENERATION, TRANSMISSION AND END-USER FACILITIES.

Revision Date: October 03, 2011

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1 INTRODUCTION

1.1 PURPOSE

The purpose of this Bulletin is to document the Utility's application and review process, and technical requirements for Developers with generating sources operating in parallel with the Utility system, Merchant transmission line interconnections, and large end user interconnections to serve loads. These requirements have been developed based on (i) regulatory requirements as set forth by the NYSDPS and/or FERC, (ii) the NYISO guidelines, and (iii) typical Utility industry design, operating procedures and safety practices in order to ensure the safety of Utility personnel and equipment, Utility customers and the general public.

1.2 REVISION HISTORY

Date	Revision Number	Change	Reference Sections
5/31/2005	**NA**	**Adoption of Revision History**	**NA**
7/7/2009	**2.0**	**Updated NYISO Procedures, updated SIRS 7 and 11 step process. Added NERC security requirements**	**3.2, 3.3, 3.4, 6.1.1.6, 6.3**
11/5/2009	**3.0**	**Added Reviewed and Approval signature lines**	**Page 2**
12/22/2009	**4.0**	**Adding Revision History Adding more end user and merchant transmission interconnection information**	**1.2, 2.x,**
9/1/2010	**5.0**	**Accommodating NERC feedback from 2009 compliance filing.**	**Index, 2.10, 3.1, 4.7, 4.8, 5.7, 6.2, 6.3, Attachment 1**

4/13/2011	**6.0**	**Updated SIRS 7 and 11 step process. Revised generator disconnect switch requirements**	**3.2 , 6.1.6**

1.3 UTILITY CONTACT

All correspondence regarding interconnections shall be directed to the following:

Manager Programs/Projects
Electric Transmission Services
NYSEG/RGE
New York State Electric & Gas Corporation
James A. Carrigg Center
Kirkwood Industrial Park - Corporate Drive
P.O. Box 5224
Binghamton, NY 13902-5224

Telephone: (607) 762-7606, (607)762-8073)
Facsimile: (607) 762-8666

2 DEFINITIONS

Whenever used in this Bulletin with initial capitalization, the following terms shall have the meanings specified in this Section 2. Terms used in this Bulletin with initial capitalization that are not defined in this Section 2 shall have meanings specified in Attachment S of the NYISO OATT.

2.1 Acceptance for Interconnection

Written acceptance by the Utility; contingent upon the Utility's satisfaction with the inspection of the Developer's facilities, testing of the Developer's protection equipment, and the fulfillment of all contractual obligations required prior to the interconnection of the Developer's facility.

2.2 Affected System

An electric system other than the transmission system owned, controlled or operated by the NYISO or the Transmission Owner that may be affected by the proposed interconnection.

2.3 Affected System Operator

The entity that operates the Affected System.

2.4 Applicable Laws and Regulations

All duly promulgated applicable federal, state and local laws, regulations, rules, ordinances, codes, decrees, judgments, directives, or judicial or administrative orders, permits and other duly authorized actions of any Governmental Authority, including but not limited to Environmental Law.

2.5 Applicable Reliability Councils

The NERC, the NPCC and the NYSRC.

2.6 Applicable Reliability Standards

The requirements and guidelines of the Applicable Reliability Councils, and the Transmission District, to which the Developer’s Large Facility is directly interconnected, as those requirements and guidelines are amended and modified and in effect from time to time; provided that no Party shall waive its right to challenge the applicability or validity of any requirement or guideline as applied to it in the context of the large Facility Interconnection Procedures.

2.7 Attachment Facilities

The Transmission Owner’s Attachment Facilities and the Developer’s Attachment Facilities. Collectively, Attachment Facilities include all facilities and equipment between the Large Generating Facility, End User Facility, or Merchant Transmission Facility and the Point of Interconnection, including any

modification, additions or upgrades that are necessary to physically and electrically interconnect the Facility to the New York State Transmission System. Attachment Facilities are sole use facilities and shall not include Stand Alone System Upgrade Facilities or System Upgrade Facilities.

2.8 Automatic Disconnect Device

An electronic or mechanical switch used to isolate a circuit or piece of equipment from a source of power without the need for human intervention.

2.9 Base Case

The base case power flow, short circuit, and stability data bases used for the Interconnection Studies by the NYISO, Transmission Owner or Developer; described in Section 2.3 of the Large Facility Interconnection Procedures.

2.10 Blade Tip Height

The distance from the ground to the highest point possible for a wind turbine's rotor and blade assembly.

2.11 Breach

The failure of a Party to perform or observe any material term or condition of the Standard Large Generator Interconnection Agreement.

2.12 Breaching Party

A Party that is in Breach of the Standard Large Generator Interconnection Agreement.

2.13 Bulletin

Bulletin 86-01, "REQUIREMENTS FOR THE INTERCONNECTION OF GENERATION, TRANSMISSION AND END-USER FACILITIES".

2.14 Business Day

Monday through Friday, excluding federal holidays.

2.15 Calendar Day

Any day including Saturday, Sunday or a federal holiday.

2.16 Cease to Energize

Cessation of energy flow capability.

2.17 Certified Test Report

A report generated by a recognized commercial testing company and signed by a licensed electrician or professional engineer.

2.18 Clustering

The process whereby a group of Interconnection Requests is studied together, instead of serially, for the purpose of conducting the Interconnection System Reliability Impact Study.

2.19 Commercial Operation

The status of a Facility that has commenced generating or transmitting electricity for sale, excluding electricity generated or transmitted during Trial Operation.

2.20 Commercial Operation Date

The date on which the Facility commences Commercial Operation as agreed to by the Parties pursuant to either the Large Generator Interconnection Procedures or the Small Generator Interconnection Procedures.

2.21 Confidential Information

Any information that is defined as confidential by either the Large Generator Interconnection Procedures or the Small Generator Interconnection Procedures.

2.22 Coordinated Electric System Interconnection Review ("CESIR")

Any studies performed by utilities to ensure the safety and reliability of the electric grid with respect to the interconnection of distributed generation as discussed in this Bulletin.

2.23 Dedicated Service Transformer or Dedicated Transformer

A transformer with a secondary winding that serves only one customer.

2.24 Default

The failure of a Party in Breach of the standard Large Facility Interconnection Agreement or the Small Facility Interconnection Agreement to cure such Breach in accordance with the appropriate Interconnection Agreement.

2.25 Design Test

A test performed on protective equipment to ensure that devices and systems used in a proposed application meet the necessary technical and functional requirements.

2.26 Developer

An individual, company, corporation, limited partnership, etc., developing a project to be interconnected to the Utility's system.

2.27 Developer's Attachment Facilities

All facilities and equipment, as identified in Large Facility Interconnection Agreement or the Small Facility Interconnection Agreement, that are located between the Facility or Merchant Transmission Facility and the Point of Change of Ownership, including any modification, addition, or upgrades to such facilities and equipment necessary to physically and electrically interconnect the Generating Facility, End User, or Merchant Transmission Facility to the New York State Transmission System. Developer's Attachment Facilities are sole use facilities.

2.28 Direct Transfer Trip ("DTT")

Remote operation of a circuit breaker by means of a communication channel.

2.29 Disconnect (verb)

To isolate a circuit or equipment from a source of power. If isolation is accomplished with a solid state device, "Disconnect" shall mean to cease the transfer of power.

2.30 Disconnect Switch

A mechanical device used for isolating a circuit or equipment from a source of power.

2.31 Dispute Resolution

The procedures described in the Large Facility Interconnection Procedures or the Small Facility Interconnection Procedures for resolution of a dispute between Parties.

2.32 Draw-out Type Circuit Breaker

Circuit breakers that are disconnected by physically separating, or racking, the breaker assembly away from the switchgear bus.

2.33 Effective Date

The date on which the Large Generator Interconnection Agreement or the Small Generator Interconnection Agreement becomes effective upon execution by the Parties, subject to acceptance by the Commission, or filed unexecuted, upon the date specified by the Commission.

2.34 End User Facility

A utility customer interconnecting to a transmission line in order to serve load.

2.35 Energy Control Center

A Utility control center whose purpose is to monitor and operate the electric transmission or distribution center.

2.36 Engineering & Procurement (E&P) Agreement

An agreement that authorizes Transmission Owner to begin engineering and procurement of long lead-time items necessary for the establishment of the interconnection in order to advance the implementation of the Interconnection Request.

2.37 Engineering Review

Preliminary Technical Review and/or Final Technical Review.

2.38 Environmental Law

Applicable Laws or Regulations relating to pollution or protection of the environment or natural resources.

2.39 Farm Waste and Wind, Net Meter, Farm Applicant

A farm applicant who is proposing to install a farm waste anaerobic digester generating system, not to exceed 1,000 kW, or farm wind not exceed 500kW at a farm, per the requirements of New York State Public Service Law §66-j.

2.40 FERC

Federal Energy Regulatory Commission.

2.41 Final Technical Review

A detailed review of the Customer-Generator's internal AC and DC elementary and control design, protection system and proposed device settings to determine if the proposed system will respond appropriately to Utility system abnormalities, such as Utility short circuits.

2.42 Force Majeure

Any act of God, labor disturbance, act of the public enemy, war, insurrection, riot, fire, storm or flood, explosion, breakage or accident to machinery or equipment, in any order, regulation or restriction imposed by government, military or lawfully established civilian authorities, or any other cause beyond the Party's control. A Force Majeure event does not include acts of negligence or intentional wrongdoing by the Party claiming Force Majeure.

2.43 Formal Acceptance

Written acceptance by the Utility; contingent upon the Utility's review of and satisfaction with the complete information package to be provided by the Developer as specified in this Bulletin.

2.44 Generating Facility

The Developer's device for the production of electricity identified in the Interconnection Request, but shall not include the Developer's Attachment Facilities.

2.45 Generating Facility Capacity

The net seasonal capacity of the Generating Facility and the aggregate net seasonal capacity of the Generating Facility where it includes multiple energy production devices.

2.46 Generator-Owner

An applicant who is proposing to install and operate on-site power generation equipment in parallel with the Utility grid per the requirements of this Bulletin.

2.47 Governmental Authority

Any federal, state, local or other governmental regulatory or administrative agency, court, commission, department, board, or other governmental subdivision, legislature, rulemaking board, tribunal, or other governmental authority having jurisdiction over any of the Parties, their respective facilities, or the respective services they provide, and exercising or entitled to exercise any administrative, executive, police, or taxing authority or power; provided, however, that such term does not include Developer, NYISO Transmission Owner, or any Affiliate thereof.

2.48 Hazardous Substances

Any chemicals, materials, or substances defined as or included in the definition of "hazardous substances", "hazardous waste", "hazardous materials", "hazardous constituents", "restricted hazardous materials", extremely hazardous substances", "toxic substances", radioactive substances", "contaminants", "pollutants", "toxic pollutants" or words of similar meaning and regulatory effect under any applicable Environmental Law, or any other chemical, material or substance, exposure to which is prohibited, limited or regulated by any applicable Environmental Law.

2.49 Initial Synchronization Date

The date upon which the Generating Facility, End-User Facility, or Merchant Transmission Facility is initially synchronized and upon which Trial Operation begins.

2.50 In-Service Date

The date upon which the Developer reasonably expects it will be ready to begin use of the Transmission Owner's Attachment Facilities to obtain back feed power.

2.51 Interconnection Facilities Study

A study conducted by the NYISO or a third party consultant for the Developer to determine a list of facilities (including Transmission Owner's Attachment Facilities and System Upgrade Facilities as identified in the Interconnection System Reliability Impact Study), the cost of those facilities, and the time required to interconnect the Generating Facility or Merchant Transmission Facility with the New York State Transmission System. The scope of the study is defined in the Large Generator Interconnection Procedures or the Small Generator Interconnection Procedures.

2.52 Interconnection Facilities Study Agreement

The form of agreement is contained in the Large Generator Interconnection Procedures or the Small Generator Interconnection Procedures for conducting the Interconnection Facilities Study.

2.53 Interconnection Feasibility Study

A preliminary evaluation of the system impact and cost of interconnecting the Generating Facility or Merchant Transmission Facility to the New York State Transmission System, the scope of the study is defined in the Large Generator Interconnection Procedures or the Small Generator Interconnection Procedures.

2.54 Interconnection Feasibility Study Agreement

The form of agreement is contained in the Large Generator Interconnection Procedures or the Small Generator Interconnection Procedures for conducting the Interconnection Feasibility Study.

2.55 Interconnection Request

Developer's request, in the form is contained in the Large Generator Interconnection Procedures or the Small Generator Interconnection Procedures, in accordance with the Tariff, to interconnect a new Generating Facility or Merchant Transmission Facility to the New York State Transmission System, or to increase capacity of, or make a material modification to the operating characteristics of, an existing Generating Facility or Merchant Transmission Facility that is interconnected with the New York State Transmission System.

2.56 Interconnection Study

Any of the following studies: the Interconnection Feasibility Study, the Interconnection System Reliability Impact Study, and the Interconnection Facilities Study described in the Large Generator Interconnection Procedures or the Small Generator Interconnection Procedures.

2.57 Interconnection System Reliability Impact Study ("SRIS")

An engineering study that evaluates the impact of the proposed Generation Facility or Merchant Transmission Facility on the safety and reliability of the

New York State Transmission System and, if applicable, an Affected System, to determine what Attachment Facilities and System Upgrade Facilities are needed for the proposed Generation Facility or Merchant Transmission Facility of the Developer to connect reliably to the New York State Transmission System in a manner that meets the NYISO Minimum Interconnection Standard. The scope of the SRIS is defined in Large Generator Interconnection Procedures or the Small Generator Interconnection Procedures.

2.58 Interconnection System Reliability Impact Study Agreement

The form of agreement contained in the Large Generator Interconnection Procedures or the Small Generator Interconnection Procedures for conducting the System Reliability Impact Study.

2.59 IPP

Independent Power Producer.

2.60 IRS

Internal Revenue Service.

2.61 Islanding

A condition in which a portion of the Utility system that contains both load and distribution generation is isolated from the remainder of the Utility system. [Adopted from IEEE Std. 929]

2.62 Large Generating Facility

A Generating Facility having a Generating Facility Capacity of more than 20 MW.

2.63 Large Generator Interconnection Procedures ("LGIP")

The interconnection procedures applicable to an Interconnection Request pertaining to a Generating Facility or Merchant Transmission Facility that are included in Attachment X of the NYISO OATT.

2.64 Large Generator Interconnection Agreement ("LGIA")

The form of interconnection agreement applicable to a Interconnection Request pertaining to a Large Generating Facility, that is included in Attachment X to the NYISO OATT.

2.65 Loss

Any and all losses relating to injury to or death of any person or damage to property, demand, suits, recoveries, costs and expenses, court costs, attorney fees, and all other obligations by or to third parties, arising out of or resulting from the Indemnified Party's performance or non-performance of its obligations under the

Large Generator Interconnection Agreement on behalf of the indemnifying Party, except in cases of gross negligence or intentional wrongdoing by the Indemnified Party.

2.66 Material Modification

Those modifications that have a material impact on the cost or timing of any Interconnection Request with a later queue priority date.

2.67 Merchant Generator

A generator that sells its energy and/or capacity into the market or to an entity other than the Utility.

2.68 Merchant Transmission Facility

Developer's device for the transmission of electricity identified in the Interconnection Request, but shall not include Developer's Attachment Facilities. Merchant Transmission Facilities shall be those for which the Developer intends to receive approval from the FERC to charge market-based rates. Merchant Transmission Facilities shall not include upgrades or additions to the New York State Transmission System for which the owner does not have market-based rate authority.

2.69 Metering Equipment

All metering equipment installed or to be installed at the Generating Faclility or Merchant Transmission Facility pursuant to the Large Generator Interconnection Agreement or the Small Generator Interconnection Agreement at the metering points, including but not limited to instrument transformers, MWh-meters, data acquisition equipment, transducers, remote terminal unit, communications equipment, phone lines, and fiber optics.

2.70 Minimum Interconnection Standard

The reliability standard that must be met by any Generating Facility, or Merchant Transmission Facility, proposing to interconnection to the New York State Transmission System. The Standard is designed to ensure reliable access by the proposed project to the New York State Transmission System. The Standard does not impose any deliverability requirement on the proposed interconnection.

2.71 NERC

North American Electric Reliability Corporation or its successor.

2.72 Net Metering

The term 'net metering service' means service to an electric consumer under which electric energy generated by that electric consumer from an eligible on-site generating facility and delivered to the local distribution facilities may be used to

offset electric energy provided by the electric utility to the electric consumer during the applicable billing period. Eligibility and requirements for net metering are defined in New York State Public Service Law §66-j and §66-l.

2.73 Network Access Interconnection Service

The service provided by the NYISO to interconnect the Developer's Generating Facility or Merchant Transmission Facility to the New York State Transmission System in accordance with the NYISO Minimum Interconnection Standard, to enable the New York State Transmission System to receive electric energy and capacity from the Generating Facility or Merchant Transmission Facility at the Point of Interconnection, pursuant to the terms of the NYISO OATT.

2.74 Notice of Dispute

A written notice of dispute or claim that arises out of or in connection with the Large Generator Interconnection Procedures, the Small Generator Interconnection Procedures, or the Standard Large Generator Interconnection Agreement, or the Standard Small Generator Interconnection Agreement, or its performance.

2.75 NPCC

Northeast Power Coordinating Council or its successor.

2.76 NYISO

New York Independent System Operator, Inc.

2.77 NYSDPS

New York State Department of Public Service, also known as the Public Service Commission.

2.78 NYSEG

New York State Electric & Gas Corporation.

2.79 OATT

Open Access Transmission Tariff.

2.80 OC

NYISO Operating Committee.

2.81 Optional Interconnection Study

A sensitivity analysis based on assumptions specified by the Developer in the Optional Interconnection Study Agreement.

2.82 Optional Interconnection Study Agreement

The form of agreement contained in the Large Generator Interconnection Procedures, or the Small Generator Interconnection Procedures for conducting the Optional Interconnection Study.

2.83 Parallel Operation

All electric power generation that is connected to a Utility substation, transmission and/or distribution facility that is part of the Utility electric system. **In accordance with IEEE 1547, g**eneration intended to be interconnected to the Utility system for 0.1 seconds or longer will be considered to be in Parallel Operation.

2.84 Party or Parties

NYISO, Transmission Owner, or Developer or any combination thereof.

2.85 Point of Change of Ownership

The point, as set forth in Large Generator Interconnection Agreement, or the Small Generator Interconnection Agreement, where the Developer's Attachment Facilities connect to the Transmission Owner's Attachment Facilities.

2.86 Point of Common Coupling

The point at which the interconnection between the electric Utility and the customer interface occurs. Typically, this is the customer side of the Utility revenue meter.

2.87 Point of Interconnection

The point, as set forth in the Large Generator Interconnection Agreement, or the Small Generator Interconnection Agreement, where the Attachment Facilities connect to the New York State Transmission System.

2.88 Preliminary Technical Review

A review of the generator-owner's proposed system capacity, impact of the proposed generation on the Utility system, system characteristics and general system regulation to determine if the interconnection is viable.

2.89 Protection System Impact Study

A study of the impact on the Utility protection system, short circuits on the Utility electric system and ferroresonant overvoltage studies that are performed on the Utility electrical system during the SRIS.

2.90 Protective Device

A device that continuously monitors a designated parameter related to the operation of the generation system that operates if preset limits are exceeded.

2.91 Queue Position

The order of a valid NYISO Interconnection Request, relative to all other pending valid NYSIO Interconnection Requests, that is established based upon the date and time of receipt of the valid Interconnection request by the NYISO.

2.92 Reasonable Efforts

With respect to an action required to be attempted or taken by a Party under the Large Generator Interconnection Procedures, or the Small Generator Interconnection Procedures, or the Large Generator Interconnection Agreement, or the Small Generator Interconnection Agreement, efforts that are timely and consistent with Good Utility Practice and are otherwise substantially equivalent to those a Party would use to protect its own interests.

2.93 Remote Terminal Unit ("RTU")

A device located in a substation or generating station used to monitor various electrical quantities and/or status of electrical equipment that is telecommunicated to an operator at a Utility Energy Control Center, and/or to provide control functions of remote equipment to the operator.

2.94 Required Operating Range

The range of magnitudes of the utility system voltage or frequency where the generator-owner's equipment, if operating, is required to remain in operation for the purposes of compliance with UL 1741 Excursions outside these ranges must result in the automatic disconnection of the generation within the prescribed time limits.

2.95 RGE

Rochester Gas & Electric Corporation.

2.96 SCADA ("Supervisory Control And Data Acquisition")

The system used to telemeter analog and status points of data collected by RTUs to the Utility Energy Control Center.

2.97 Scoping Meeting

The meeting between representatives of the Developer, NYISO and Transmission Owner conducted for the purpose of discussing alternative interconnection options, to exchange information including any transmission data and earlier study evaluations that would be reasonably expected to impact such interconnection options, to analyze such information, and to determine potential feasible Points of Interconnection.

2.98 Services Tariff

The NYISO Market Administration and Control Area Tariff, as filed with the Commission, and as amended or supplemented from time to time, or any successor tariff thereto.

2.99 Small Generator Interconnection Procedures ("SGIP")

The interconnection procedures applicable to an Interconnection Request pertaining to a Generating Facility or Merchant Transmission Facility that are included in Attachment Z of the NYISO OATT.

2.100 Small Generator Interconnection Agreement ("SGIA")

The form of interconnection agreement applicable to a Interconnection Request pertaining to a Generating Facility, that is included in Attachment Z to the NYISO OATT.

2.101 SIR

The New York State Standardized Interconnection Requirements and Application Process for New Distributed Generators Rated 2 MW or Less Connected in Parallel with Utility Distribution Systems.

2.102 Site Control

Documentation reasonably demonstrating: (1) ownership of, a leasehold interest in, or a right to develop a site for the purpose of constructing the Large Generating Facility or Merchant Transmission Facility; (2) an option to purchase or acquire a leasehold site for such purpose; or (3) an exclusivity or other business relationship between Developer and the entity having the right to sell, lease or grant Developer the right to possess or occupy a site for such purpose.

2.103 Solar, Wind and Micro CHP/Fuel Cell, Net Meter, Residential Applicant

A residential applicant who is proposing to install a photovoltaic, wind and/or Micro CHP/Fuel Cell generating system, not to exceed 25 kW, in an owner occupied residence per the requirements of New York State Public Service Law §66-j and §66-l

2.104 Solar and Wind, Net Meter, Non-Residential Applicant

A non residential applicant who is proposing to install a photovoltaic and/or wind generating system, greater then 25kW but not to exceed 2MW, in an owner occupied residence per the requirements of New York State Public Service Law §66-j and §66-l

2.105 Stand Alone System Upgrade Facilities

System Upgrade Facilities that a Developer may construct without affecting day-to-day operations of the New York State Transmission System during their construction. NYISO, the Transmission Owner and the Developer must agree as to what constitutes Stand Alone System Upgrade Facilities and identify them in the Large Generator Interconnection Agreement, or the Small Generator Interconnection Agreement.

2.106 System Protection Facilities

The equipment, including necessary protection signal communications equipment, required to (1) protect the New York State Transmission System from faults or other electrical disturbances occurring at the Generating Facility or Merchant Transmission Facility or (2) protect the Generating Facility or Merchant Transmission Facility from faults or other electrical system disturbances occurring on the New York State Transmission System or on other delivery systems or other generating systems to which the New York State Transmission System is directly connected.

2.107 Tariff

The NYISO Open Access Transmission Tariff ("OATT") , as filed with the Commission, and as amended or supplemented from time to time, or any successor tariff.

2.108 TPAS

NYISO Transmission Planning Advisory Subcommittee.

2.109 Transmission Owner

The public utility or authority (or its designated agent) that (i) owns facilities used for the transmission of Energy in interstate commerce and provides Transmission Service under the Tariff, (ii) owns leases or otherwise possesses an interest in the portion of the New York State Transmission System at the Point of Interconnection and (iii) is a Party to the Large Generator Interconnection Agreement or the Small Generator Interconnection Agreement.

2.110 Transmission Owner's Attachment Facilities

All facilities and equipment owned, controlled or operated by the Transmission Owner from the Point of Change of Ownership to the Point of Interconnection as identified in the Large Generator Interconnection Agreement or the Small Generator Interconnection Agreement, including any modifications, additions or upgrades to such facilities and equipment. Transmission Owner's Attachment Facilities are sole use facilities and shall not include Stand Alone Upgrade Facilities or System Upgrade Facilities.

2.111 Trial Operation

The period during which Developer is engaged in on-site test operations and commissioning of the Generating Facility or Merchant Transmission Facility prior to Commercial Operation.

2.112 Utility Grade Relay

A relay that is constructed to comply with, as a minimum, the most current version of the following standards for non-nuclear facilities:

Standard	Conditions Covered
ANSI/IEEE C37.90	Usual Service Condition Ratings - Current and Voltage Maximum design for all relay ac and dc auxiliary relays Make and carry ratings for tripping contacts Tripping contacts duty cycle Dielectric tests by manufacturer Dielectric tests by user
ANSI/IEEE C37.90.1	Surge Withstand Capability (SWC) Fast Transient Test
IEEE C37.90.2	Radio Frequency Interference
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
IEC 255-5	Insulation (Impulse Voltage Withstand)

2.113 Verification Test

A test performed upon initial installation and repeated periodically to determine if there is continued acceptable performance.

3 APPLICATION AND REVIEW PROCESS

3.1 General

Before a Developer is allowed to install and operate any facility in parallel with the Utility system, the Developer shall submit design and operating information for the proposed facility to the Utility for its review and Formal Acceptance in accordance with the applicable application and review process described in this Bulletin.

The Utility's review and acceptance of the Developer's proposed facility and protection design and operating information for the proposed facility shall not be construed as confirming or endorsing the design, or as any warranty of safety, desirability, or reliability of any of the Developer's facilities.

The Developer will be responsible for all Utility costs incurred during the Application and Review Process as set forth in this Bulletin.

All wind turbine installations must be set back from the edge of a transmission line right of way a distance of at least 1.5 times the Blade Tip Height, or more as required by the local building and zoning ordinances. All wind turbine installations must be set back from all distribution line conductors and structures a distance of at least 1.5 times the Blade Tip Height, or more as required by the local building and zoning ordinances. No construction of wind turbine towers will be allowed until these setback requirements are met, this may include any relocation of utility lines and structures or the burying of utility lines.

All wind turbines installed in the vicinity of gas pipelines shall design their ground grids to be in full conformance with IEEE 80 standards. Developer shall test the ground grids for all turbines within 600 feet of a metal gas pipeline on a yearly basis and provide the results of the testing in a report to the Utility.

3.2 Distributed Generation Rated 2 MW or Less Connected in Parallel with Utility Distribution Systems

3.2.1 Introduction

This section provides a framework for processing applications to:

- interconnect new distributed generation facilities with a nameplate rating of 2 MW or less [aggregated on the customer side of the point of common coupling (PCC)], and

- review any modifications affecting the interface at the PCC to existing distributed generation facilities with a nameplate rating of 2 MW or less (aggregated on the customer side of the PCC) that have been interconnected to the utility distribution system and where an existing contract between the applicant and the utility is in place.

Generation neither designed to operate, nor operating, in parallel with the utility's electrical system is not subject to these requirements. This section will ensure that applicants are aware of the technical interconnection requirements and utility interconnection policies and practices. This section will also provide applicants with an understanding of the process and information required to allow utilities to review and accept the applicants' equipment for interconnection in a reasonable and expeditious manner.

The time required to complete the process will reflect the complexity of the proposed project. Projects using previously submitted designs certified per the requirements of Section II.H will move through the process more quickly, and several steps may be satisfied with an initial application depending on the detail and completeness of the application and supporting documentation submitted by the applicant. Applicants submitting systems utilizing certified equipment however, are not exempt from providing utilities with complete design packages necessary for the utilities to verify the electrical characteristics of the generator systems, the interconnecting facilities, and the impacts of the applicants' equipment on the utilities' systems.

The application process and the attendant services must be offered on a non-discriminatory basis. The utilities must clearly identify their costs related to the applicants' interconnections, specifically those costs the utilities would not have incurred but for the applicants' interconnections. The utilities will keep a log of all applications, milestones met, and justifications for application-specific requirements. The applicants are to be responsible for payment of the utilities' costs, as provided for herein.

3.2.2 Application Process Steps

STEP 1: Initial Communication from the Potential Applicant

Communication could range from a general inquiry to a completed application.

STEP 2: The Inquiry is Reviewed by the Utility to Determine the Nature of the Project

Technical staff from the utility discusses the scope of the interconnection with the potential applicant (either by phone or in person) to determine what specific information and documents (such as an application, contract, technical requirements, specifications, listing of qualified type-tested equipment/systems, applicable rate schedules, and metering requirements) will be provided to the potential applicant. The preliminary technical feasibility of the project at the proposed location may also be discussed at this time. All such information and a copy of the standardized interconnection requirements (SIR) must be sent to the applicant within three (3) business days following the initial communication from the potential applicant, unless the potential applicant indicates otherwise. A utility representative will be designated to serve as the single point of contact for the applicant (unless the utility informs the applicant otherwise) in coordinating the potential applicant's project with the utility.

STEP 3: Potential Applicant Files an Application

The potential applicant submits an application package to the utility. A complete application package will consist of (1) a letter of authorization by the customer (if the applicant is an agent for the customer), (2) the standard single page application form completed and signed by the applicant, (3) a signed copy of the standardized contract, (4) a three line diagram for the system identifying the manufacturer and model number of the equipment(s), (5) a copy of the manufacturer's data sheet for the equipment(s), (6) a copy of the manufacturers verification test procedure(s) and (7) a copy of the equipment(s) certification to UL 1741 (November 2005 revision) if applicable. The equipment(s) will be considered acceptable by the utility if they meet the requirements of Section II.H. If the application is not complete, then within five (5) business days of receipt of the application package the utility will notify the applicant by email, fax, or other form of written communication, and explain the deficiencies. If the proposed system meets the SIR technical requirements the utility will return a signed and executed standardized contract to the applicant within ten (10) business days of receiving the application and the applicant may proceed with the installation. If the proposed system does not meet the SIR technical requirements, then the utility will so notify the applicant within ten (10) business days of receiving the application by email, fax, or other form of written communication and explain the technical issues or problems.

Maximum Expense for Dedicated Transformer and Other Safety Equipment for Net Metered Customers (25kW or Less)

Generator Type	Generator Size	Maximum Equipment Responsibility
Micro CHP/Fuel Cell	Less than or equal to 10 kW	$350
Solar	Less than or equal to 25 kW	$350
Wind	Less than or equal to 25 kW	$750

STEP 4: System Installation

The applicant will install the system according to the utility accepted design and the equipment manufacturer's requirements. All inverter based systems will be allowed to interconnect to the utility system for a period not to exceed two hours, for the sole purpose of assuring proper operation of the installed equipment.
For net metered systems as defined in Section II.A.6, any modifications related to existing metering configurations to allow for net metering shall be completed by the utility prior to Step 5. The utility shall complete the necessary metering changes within ten (10) business days of receiving request from the applicant.

STEP 5: The Applicant's Facility is Tested in Accordance with the Standardized Interconnection Requirements.

Verification testing will be performed by the applicant in accordance with the written verification test procedure provided by the equipment manufacturer. The verification testing will be conducted within ten (10) business days of system installation at a mutually agreeable time, and the utility shall be given the opportunity to witness the tests. If the utility opts not to witness the test, the applicant will send the utility within five (5) days of the test a written notification, certifying that the system has been installed and tested in compliance with the SIR, the utility-accepted design and the equipment manufacturer's instructions. The applicant's facility will be allowed to commence parallel operation upon satisfactory completion of the tests in Step 5. The applicant must have complied with and must continue to comply with all contractual and technical requirements.

STEP 6: Final Acceptance

Within five (5) business days of receiving the written test notification from Step 5, the utility will either issue to the applicant a formal letter of acceptance for interconnection, or will request that the applicant and utility set a date and time for an on-site verification and witness operation of the system. This joint on-site verification must be completed within ten (10) business days after being requested. Within five (5) business days of the completion of the on-site verification, the utility will issue to the applicant either a formal letter of acceptance for interconnection or a detailed explanation of the deficiencies in the system.

3.2.3 Application Forms

New York State Standardized Application for Single Phase Interconnection of Parallel Generation Equipment 25kW or Smaller. (Reference ATTACHMENT 3)

Application Process Steps for Systems Above 25kW up to 2MW

Exception: For inverter based systems above 25 kW up to 200 kW, applicants may follow the expedited application process outlined under Section I. B. of the SIR, as long as the inverter-based system has been certified and tested in accordance with UL 1741

(November 2005 revision) and the utility has approved the project accordingly. The utility has fifteen (15) business days from original application submittal to determine and notify the applicant in writing of its findings. If the utility determines that the inverter-based system is not eligible for the fast track or expedited application process, the applicant can:

1) Proceed with the remaining steps of Section I.C of the SIR (Systems above 25 kW up to 2 MW); or

2) Request a review by the Department of Public Service.

For non-inverter based systems and those inverter based systems not certified and tested in accordance with UL 1741 above 25 kW up to 200 kW, the potential applicants and utilities are encouraged to use expedited application process (Section I. B.), but only in circumstances where the utility deems it to be appropriate.

STEP 1: Initial Communication from the Potential Applicant.

Communication could range from a general inquiry to a completed application.

STEP 2: The Inquiry is Reviewed by the Utility to Determine the Nature of the Project.

Technical staff from the utility discusses the scope of the interconnection with the potential applicant (either by phone or in person) to determine what specific information and documents (such as an application, contract, technical requirements, specifications, listing of qualified type-tested equipment/systems, application fee information, applicable rate schedules, and metering requirements) will be provided to the potential applicant. The preliminary technical feasibility of the project at the proposed location may also be discussed at this time. All such information and a copy of the standardized interconnection requirements must be sent to the applicant within three (3) business days following the initial communication from the potential applicant, unless the potential applicant indicates otherwise. A utility representative will be designated to serve as the single point of contact for the applicant (unless the utility informs the applicant otherwise) in coordinating the potential applicant's project with the utility.

STEP 3: Potential Applicant Files an Application.

The potential applicant submits an application to the utility. The submittal must include the completed standard application form, including a copy of equipment certification to UL 1741 (November 2005 revision) as applicable, a three line diagram specific to the proposed system, a letter of authorization (if applicant is agent for the customer), and payment of a non-refundable $350 application fee, except that the fee shall be refunded to net metering customer-generators unless applied toward the cost of installing a dedicated transformer. If the applicant proceeds with the project to completion, the application fee will be applied as a payment to the utility's total cost for interconnection, including the

cost of processing the application. Within five (5) business days of receiving the application, the utility will notify the applicant of receipt and whether the application has been completed adequately. It is in the best interest of the applicant to provide the utility with all pertinent technical information as early as possible in the process. If the required documentation is presented in this step, it will allow the utility to perform the required reviews and allow the process to proceed as expeditiously as possible.

STEP 4: Utility Conducts a Preliminary Review and Develops a Cost Estimate for the Coordinated Electric System Interconnection Review (CESIR).

The utility conducts a preliminary review of the proposed system interconnection. Upon completion of the preliminary review, the utility will inform the applicant as to whether the proposed interconnection is viable or not, and provide the applicant with an estimate of costs associated with the completion of the CESIR. The preliminary review shall be completed and a written response detailing the outcome of the preliminary review shall be sent to the applicant within fifteen (15) business days of the completion of Step 3. The utility's response to applicants proposing to interconnect aggregate DG systems above 25 kW and up to 2 MW, or proposing to interconnect to network systems will include preliminary comments on requirements for protective relaying, metering and telemetry**.**

STEP 5: Applicant Commits to the Completion of the CESIR

Prior to commencement of the CESIR, the applicant shall provide the following information to the utility:

- a complete detailed interconnection design package
- the name and phone number of the individual(s) responsible for addressing technical and contractual questions regarding the proposed system, and
- if applicable, advanced payment of the costs associated with the completion of the CESIR

The complete detailed interconnection design package shall include:

(1) Electrical schematic drawing(s) reflecting the complete proposed system design which are easily interpreted and of a quality necessary for a full interconnection. The drawings shall show all electrical components proposed for the installation, and their connections to the existing on-site electrical system from that point to the PCC.

(2) A complete listing of all interconnection devices proposed for use at the PCC. A set of specifications

for this equipment shall be provided by the applicant upon request from the utility.

(3) The written verification test procedure provided by the equipment manufacturer, if such procedure is required by this document.

(4) Three (3) copies of the following information:

- Proposed three line diagram of the generation system showing the interconnection of major electrical components within the system. Proposed equipment ratings clearly needs to indicate:

1) Number, individual ratings, and type of units comprising the above rating;

2) General high voltage bus configuration and relay functions;

3) Proposed generator step-up transformer MVA ratings, impedances, tap settings and winding voltage ratings;

- Electrical studies as requested by the utility to demonstrate that the design is within acceptable limits, inclusive and limited to the following: system fault, relay coordination, flicker, voltage drop, and harmonics.

STEP 6: **Utility Completes the CESIR**

The CESIR will consist of two parts:

(1) a review of the impacts to the utility system associated with the interconnection of the proposed system, and

(2) a review of the proposed system's compliance with the applicable criteria set forth below.

A CESIR will be performed by the utility to determine if the proposed generation on the circuit results in any relay coordination, fault current, and/or voltage regulation problems. A full CESIR may not be needed if the aggregate generation is less than: 50 kW on a single-phase branch of a radial distribution circuit; or 150 kW on a single distribution feeder.

The CESIR shall be completed within sixty (60) business days of receipt of the information set forth in Step 5. For systems utilizing type-tested equipment, the time required to complete the CESIR may be reduced.

Upon completion of the CESIR, the utility will provide the following, in writing, to the applicant:

(1) utility system impacts, if any;

(2) notification of whether the proposed system meets the applicable criteria considered in the CESIR process;

(3) if applicable, a description of where the proposed system is not in compliance with these requirements;

(4) Subject to subsections (a) through (d) below, a good faith, detailed estimate of the total cost of completion of the interconnection of the proposed system and/or a statement of cost responsibility for a dedicated transformer(s) or other required interconnection equipment:

(a) with respect to an applicant that is <u>not</u> to be net-metered, an estimate shall be provided and shall include the costs associated with any required modifications to the utility system, administration, metering, and on-site verification testing;

(b) with respect to an applicant that <u>is</u> to be net-metered and that is either a Farm Wind or Non-Residential Wind applicant intending to install wind electric generating equipment with a rated capacity of more than 25 kW, an estimate shall be provided and (i) shall include the costs associated with any required modifications to the utility system, administration, metering, and on-site verification testing, and such applicant shall be informed that it is responsible for one-half of such costs, and (ii) shall include the applicant's responsibility for the actual cost of installing any dedicated transformer(s) and other safety equipment up to the maximum set forth in subsection (d) below;

(c) with respect to an applicant that <u>is</u> to be net-metered (but not a Farm Wind or Non-Residential Wind applicant covered in subsection (b) above) such applicant shall have no responsibility for the interconnection costs described in subsection (b)(i) above, and a statement shall be provided showing the applicant's responsibility for the actual cost of installing any dedicated transformer(s) and other safety equipment up to the maximum set forth in subsection (d) below and;

(d) with respect to an applicant that is to be net-metered, if the utility determines that it is necessary to install a dedicated

transformer(s) or other equipment to protect the safety and adequacy of electric service provided to other customers, the applicant shall be informed of its responsibility for the actual costs for installing the dedicated transformer(s) and other safety equipment. The following table reflects the maximum responsibility each designated applicant shall have with respect to the actual cost of the dedicated transformer(s) and other safety equipment.

Maximum Expense for Dedicated Transformer and Other Safety Equipment for Net Metered Customers (Above 25kW up to 2MW)

Generator Type	Generator Size	Maximum Equipment Responsibility
Solar	Over 25 kW up to 2 MW	As determined by Utility*
Wind	Over 25 kW up to 2 MW	As determined by Utility*
Farm Wind	Over 25 kW up to 500 kW	$5,000
Farm Waste	Up to 1 MW	$5,000

***Subject to review by the Commission at the request of the Customer**

STEP 7: Applicant Commits to Utility Construction of Utility's System Modifications.

The applicant and utility will execute a standardized contract for interconnection and the applicant will provide the utility with an advance payment for the utility's estimated costs as identified in Step 6 (estimated costs will be reconciled with actual costs in Step 11).

STEP 8: Project Construction.

The applicant will build the facility in accordance with the utility-accepted design. The utility will commence construction/installation of system modifications and metering requirements as identified in Step 6. Utility system modifications will vary in construction time depending on the extent of work and equipment required. The schedule for this work is to be discussed and agreed upon with the applicant in Step 6.

STEP 9: The Applicant's Facility is Tested in Accordance With the Standardized Interconnection Requirements.

The verification testing will be performed in accordance with the written test procedure provided in Step 5 and any site-specific requirements identified by the utility in Step 6. The final testing will be conducted within ten (10) business days of complete installation at a mutually agreeable time, and the utility shall be given the opportunity to witness the tests. If the utility opts not to witness the test, the applicant will send the utility within five (5) days of the test a written notification, certifying that the system has been installed

and tested in compliance with the SIR, the utility-accepted design, and the equipment manufacturer's instructions.

STEP 10: Interconnection.

The applicant's facility will be allowed to commence parallel operation upon satisfactory completion of the tests in Step 9. In addition, the applicant must have complied with and must continue to comply with the contractual and technical requirements.

STEP 11: Final Acceptance and Utility Cost Reconciliation.

If the utility witnessed the verification testing, then, within ten (10) business days of the test, the utility will issue to the applicant either a formal letter of acceptance for interconnection or a detailed explanation of the deficiencies in the system. If the utility did not witness the verification testing, then, within ten (10) business days of receiving the written test notification from Step 9, the utility will either issue to the applicant a formal letter of acceptance for interconnection, or will request that the applicant and utility set a date and time for an on-site verification and witness operation of the system. This joint on-site verification must be completed within twenty (20) business days after being requested. Within ten (10) business days of the completion of the on-site verification, the utility will issue to the applicant either a formal letter of acceptance for interconnection or a detailed explanation of the deficiencies in the system. At this time, the utility will also reconcile its actual costs related to the applicant's project against the application fee and advance payments made by the applicant. The applicant will receive either a bill for any balance due or a reimbursement for overpayment as determined by the utility's reconciliation, except that a net metering applicant may not be charged in excess of the cost of installing the dedicated transformer(s) or other safety equipment described above in Step 6. The applicant may contest the reconciliation with the utility. If the applicant is not satisfied, a formal complaint may be filed with the Commission.

3.2.4 Application Forms

New York State Standardized Application for Single Phase Interconnection of Parallel Generation Equipment above 25kW up to 2MW. (Reference ATTACHMENT 4)

3.3 Independent Power Producer Generation Rated Greater Than 2 MW and Less Than or Equal to 20 MW that does not fall under the Small Generation Interconnection Procedure of the NYISO,

3.3.1. Introduction

The section provides the framework for processing applications for the interconnection of IPP generation, rated greater than 2 MW but less than or equal to 20 MW, to the Utility system.

3.3.2. Engineering Review Process

Upon receipt of a request from a Developer for interconnection requirements associated with the installation and operation of a generating facility in parallel with the Utility's system, the Developer will be sent a copy of this Bulletin and a copy of the applicable Utility standard agreement. If the Developer wishes to proceed with a project, it shall furnish the Utility with ALL of the information asterisked (*) in ATTACHMENT1, and described in Section 4. Within ten (10) business days of receipt of the initial application and design package, the Utility shall review the information for completeness and, if necessary, provide the Developer, in writing, with a list of missing information and a cost estimate to complete the Preliminary Technical Review.

PRELIMINARY TECHNICAL REVIEW PROCESS

Upon receipt of a complete application and design package and advanced payment, if applicable, the Utility shall commence the Preliminary Technical Review, which shall be completed in four (4) months following receipt of a complete application and design package, and advanced payment, if applicable, unless otherwise agreed upon by the Parties. The duration of the Preliminary Technical Review is dependent upon the size, location and interconnect scheme of the proposed generating facility. The Preliminary Technical Review shall consist of a review of the Developer's proposed system capacity, impact of the proposed generation on the Utility system, system characteristics and general system regulation to determine if the interconnection is viable.

Once the Preliminary Technical Review is completed, the Utility will provide the Developer, in writing, the results of the review. Such results shall include (i) any problems or deficiencies in the proposed design or information provided, (ii) identification of required system modifications, and (iii) a preliminary cost estimate for the required system modifications and completion of the Technical Review. **The Developer will be responsible for all costs pursuant to Section 5 of this Bulletin.**

Following receipt of the Preliminary Technical Review results, if the Developer elects to proceed with the project, it must provide to the Utility a proposed project schedule noting dates for obtaining major permits for the project, purchasing and receiving major equipment, starting and completing construction of the Developer's facilities, synchronizing with the Utility system and commencing Commercial Operation. This project schedule may be subject to modifications since it must also reflect the schedule for any modifications/additions to the Utility's system.

FINAL TECHNICAL REVIEW PROCESS

In order for the Utility to begin the Final Technical Review, the Developer must submit to the Utility all of the information listed in ATTACHMENT 1 and described in Section 4, and provide advanced payment for the cost of the review. The Final Technical Review will be completed in no more than six (6) months following receipt of ALL information required and advanced payment, unless otherwise agreed upon by the Parties. The duration of the review is dependent upon on the size, location and interconnection scheme of the proposed generating facility. If any portion of the submitted design or data is not acceptable, the Utility will comment on those areas and notify the Developer to make the appropriate revisions. The Developer must submit the revisions to the Utility before the Final Technical Review will continue. Any delay in the Developer's response to the Utility's comments will directly delay completion of the Final Technical Review and Final Acceptance of the proposed generation and protection design.

Upon completion of the Final Technical Review, the Utility will provide the Developer, in writing, the results of the review. If the review determines the Utility's acceptance of the Developer's proposed generation and protection design (in accordance with this Bulletin), then the written notification will include a Formal Acceptance. Formal Acceptance of the Developer's proposed generation and protection design is the first stage in the process leading to the Utility's acceptance of the Developer's generating facility for interconnection to the Utility system (see Section 8).

3.4 Generating Facility, or Merchant Transmission Facility Interconnecting to the New York State Transmission System under the Large Generation Interconnection Procedures or the Small Generation Interconnection Procedures.

If the proposed generating facility or merchant transmission facility is interconnecting to the New York State Transmission System, then the Developer must follow the procedures set forth in Attachment X, or Attachment Z to the NYISO OATT.

4 INFORMATION REQUIREMENTS

In order for the Utility to review and formally accept the Developer's proposed interconnection and protection design, the Developer shall furnish the Utility will ALL of the information listed in ATTACHMENT 1. This Section 4 provides a brief description of the items listed in ATTACHMENT 1 to assist the Developer in preparing the application and design package. Items with an asterisk (*) are required for the Preliminary Technical Review or Protection System Impact Study.

*4.1 Utility Form NB 232**

To permit the Utility to begin the Engineering Review Process for the Developer's proposed generation project, the Developer must complete the Independent Power Producer Generator Notice (Form NB-232)(See ATTACHMENT 2)

If, at any time during the Engineering Process, modifications are made to the Developer's design that affect the original information furnished on Form NB-232, then the Developer shall provide a revised Form NB-232 to the Utility.

Form NB-232 contains information that is supplied by both the Utility and the Developer. A description of the information to be furnished by the Developer is provided below.

4.1.1 Developer Information

a)	Developer Name:	Name of Developer proposing the IPP project.
b)	Developer Address:	Developer's address.
c)	Telephone No. Primary:	Developer's primary telephone number.
d)	Telephone No. Alternate:	Developer's alternate telephone number.
e)	Proposed Generating Facility Location:	Location of the proposed generating facility, including street, city/town/village, county, state and zip code.

4.1.2 Generator Information

a)	Manufacturer:	Generator manufacturer's name and model number.
b)	Type:	Type of generator (i.e., induction, synchronous, dc with synchronous inverter, ac with synchronous inverter, etc.)
c)	Rated Output (kVA):	Maximum rated output of the generating unit in kVA. For multiple generating units, the Developer shall note the quantity and rating of the units. The Developer shall complete the Generator Information

		Sheet (ATTACHMENT 5) for the Utility's Preliminary Technical Review Process.
d)	Nameplate Voltage:	Rated output voltage of the generating unit(s).
e)	Power Factor:	Power factor of the generating unit(s).
f)	Phase:	Indication of whether the generating unit is single or three phase.
g)	Disconnect Device:	Indication of the manufacturer, type and continuous and interrupting ratings of the disconnecting device proposed to isolate the generating facility from the Utility system.
h)	Prime Mover:	Source of power to the generating unit (i.e., wind, hydro, wood, solar, natural gas, etc.).

4.1.3 Merchant Transmission Interconnection Information

a)	Capacity/Impedances	All relevant information regarding the lines capacity to transmit power and impedances so that the new line can be modeled in the ASPEN 1 Liner.

4.1.4 End User Facility Interconnection Information

a)	Load Size and Profile	All relevant information regarding the real and reactive side of the new load and the profile over time so that the new load can be modeled in the ASPEN 1 Liner.

4.1.5 General Information

a)	Consultant:	Name and telephone number of Developer's consulting engineer, if any.
b)	Electrical Contractor:	Name and telephone number of Developer's electrical contractor, if any. If Developer is providing its own personnel for electrical work, it must indicate so.
c)	Equipment Supplier:	Name and telephone number of the manufacturer or firm supplying generation equipment for the project.
d)	Interconnection Date:	Estimated date that the Developer's generating facility will be ready for interconnection to the Utility system.

4.1.6 Remarks

This section shall be used to provide any additional information necessary to complement the information provided above. Any unusual conditions or potential problems should be noted. If the Prime Mover is something other than wind or solar, the Developer should provide the turbine or engine size.

*4.2 Application Form**

This form is the standard application form found in the New York State Standardized Interconnection Requirements and Application Process for New Distributed Generators 2 MW or Less and Connected in Parallel with Utility Distributions Systems, and included in ATTACHMENTS 3&4.

4.3 Project Schedule

A schedule (bar chart, CPM, etc.), noting dates for obtaining major permits and financing for the project, purchasing and receiving major equipment, starting and completing construction of the Developer's facilities, synchronizing with the Utility system, and commencing Commercial Operation.

*4.4 Site Plan**

A detailed site plan showing the Developer's facilities, including any interconnection facilities (substations, etc.), in relation to the Utility's existing facilities. This site plan must be of sufficient detail to accurately locate the Developer's facilities on a U.S. Geological Survey ("USGS") topographic map.

*4.5 Description of Operation**

A brief description of the intended operation and control of the Developer's facilities, including the method of starting and the number of starts per day. Any unusual switching procedures or unique operating condition that may be planned shall also be explained.

*4.6 One Line Electrical Diagram of Complete Facility**

The one line diagram must accurately represent the Developer's electrical equipment up to the point of interconnection with the Utility system. The one line diagram must include, at a minimum, the following: Disconnect Switch(es), step-up transformer(s), circuit breaker(s) and contactors, switches, generator(s), current and voltage transformers, capacitors, surge arresters, and station service transformer.

*4.7 One Line Relay Diagram**

The one-line relay diagram must accurately represent the Developer's electrical equipment up to the point of interconnection with the Utility system. The one-line diagram shall include, as a minimum, the following:

- Disconnect Switch(es), including voltage class and continuous current rating
- step-up transformer(s), including size, voltage ratings, winding connections and impedance
- circuit breaker(s) and contactors, including voltage rating and symmetrical current interrupting rating
- any generator(s), including size, rated voltage and winding connection
- current transformers (CTs), including ratio of full winding, tap used and accuracy class of full CT
- voltage transformers (VTs), including ratio and winding connection
- station service transformer(s), including ratio and winding connection
- proposed protective relay device function numbers

*4.8 Three Line Relay or AC Elementary Diagram(s)**

This diagram must detail the interconnection wiring for the equipment detailed on the one-line diagrams. In particular, this diagram must illustrate how the protective relays and instrument transformers are connected. (This may not be necessary if the instrument transformer winding connections are shown on the One Line Relay Diagram).

4.9 Elementary Control or DC Elementary Control Diagram(s)

Sometimes referred to as a schematic diagram, the elementary control diagram depicts the electrical arrangement of the relays and contacts associated with the protective relay scheme, the generator control scheme and the circuit breaker trip and close schemes.

*4.10 Generator, Exciter and Governor Information Sheets**

The Developer shall complete the Generator (ATTACHMENT 5), Exciter (ATTACHMENT 6), and Governor (ATTACHMENT 7) Information sheets. Incomplete information sheets will result in delays since the Developer will be requested to provide the missing information.

4.11 Equipment Nameplate Data and Electrical Ratings

The Developer shall provide the following information, as a minimum for each piece of equipment:

a. Prime Mover - type, manufacturer, power rating, rated speed.
b. Interface/Step-up Transformer(s)* (from proposed generation to point of common coupling) - manufacturer, rated kVA, high and low voltage ratings, winding connections, winding impedance, neutral impedance.
c. Interrupting Devices* - manufacturer, type, rated voltage, rated current, interrupting capacity, operating time.

d. Current Transformers (CTs)* - manufacturer, type, accuracy class, ratio of all devices utilized for protection, control and data telemetering (if required).
e. Voltage Transformers (VTs)* - manufacturer, type, primary and secondary voltage, winding connections, VA rating of all devices utilized for protection, control and data telemetering (if required).
f. Line/Disconnect Switch(es)* - manufacturer, type, rated voltage and current, rated interrupting capacity and location of switch.
g. Capacitor Bank - manufacturer, rated kVAR and connection.
h. Battery and Charger or Source of Power Supply to Protective Relays and Interrupting Devices (such as a UPS) - manufacturer, rating, dc voltage range and output capacity and duration upon loss of ac supply.
i. Surge Arresters - manufacturer, catalog number, MCOV rating.
j. Other – additional information will be requested by the Utility, as required, to complete the review of the Developer's design.

4.12 Proposed Relay Types and Settings for Fault Isolation Protection Schemes

The Developer shall provide a list of relays proposed for the purpose of providing isolation protection, detection of short circuits and other system abnormalities on the Utility system, and detection of short circuits within the generating facilities to disconnect the generating facilities from the Utility system. Each relay's function, manufacturer, model, and range shall be indicated. The proposed settings for the relays provided for detection of short circuits and other system abnormalities on the Utility system shall be provided. For microprocessor relays, the proposed logic to be programmed in the relays and input/output assignments shall be provided. The settings for the isolation protection relays are specified in Sections 6.1.1.1.1 and 6.1.1.1.2 or Section 6.2.2.1.6 of this Bulletin, depending on the size and type of the proposed generator.

4.13 Telemetering Information (when applicable)

When data telemetering is required, the Developer shall provide the Utility with the following telemetering information:

a. AC Elementary Diagram(s) - showing current, potential and external power inputs to the transducers, test switches, etc.
b. Connection diagram(s)
c. Types and ratings of integrated electronic devices ("IEDs"), IED connection(s) and associated scaling.
d. Copies of certificates of test for the metering current and voltage transformers. When certificates are not available, a typical curve for the type of transducer shall be furnished.

4.14 Protective Relay Communications and Monitoring Systems Information (when applicable)

When protective relay communications and/or monitoring equipment are required, the Developer shall provide the Utility with the following information (refer to Section 6.3):

a. Equipment vendor bid proposals, correspondence, equipment drawings, certified test reports and instruction books for the protective relay communications and/or monitoring equipment.
b. Copy of the Communications Service Request Form, Ground Potential Rise calculations and earth resistance measurement data for leased telephone channels for protective relaying.

Although it's the Developer's responsibility to order the communication circuits and provide the necessary info for facilities owned by the Developer, the Utility can use their phone company account representatives to advise on how best to facilitate the order (Telco procedures preclude Energy East from taking an active role in the actual ordering of circuits owned by others).

4.15 Method of Excitation

The means for providing the generator excitation (rotating dc generator, static var source, etc.) must be described.

4.16 Minimum Site Load Without Generation On Line*

The Developer's minimum site load (kVA, power factor), is required to determine the overall load/generation ratio, to determine the impact of the Developer's generation on the Utility system and to ensure that an adequate design is employed.

4.17 Generation Saturation Curve

Per unit armature voltage versus field current for open and short circuit conditions that identify and specify the saturation factor values at 1.0 and 1.2 per unit armature voltage values.

4.18 Exciter Saturation Curves

Per unit exciter field voltage versus exciter field current during load and no-load conditions that identify and specify the exciter field current values at 75% and 100% of maximum exciter field voltage values.

4.19 Block Diagrams

System block diagram, complete with corresponding constants for each type of governor and exciter proposed.

4.20 Regulatory Filings, Impact Statements, License Applications and Other Permit Applications

The Developer shall notify the Utility (provide copies) of all regulatory filings, impact statements, license applications and all other permit applications required by federal, state and local agencies for the Developer's generating facilities. When the Utility's interconnection facilities are included in the Developer's regulatory filings, impact statements, license applications and other permit applications for the generating facilities, the Developer shall provide this information to the Utility for review and acceptance, prior to filing with the agency. Copies of all regulatory approvals and permits obtained by the Developer shall be provided to the Utility upon the Utility's request, including all conditions applied to the approvals.

4.21 Additional Information

The Utility shall request from the Developer, and the Developer shall provide, any additional information required that the Utility deems necessary for completion of the technical reviews.

5 UTILITY SYSTEM MODIFICATIONS

5.1 General

This Section 5 provides information associated with Utility system modifications. If the proposed project is subject to the NYISO OATT, to the extent that this Section 5 conflicts with Attachment X and/or Attachment S, Attachment X and Attachment S shall apply.

5.2 Preliminary Cost Estimate

If Utility system modifications are required, the Utility will provide the Developer with a preliminary cost estimate and estimated completion date for the system modifications at the completion of the Utility's review process as described in the applicable sections of Section 3. A firm schedule for the completion of the Utility's system modifications will be provided after the design has been finalized and Utility internal authorization has been obtained.

5.3 Final Cost Estimate

Upon completing the final design and obtaining Utility internal authorization for any Utility system modifications required due to the Developer's proposed generation, the Utility will provide the Developer with a final engineering quality estimate for the required Utility system modifications. **The Developer will be responsible for all Utility actual incurred costs associated with the required Utility system modifications.** The Utility will provide an advance payment schedule to the Developer, which will be the basis for invoices to be issued monthly by the Utility, to cover the estimated cost of all Utility system modifications. Invoices will be issued to the Developer so that payments are received from the Developer prior to completion of the work. Any differences between the estimated and actual incurred Utility costs will be resolved at the completion of the required system modifications through reimbursements to the Developer (for overpayments), or an invoice issued to the Developer (for additional incurred costs).

5.4 Engineering, Design and Construction

Unless otherwise negotiated with the Developer, the Utility will engineer, design, procure equipment for and construct any modifications required on the Utility system due to the installation of the Developer's facility. If Agreements state that interconnection facilities (electric transmission, distribution, and/or substation facilities) are to be provided by the Developer and transferred to the Utility upon completion and acceptance by the Utility, the Developer shall engineer, design, procure equipment for, construct and test all

facilities in accordance with the Utility's latest design guidelines and equipment and construction specifications. The Utility will provide these documents to the Developer as required.

The Developer shall submit to the Utility for review and acceptance all design drawings, engineering documentation and equipment specifications for all interconnection facilities to be transferred to the Utility upon completion and acceptance by the Utility. The Utility will require at least thirty (30) days to review all submitted documentation and either accept or provide comments to the Developer. Depending on what interconnection facilities are required, the Utility will furnish a list of design packages and documentation to be submitted by the Developer for the Utility's review and acceptance.

5.5 Regulatory Approvals and Permits

The Developer shall obtain all regulatory approvals and permits required for all interconnection facilities to be constructed by the Developer and transferred to the Utility. The Developer shall provide copies of all regulatory filings, impact statements, license applications and all other permit applications involving interconnection facilities to be transferred to the Utility. The Developer shall provide this information to the Utility for review and acceptance, prior to filing with the agency. Copies of all regulatory approvals and permits obtained by the Developer shall be provided to the Utility, including all conditions applied to the approvals.

5.6 Installation and Testing

During the installation and testing of the interconnection facilities to be transferred to the Utility, the Utility will have the right to be present to verify that the facilities are in complete accordance with the Utility's design guidelines and equipment and construction specifications and standards. The Developer will be required to correct all work not completed in accordance with the Utility's standards. Upon the Utility's acceptance of the interconnection facilities and energization of the Developer's generating facility, the Developer shall transfer ownership of the interconnection facilities to the Utility.

5.7 Affected Systems

Where other public utilities are involved in the Developer's project, the Developer shall coordinate all project activities. The Developer shall be responsible for negotiating and/or obtaining any additional agreements or contract requirements with the other public utilities.

6 ELECTRICAL INTERCONNECTION REQUIREMENTS

This Section 6 specifies the Utility's technical interconnection requirements for Independent Power Producer generation connected in parallel with the Utility's system. Generation that does not operate in parallel with the Utility's system is not subject to these requirements. The requirements in this section have been developed based on typical Utility industry design, operating procedures, and safety practices in order to ensure the safety of Utility personnel and equipment, Utility customers, and the general public.

The Developer's proposed generation interconnection shall have 60 Hz alternating current characteristics compatible with the Utility system at the point of interconnection.

6.1 New York State Standardized Interconnection Requirements for New Distributed Generation 2 MW or Less Connected in Parallel with Utility Distribution Systems

6.1.1 Design Requirements

6.1.1.1 Common

The owner shall provide appropriate protection and control equipment, including a protective device that utilizes an automatic disconnect device that will disconnect the generation in the event that the portion of the utility system that serves the generator is de-energized for any reason or for a fault in the generator-owner's system. The generator-owner's protection and control equipment shall be capable of automatically disconnecting the generation upon detection of an islanding condition and upon detection of a utility system fault.

The generator-owner's protection and control scheme shall be designed to ensure that the generation remains in operation when the frequency and voltage of the utility system is within the limits specified by the required operating ranges. Upon request from the utility, the generator-owner shall provide documentation detailing compliance with the requirements set forth in this document.

The specific design of the protection, control and grounding schemes will depend on the size and characteristics of the generator-owner's generation, as well the generator-owner's load level, in addition to the characteristics of the particular portion of the utility's system where the generator-owner is interconnecting.

The generator-owner shall have, as a minimum, an automatic disconnect device(s) sized to meet all applicable local, state, and federal codes and operated by over and under

voltage and over and under frequency protection. For three-phase installations, the over and under voltage function should be included for each phase and the over and under frequency protection on at least one phase. All phases of a generator or inverter interface shall disconnect for voltage or frequency trip conditions sensed by the protective devices. Voltage protection shall be wired phase to ground for single phase installations and for applications using wye grounded-wye grounded service transformers.

The settings below are listed for single-phase and three-phase applications using wye grounded-wye grounded service transformers or wye grounded-wye grounded isolation transformers. For applications using other transformer connections, a site-specific review will be conducted by the utility and the revised settings identified in Step 6 of the Application Process.

The requirements set forth in this document are intended to be consistent with those contained in IEEE Std 1547, Standard for Interconnecting Distributed Resources with Electric Power Systems. The requirements in IEEE Std 1547 above and beyond those contained in this document shall be followed[1].

6.1.1.1.1 Voltage Response

The required operating range for the generators shall be from 88% to 110% of nominal voltage magnitude. For excursions outside these limits the protective device shall automatically initiate a disconnect sequence from the utility system as detailed in the most current version of IEEE Std 1547. Clearing time is defined as the time the range is initially exceeded until the generator-owner's equipment ceases to energize the PCC and includes detection and intentional time delay.

6.1.1.1.2 Frequency Response

The required operating range for the generators shall be from 59.3 Hz to 60.5 Hz. For generators greater than 30 kW the utility may request that the generator operate at frequency ranges below 59.3 Hz as defined in IEEE Std 1547. For excursions outside these limits the protective device shall automatically initiate a disconnect sequence from the utility system as detailed in the most current version of IEEE Std 1547. Clearing time is defined as the time the range is initially exceeded until the generator-owner's equipment ceases to energize the PCC and includes detection and intentional time delay.

If the generation facility is disconnected as a result of the operation of a protective device, the generator-owner's equipment shall remain disconnected until the utility's service voltage and frequency have recovered to acceptable voltage and frequency limits for a minimum of five (5) minutes. Systems greater than 25 kW that do not utilize inverter based interface equipment shall not have automatic recloser capability unless otherwise approved by the utility. If the utility determines that a facility must receive

[1] It is expected that IEEE Std 1547 will eventually supersede the need for explicit technical standards in New York State. However, until such time as all IEEE 1547 series of standards are complete and approved, this standard will take precedence.

permission to reconnect, then any automatic reclosing functions must be disabled and verified to be disabled during verification testing.

6.1.1.2 Synchronous Generators

Synchronous generation shall require synchronizing facilities. These shall include automatic synchronizing equipment or manual synchronizing with relay supervision, voltage regulator, and power factor control.

For all synchronous generators sufficient reactive power capability shall be provided by the generator-owner to withstand normal voltage changes on the utility's system. The generator voltage VAR schedule, voltage regulator, and transformer ratio settings shall be jointly determined by the utility and the generator-owner to ensure proper coordination of voltages and regulator action. Generator-owners shall have synchronous generator reactive power capability to withstand voltage changes up to 5% of the base voltage levels.
A voltage regulator must be provided and be capable of maintaining the generator voltage under steady state conditions within plus or minus 1.5% of any set point and within an operating range of plus or minus 5% of the rated voltage of the generator.

Generator-owners shall adopt one of the following grounding methods for synchronous generators:

a) Solid grounding

b) High- or low-resistance grounding

c) High- or low-reactance grounding

d) Ground fault neutralizer grounding

Synchronous generators shall not be permitted to connect to utility secondary network systems without the approval of the utility.

6.1.1.3 Induction Generators

Induction generation may be connected and brought up to synchronous speed (as an induction motor) if it can be demonstrated that the initial voltage drop measured at the PCC is acceptable based on current inrush limits. The same requirements also apply to induction generation connected at or near synchronous speed because a voltage dip is present due to an inrush of magnetizing current. The generator-owner shall submit the expected number of starts per specific time period and maximum starting kVA draw data to the utility to verify that the voltage dip due to starting is within the visible flicker limits as defined by IEEE Std 519, Recommended Practices and Requirements for Harmonic Control in Electric Power Systems.

Starting or rapid load fluctuations on induction generators can adversely impact the utility's system voltage. Corrective step-switched capacitors or other techniques may be necessary. These measures can, in turn, cause ferroresonance. If these measures (additional capacitors) are installed on the customer's side of the PCC, the utility will review these measures and may require the customer to install additional equipment.

6.1.1.4 Inverters

Direct current generation can only be installed in parallel with the utility's system using a synchronous inverter. The design shall be such as to disconnect this synchronous inverter upon a utility system interruption.

It is recommended that equipment be selected from the "Certified Equipment" list maintained by the PSC. Interconnected Distributed Generating systems utilizing equipment not listed in the "Certified Equipment" list must meet all functional requirements of IEEE Std 1547 and be protected by utility grade relays (as defined in these requirements) using settings approved by the utility and verified in the field. The field verification test must demonstrate that the equipment meets the voltage and frequency requirements detailed in this section.

Synchronization or re-synchronization of an inverter to the utility system shall not result in a voltage deviation that exceeds the requirements contained in Section II.E, Power Quality. Only inverters designed to operate in parallel with the utility system shall be utilized for that purpose.

A line inverter can be used to isolate the customer from the utility system provided it can be demonstrated that the inverter isolates the customer from the utility system safely and reliably.

6.1.1.5 Minimum Protective Function Requirements

Protective system requirements for distributed generation facilities result from an assessment of many factors, including but not limited to:

- Type and size of the distributed generation facility
- Voltage level of the interconnection
- Location of the distributed generation facility on the circuit
- Distribution transformer
- Distribution system configuration
- Available fault current
- Load that can remain connected to the distributed generation facility under isolated conditions
- Amount of existing distributed generation on the local distribution system.

AS A RESULT, PROTECTION REQUIREMENTS CAN NOT BE STANDARDIZED ACCORDING TO ANY SINGLE CRITERIA.

MINIMUM PROTECTIVE FUNCTION REQUIREMENTS SHALL BE AS DETAILED IN THE TABLE BELOW. ANSI C37.2, ELECTRIC POWER SYSTEM DEVICE FUNCTION NUMBERS, ARE LISTED WITH EACH FUNCTION.

SYNCHRONOUS GENERATORS	INDUCTION GENERATORS	INVERTERS
OVER/UNDER VOLTAGE (FUNCTION 27/59)	OVER/UNDER VOLTAGE (FUNCTION 27/59)	OVER/UNDER VOLTAGE (FUNCTION 27/59)
OVER/UNDER FREQUENCY (FUNCTION 81O/81U)	OVER/UNDER FREQUENCY (FUNCTION 81O/81U)	OVER/UNDER FREQUENCY (FUNCTION 81O/81U)
		ANTI-ISLANDING PROTECTION

The need for additional protective functions shall be determined by the utility on a case-by-case basis. If the utility determines a need for additional functions, it shall notify the generator-owner in writing of the requirements. The notice shall include a description of the specific aspects of the utility system that necessitate the addition, and an explicit justification for the necessity of the enhanced capability. The utility shall specify and provide settings for those functions that the utility designates as being required to satisfy protection practices. Any protective equipment or setting specified by the utility shall not be changed or modified at any time by the generator-owner without written consent from the utility.

The generator-owner shall be responsible for ongoing compliance with all applicable local, state, and federal codes and standardized interconnection requirements as they pertain to the interconnection of the generating equipment. Protective devices shall utilize their own current transformers and potential transformers and not share electrical equipment associated with utility revenue metering.

A failure of the generator-owner's protective devices, including loss of control power, shall open the automatic disconnect device, thus disconnecting the generation from the utility system. A generator-owner's protection equipment shall utilize a non-volatile memory design such that a loss of internal or external control power, including batteries, will not cause a loss of interconnection protection functions or loss of protection set points.

All interface protection and control equipment shall operate as specified independent of the Calendar date.

6.1.1.6 Metering

The need for additional revenue metering or modifications to existing metering will be reviewed on a case-by-case basis and shall be consistent with metering requirements adopted by the Commission.

Any incremental metering costs are included in interconnection costs that may be required of an applicant. (As described in Section C, Step 6, net metered Solar, Farm Waste, Farm Wind (25 kW or Less) and Residential-Wind customer-generators are only required to contribute to the cost of dedicated transformer(s) and other safety equipment, and Farm Wind and Non-Residential Wind customer-generators with systems of 25 kW and larger are only responsible for payment of one-half of interconnection costs other than dedicated transformer(s) and other safety equipment).

The following Table summarizes the New York Net Metering Rules

New York (PSL 66-j) - Net Metering[2]

Incentive Type:	Net Metering Rules			
Eligible Renewable/Other Technologies:	Solar		Biogas	Micro CHP / Fuel Cell
Applicable Sectors:	Residential	Non-Residential	Farm-Waste	Residential
Limit on System Size:	25 kW	Up to 2MW	1 MW	10 kW
Limit on Overall Enrollment:	1% of 2005 Demand per IOU for Solar, Biogas, Micro CHP, and Fuel Cells Combined			

New York (PSL 66-l) - Net Metering[2]

Incentive Type:	Net Metering Rules		
Eligible Renewable/Other Technologies:	Wind		
Applicable Sectors:	Residential	Non-Residential	Farm-Service Wind
Limit on System Size:	25 kW	Up to 2MW	500 kW
Limit on Overall Enrollment:	.3% of 2005 Demand per IOU		

[2] Refer to specific utility tariff leaves for more detailed rules and regulations applicable to net metering.

6.1.2 Operating Requirements

The generator-owner shall provide a 24-hour telephone contact. This contact will be used by the utility to arrange access for repairs, inspection or emergencies. The utility will make such arrangements (except for emergencies) during normal business hours.

Voltage and frequency trip set point adjustments shall be accessible to service personnel only.
Any changes to these settings must be reviewed and approved by the utility.

The generator-owner shall not supply power to the utility during any outages of the utility system that serves the PCC. The generator-owner's generation may be operated during such outages only with an open tie to the utility. Islanding will not be permitted. The generator-owner shall not energize a de-energized utility circuit for any reason.

The disconnect switch specified for system size larger than 25kW and non-inverter based systems of 25 kW or less in Section II.D, Disconnect Switch, may be opened by the utility at any time for any of the following reasons:

a. to eliminate conditions that constitute a potential hazard to utility personnel or the general public;

b. pre-emergency or emergency conditions on the utility system;

c. a hazardous condition is revealed by a utility inspection;

d. protective device tampering;

e. parallel operation prior to utility approval to interconnect.

The disconnect switch may be opened by the utility for the following reasons, after notice to the responsible party has been delivered and a reasonable time to correct (consistent with the conditions) has elapsed:

a. A generator-owner has failed to make available records of verification tests and maintenance of its protective devices;

b. A generator-owner's system adversely impacts the operation of utility equipment or equipment belonging to other utility customers;

c. A generator-owner's system is found to adversely affect the quality of service to adjoining customers.

The utility will provide a name and telephone number so that the generator-owner can obtain information about the utility lock-out.

The generator-owner shall be allowed to disconnect from the utility without prior notice in order to self generate.

Under certain conditions a utility may require direct transfer trip (DTT). The utility shall provide detailed evidence as to the need for DTT.

If a generator-owner proposes any modification to the system that has an impact on the interface at the PCC after it has been installed and a contract between the utility and the generator-owner has already been executed, then any such modifications must be reviewed and approved by the utility before the modifications are made.

6.1.3 Dedicated Transformer

The utility reserves the right to require a power-producing facility to connect to the utility system through a dedicated transformer. The transformer shall either be provided by the connecting utility at the generator-owner's expense, purchased from the utility, or conform to the connecting utility's specifications. The transformer may be necessary to ensure conformance with utility safe work practices, to enhance service restoration operations or to prevent detrimental effects to other utility customers. The transformer that is part of the normal electrical service connection of a generator-owner's facility may meet this requirement if there are no other customers supplied from it. A dedicated transformer is not required if the installation is designed and coordinated with the utility to protect the utility system and its customers adequately from potential detrimental net effects caused by the operation of the generator.

If the utility determines a need for a dedicated transformer, it shall notify the generator-owner in writing of the requirements. The notice shall include a description of the specific aspects of the utility system that necessitate the addition, the conditions under which the dedicated transformer is expected to enhance safety or prevent detrimental effects, and the expected response of a normal, shared transformer installation to such conditions.

6.1.4 Circuit Breakers and Other Interrupting Devices

Facilities requiring Circuit Breakers or other types of fault current interrupting devices shall be specified by a NYS Professional Engineer and have sufficient capacity to interrupt the fault currents that are expected given the system conditions based on the point of interconnection. NYSEG and RG&E do not specify a breaker duty. Each application is evaluated based on the system conditions where the breaker is to be placed in service. The interconnection customer designs the interconnection and NYSEG and RG&E review and then accepts the design if then engineering is correct.

6.1.5 Insulators

Facilities requiring insulators of any type shall be specified by a NYS Professional Engineer and have sufficient capability to operate effectively given the system conditions based on the point of interconnection and coordinated with the utility system. NYSEG does not specify insulation requirements. Each application is evaluated based on the system conditions where the equipment is to be placed in service. The interconnection customer designs the interconnection and NYSEG reviews and then accepts the design if then engineering is correct. Here are some typical BI Levels used on the NYSEG system, the capabilities of the insulators chosen for a developers facility must be proposed by the developers engineer and accepted by the Utility.

Nominal Voltage	Effectively Grounded BIL	Non Effectively Grounded BIL
345kV		NA
230kV		NA
115kV		NA
46 kV		
34.5kV Transmission		
34.5kV Distribution Group Op Load Break Switch (600 amp)	200	200
Pad Switchgear (600 amp)	150	150
High Voltage Fusing	150	150
Transformer	150	150
15kV and below Group Op Load Break Switch (600 amp)	110	110
Pad Switchgear (600 amp)	95	95
High Voltage Fusing	125	125
Transformer	95	95

6.1.6 Disconnect Switch

Facilities with system size larger than 25 kW and non-inverter based systems of 25 kW or less shall be capable of being isolated from the utility system by means of an external, manual, visible, gang-operated, load break disconnecting switch. The disconnect switch shall be installed, owned, and maintained by the customer-generator, and located between

the generating equipment and its interconnection point with the utility system.

The disconnect switch must be rated for the voltage and current requirements of the installation.

The basic insulation level (BIL) of the disconnect switch shall be such that it will coordinate with that of the utility's equipment. Disconnect devices shall meet applicable UL, ANSI, and IEEE standards, and shall be installed to meet all applicable local, state, and federal codes. (New York City Building Code may require additional certification.)

The disconnect switch shall be clearly marked, "Generator Disconnect Switch," with permanent 3/8 inch or larger letters or larger.

The disconnect switch shall be located within 10 feet of the utility's external electric service meter. If such location is not possible, the customer-generator will propose, and the utility will approve, an alternate location. The location and nature of the disconnect switch shall be indicated in the immediate proximity of the electric service entrance. The disconnect switch shall be readily accessible for operation and locking by utility personnel in accordance with Section II.B, Operating Requirements. The disconnect switch must be lockable in the open position with a 3/8" shank utility padlock.

6.1.7 Power Quality

The maximum harmonic limits for electrical equipment shall be in accordance with IEEE 519 to limit the maximum individual frequency voltage harmonic to 3% of the fundamental frequency and the voltage Total Harmonic Distortion (THD) to 5% on the utility side of the PCC. In addition, any voltage fluctuation resulting from the connection of the customer's energy producing equipment to the utility system must not exceed the limits defined by the maximum permissible voltage fluctuations border line of visibility curve identified in IEEE Std 519. This requirement is necessary to minimize the adverse voltage effect upon other customers on the utility system.

6.1.8 Power Factor

If the average power factor, as measured at the PCC, is less than 0.9 (leading or lagging), the method of power factor correction necessitated by the installation of the generator will be negotiated with the utility as a commercial item.

Induction power generators may be provided VAR capacity from the utility system at the generator-owner's expense. The installation of VAR correction equipment by the generator-owner on the generator-owner's side of the PCC must be reviewed and approved by the utility prior to installation.

6.1.9 Islanding

Generation interconnection systems must be designed and operated so that islanding is not sustained on utility distribution circuits. The requirements listed in this document are designed and intended to prevent islanding.

6.1.10 Equipment Certification

In order for the equipment to be acceptable for interconnection to the utility system without additional protective devices, the interface equipment must be equipped with the minimum protective function requirements listed in the table in Section II.A.5 and be tested by a Nationally Recognized Testing Laboratory (NRTL) recognized by the United States Occupational Safety and Health Administration (OSHA) in compliance with Underwriter's Laboratories (UL) 1741, Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources (November 7, 2005 revision).

For each interconnection application, documentation including the proposed equipment certification, stating compliance with UL 1741 by an NRTL, shall be provided by the applicant to the utility. Supporting information from an NRTL website or UL's website stating compliance is acceptable for documentation.

If an equipment manufacturer, vendor, or any other party desires, documentation indicating compliance as stated above may be submitted to the Department of Public Service Commission for listing under the "Certified Equipment" list on the Department's website (http://www.dps.state.ny.us/distgen.htm).

Certification information for equipment tested and certified to UL 1741 (November 2005 revision) by a non-NRTL shall be provided by the manufacturer, or vendor to the contacts listed on the Public Service Commission's website (http://www.dps.state.ny.us/distgen.htm) for review before final approval and posting under the Public Service Commission's "Certified Equipment" list. Utilities are not responsible for reviewing and approving equipment tested and certified by a non-NRTL.

If an equipment is UL 1741 (November 2005 revision) certified by an NRTL and compliance documentation is submitted to the utility, the utility shall accept such equipment for interconnection in New York state. All equipment certified to UL 1741 (November 2005 revision) by an NRTL shall be deemed 'certified equipment' even if it does not appear on the Department of Public Service Commission's website.

Utility grade relays need not be certified per the requirements of this section.

6.1.11 Verification Testing

All interface equipment must include a verification test procedure as part of the documentation presented to the utility. Except for the case of small single-phase inverters as discussed later, the verification test must establish that the protection settings meet the SIR requirements. The verification testing may be site-specific and is conducted periodically to assure continued acceptable performance.

Upon initial parallel operation of a generating system, or any time interface hardware or software is changed, the verification test must be performed. If a protective relay must be physically disconnected from a circuit in order for it to be tested, a verification test must be performed. A qualified individual must perform verification testing in accordance with the manufacturer's published test procedure. Qualified individuals include professional engineers, factory-trained and certified technicians, and licensed electricians with experience in testing protective equipment. The utility reserves the right to witness verification testing or require written certification that the testing was successfully performed.

Verification testing shall be performed at least once every four years. All verification tests prescribed by the manufacturer shall be performed. If wires must be removed to perform certain tests, each wire and each terminal must be clearly and permanently marked. The generator-owner shall maintain verification test reports for inspection by the utility.

Single-phase inverters and inverter systems rated 25 kW and below shall be verified upon initial parallel operation and once every four years as follows: the generator-owner shall interrupt the utility source and verify that the equipment automatically disconnects and does not reconnect for at least five minutes after the utility source is reconnected. The owner shall maintain a log of these operations for inspection by the connecting utility. Any system that depends upon a battery for trip power shall be checked and logged at least annually for proper voltage. Once every four (4) years the battery must be either replaced or a discharge test performed.

6.2 Electrical Interconnection Requirements for Independent Power Producer Generation Rated Greater than 2 MW, Merchant Transmission Lines and End User Facilities.

6.2.1 General

This Section 6.2 specifies the Utility's interconnection technical requirements for Developers of generating sources rated greater than 2 MW and operating in parallel with the Utility system, Merchant Transmission Lines, and End User Facilities connecting to the Utility Transmission Grid.

The protection requirements described in this Section 6.2 are those necessary to protect the Utility system from the Developer's facility and to minimize any adverse consequences to the Utility system. Illustrated in ATTACHMENTS 8, 9, 10 and 11 are typical protection, control and grounding schemes that could be employed by the Developer to meet those requirements. It should be noted, however, that the specific design of the protection, control and grounding schemes will depend on the size and characteristics of the Developer's facility as well as the characteristics of the particular portion of the Utility system to which the Developer is connecting the facility. The Developer's relay calculations and settings associated with the interconnection protection must be submitted to the Utility for review and acceptance, and should be done early enough in the project such that any changes identified during the Utility review do not adversely affect schedules.

Facilities connected to the Utility transmission and subtransmission system shall be capable of coordinating their underfrequency protective relaying with the NPCC Underfrequency Load Shedding Curve (see ATTACHMENT 14). The Developer's facilities shall be capable of remaining connected (not trip or be damaged) through major system disturbances until both stages of the Utility underfrequency load shedding scheme have had a chance to operate and reduce system load. The Developer shall take whatever steps are necessary during the design of their facility to ensure that they can withstand sustained underfrequency operation. During system conditions where local area load exceeds generation, NPCC Emergency Operation Criteria requires a program of phased automatic underfrequency load shedding of up to 30% of area load to assist in arresting frequency decay and to minimize the possibility of a widespread system collapse. In conformance with the Emergency Operating Criteria, the facility shall be required to remain connected to the system during the frequency decline to allow the objectives of the NPCC automatic load shedding program to be achieved.

For facilities proposed for interconnection to circuits that are equipped with underfrequency load shedding relays, these relays will be required to be relocated from the circuit of origin to another circuit on the Utility system at the developer’s expense.

The Developer's system design must conform to all applicable National Electrical Code ("NEC"), National Electrical Safety Code ("NESC"), American National Standards Institute ("ANSI") and Institute of Electrical and Electronic Engineers ("IEEE") standards and applicable government regulations.

It is not the Utility's intention to ensure that the Developer's generator or facilities other than the interconnection are adequately protected. If a safety concern is identified during the course of reviewing the Developer's design or witnessing start-up testing, the Utility will bring it to the Developer's and/or their agent's attention for corrective action. Ultimately, the responsibility to identify compliance with applicable safety codes and government regulations and to resolve any opposing views regarding safety code interpretation lies with the authorized inspection organization.

The Utility may require the Developer to provide two independent, redundant relaying systems in accordance with NPCC criteria for the protection of the bulk power system if the interconnection is to the bulk power system, or if it is determined that delayed clearing of faults within the generating facility adversely affects the bulk power system.

6.2.2 System Design Requirements for Independent Power Producer Generation Rated Greater than 2 MW, Merchant Transmission Lines and End User Facilities.

6.2.2.1 Protection & Control

The protection requirements described in this document are those necessary to protect the Utility system from the Developer's facility and minimize its impact on the system. Other devices necessary solely for the protection of the Developer's equipment and to ensure its safe operation shall be the Developer's responsibility. It is not the Utility's intent to assess such protection in the Utility Engineering Review Process.

6.2.2.1.1 *PE Engineer*

The Developer is required to obtain the services of a qualified, New York State licensed Professional Engineer ("P.E.") to design the protection system to meet the Utility's requirements, as well as the Developer's own requirements. The responsible P.E.'s seal shall be affixed on all of the Developer's design documentation that is required to be submitted to the Utility for review and acceptance.

6.2.2.1.2 *Consultant(s)*

To help minimize the potential for delays in the Utility Engineering Review Process, it is highly recommended that the Developer's consultant(s) have extensive background in power system protection and relay calibration and testing. It is the sole responsibility of the Developer to ensure the qualification of the Developer's consultant(s).

6.2.2.1.3 *Protection Schemes*

The Utility requires that Developers with a generating source(s) operating in parallel with the Utility system design, purchase, and install protection schemes at their location that are designed to detect the following:

- System abnormalities and disturbances on the Utility system to which the Developer's generation is interconnected (Utility fault protection scheme).
- Faults within the Developer’s plant, to separate the plant from the Utility system, avoiding outages to other Utility customers supplied on the same circuit to which the generation is interconnected (plant fault protection scheme).

- Backfeeding, by the Developer's generation, to the Utility system when the Utility supply is separated from the Utility system to which the Developer's generation is interconnected (isolation protection scheme).

6.2.2.1.4 *Line Protection for Interconnections to Utility Subtransmission or Transmission Circuits*

For facilities proposed for interconnection to Utility subtransmission or transmission circuits, the infeed that is introduced into the circuit from the proposed facility has an adverse impact on the Utility protective relays at the line terminals. The infeed causes the Utility protective relays to be less sensitive for short circuits that occur on the protected line beyond the proposed interconnection point. In addition, settings for the Utility line terminal protective relays may not be able to be calculated to protect the line for all operating conditions (e.g. all generators on line, no generators on line, etc.).

Because of this impact on the Utility line protection schemes, a developer shall not be allowed to interconnect to a Utility subtransmission or transmission line as a third line terminal. The developer will be required to install facilities at the proposed point of interconnection to split the line into two separate lines. The Developer shall install line protection equipment at each new line terminal that can interface with the protective relays at each of the Utility line terminals.

6.2.2.1.5 *Protective Relays*

The protective relays used by the Developer to meet the Utility's fault and isolation protection requirements must be Utility-approved Utility Grade Relays (see Section 2 - Definitions). The following suppliers are currently approved by the Utility for the fault and isolation protection relays shown in Figures 1, 2, and 3 (ATTACHMENTS 8, 9, and 10):

- ABB (former Westinghouse, ASEA, and BBC types only)
- Basler (BE1 class relays only)
- Beckwith
- General Electric and GE/Multilin
- Schweitzer Engineering Laboratories (SEL)
- Siemens

6.2.2.1.6 *Fault Protection Schemes*

The Developer's fault protection scheme must isolate the Developer's facility from the Utility system for, but not necessarily limited to, the following abnormalities and disturbances:

- Faults within the Developer's equipment;
- Multiphase and ground faults on the Utility system between the Developer's facility and a Utility-designated "system location"; and

- Single phasing of a three-phase facility (open conductor).
- Loss of power supply to the protective relays within the plant
- Protective relay failure (relay trouble alarm)
- Loss of Control Power

6.2.2.1.7 *Isolation Protection Scheme*

The Developer's isolation protection scheme must automatically isolate the Developer's facility from the Utility system for loss of the Utility supply. The Developer's facility must not supply other Utility customers in the event of a loss of the Utility source. The isolation protective equipment would typically be designed to sense a "step change" in the facilities output voltage, current, or frequency upon loss of the Utility source. NOTE: The "step change" resulting from the loss of the Utility supply may or may not be locally detectable at the Developer's location. If not, additional remote communications protection may be required.

Figures 1, 2 and 3 (ATTACHMENTS 8, 9, and 10) illustrate examples of the minimum protection requirements available to the Developer for various typical systems. The specific design of the protection schemes will depend on the facility type and kVA size, the Developer's own site load, the type of Utility supply feeder and its associated loads, as well as the method of grounding selected. The circuit breaker used to disconnect the facility from the Utility system shall be tripped either directly from the protective relay or through one interposing relay.

The windings of the VTs for the undervoltage and overvoltage elements shall be connected so that the secondary voltage in which they monitor accurately emulates the voltages of the Utility circuit to which the facility is interconnected. For example, if the VTs are installed on the secondary of a delta-wye power transformer, they must be connected wye-delta to properly emulate the phase-to-neutral voltages of the Utility circuit.

For isolation protection relays, the Utility requires the following minimum settings:

Underfrequency (81U)

Coordinate with the NPCC Underfrequency Load Shedding Curve shown in ATTACHMENT 14 (i.e., the setting must be on or below the curve shown).

Overfrequency (81O)

Pick-up at no more than 60.5 Hz and operate in no greater than 0.5 seconds.

Undervoltage (27)

Pick-up at no less than 90% of nominal supply voltage and operate in no greater than 1.0 seconds.

Overvoltage (59)

For facilities interconnected to Utility circuits that are ungrounded, or not effectively grounded, pick-up at no more than 110% of nominal supply voltage and operate instantaneously.

For facilities interconnected to Utility circuits that are effectively grounded, pick-up at no more than 110% of nominal supply voltage and operate in no greater than 1.0 seconds.

6.2.2.1.8 *Fault Protection Relays*

For fault protection relays, it is the Developer's responsibility to perform the necessary calculations and determine the proper settings. The Utility will provide the Developer with pertinent Utility system data and the appropriate fault protection criteria. Once the Developer has completed the calculations and finalized these settings, the calculations and settings must be provided to the Utility for review and acceptance. For microprocessor relays, this includes all associated logic and input/output programming.

6.2.2.1.9 *Current Transformers (CTs) Used for Fault Protection Relays*

Relay accuracy CTs (CTs whose accuracy class begin with a “C” or a “T” followed by a voltage class (e.g. C400, T200, etc.) must be used for all protective relays installed within the plant that are used for fault protection. Metering accuracy CTs can saturate when exposed to fault currents, and are thus unacceptable.

6.2.2.1.10 *Voltage Transformers (VTs) Used for Fault and Isolation Protection*

Winding connections for VTs used to provide voltage quantities to fault and isolation protection relays shall be reviewed on a case-by-case basis. This will be done to assure that the phase voltages of the interconnecting utility system are correctly emulated to the relays so that they will operate properly for the appropriate conditions. The VT winding connection depends on the configuration of the utility system, the GSU transformer connection and other factors. VTs used for fault and isolation protection shall not be connected open delta-open delta, because the phase voltages of the interconnecting utility system cannot be correctly emulated to the fault and isolation protection relays regardless of the winding connection of the GSU power transformer to the utility.

6.2.2.1.11 *High Speed Protection vs. Time-Delayed Protection*

The developer 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 system on Utility lines.

6.2.2.1.12 *Local Breaker Failure Protection*

The Developer may be required to provide local breaker failure protection, which may include Direct Transfer Tripping to the Utility line terminal(s), in order to detect and clear faults within the generating source that cannot be detected by Utility backup protection or that could result in undesirable interruption to utility customers.

6.2.2.1.13 *Relay Test Switches*

Relay test switches (ABB FT-19R or equivalent) shall be installed for each microprocessor-based relay that provides isolation protection and/or detection of short circuits or other abnormalities on the Utility system. At least one test switch is required for each relay. This requirement is primarily to assure that any relay output is not rewired incorrectly following the required initial and periodic relay testing. Installation of relay test switches also aids to facilitate and expedite relay testing.

6.2.2.2 Grounding

The Utility transmission, subtransmission and distribution facilities are all designed and built to maintain a specific level or type of grounding. The interconnection of the Developer's facility to Utility facilities may adversely affect that grounding. In order to maintain the existing level or type of grounding on the circuit, the interconnecting facility must comply with the following criteria:

Developer's interconnecting to wye-grounded distribution circuits must provide a ground source to maintain effective grounding on the circuit. The ground source must ensure that under all conditions where the Developer's facility becomes isolated with the Utility's distribution load, the distribution circuit remains effectively grounded. (A ground source provides effective grounding if, during a phase-to-ground fault, the voltages on the unfaulted phases with respect to ground do not exceed 1.35 per unit.)

a. During a phase-to-ground fault on the Utility's distribution circuit, the Developer's facility may be isolated with the phase-to-ground fault if the Utility source opens before the Developer's protection detects the fault condition and isolates the facility from the Utility system. If the Developer's facility does not provide effective grounding during the period that the facility is isolated with the phase-to-ground fault, the system neutral can shift, creating an overvoltage on the two remaining unfaulted phases. All phase-to-ground connected loads isolated with the facility will be subjected to this overvoltage, which can reach 173% of nominal voltage. This high voltage could quickly damage Utility equipment and/or other customer's equipment.

b. The qualified New York State licensed P.E. responsible for the design of the Developer's system shall be aware that the ground source at the Developer's location will provide a path for a portion of the zero-sequence fault current for <u>all</u> phase-to-ground faults on the circuit. Should this

additional fault current path adversely affect the operation of existing Utility ground relaying and/or fusing on the circuit, additional zero-sequence impedance may have to be added to the Developer's ground source (while still maintaining effective grounding), or the ground source may have to be tripped-off simultaneously when the facility is tripped for faults.

c. The following are examples of methods that the Developer may use to provide the required ground source at his location. Figures 4.1, 4.2 and 4.3 (ATTACHMENT 11) illustrate each of these methods, respectively:
   - A wye-grounded/wye-grounded step-up transformer with a wye-grounded generator.
   - A grounding transformer at the point of interconnection. A wye-grounded/delta or zig-zag transformer may be used.
   - A wye-grounded/delta step-up transformer.

The Developer's interconnecting to delta-connected distribution circuits typically will not be required, nor allowed, to provide a ground source for the Utility system. However, the Developer must provide the appropriate protective relaying at the Point of Interconnection to detect ground fault on the Utility electrical system and disconnect the facility from the Utility system.

The Developer's interconnecting to transmission or subtransmission facilities, either delta- or wye-connected, will be reviewed individually to determine if there is a need for the Developer to provide a ground source for the Utility system.

6.2.2.3 Synchronizing and Reclosing

Installations with synchronous generators or self-commutated inverters are required to use Utility Grade synchronizing equipment to parallel their generation with the energized Utility system. In general, installations with induction generators or line-commutated inverters are not required to have synchronizing equipment.

The connection of any type of facility to a de-energized portion of the Utility system is prohibited.

When the Developer's fault interrupting device is tripped via fault or isolation protective relay equipment, reclosing of that device must be delayed until the Utility system has been restored for a minimum of five (5) minutes.

NOTE: The facility should be aware that Utility autoreclosing may cause transient shaft torque on the Developer's machine(s) and transient line overvoltages if it (they) is (are) still connected to the Utility system when reclosing occurs.

For fault initiated operations on transmission, subtransmission and distribution circuits, the Utility substation and line fault interrupting devices (excluding fuses) typically reclose automatically without hot-line supervision or synchronizing. Dead time on the Utility circuit before the first reclosing occurs typically ranges from 2 to 15 seconds. As noted previously, if the Developer's facility remains on-line when reclosing occurs, the Developer's equipment may be damaged by a possible out-of-sync reclose. The Utility may require the installation of hot-line supervision or synchronizing to existing fault interrupting devices on transmission, subtransmission, and distribution circuits when developer owned facilities are connected to them. The utility reserves the right to add hot-line supervision to block automatic reclosing at the Developers expense so that other customers are not impacted by a voltage transient caused by an out of step close.
A Developer may be asked to provide an initial synchronizing plan.

6.2.2.4 Disconnect Switch

6.2.2.4.1 *General*

Developer’s facilities shall be capable of being isolated from the Utility system by means of an external, manual, visible, gang-operated, load break Disconnect Switch. The Disconnect Switch shall be installed, owned and maintained by the owner of the facility, and located between the developer’s equipment and its interconnection point with the Utility system.

a. The Disconnect Switch shall be clearly marked, "Disconnect Switch," with permanent 3/8 inch letters or larger.
b. The Disconnect Switch shall be located within 10 feet of the Utilities' external electric service meter or the location and nature of the dispersed r Disconnect Switches shall be indicated in the immediate proximity of the electric service entrance.
c. The Disconnect Switch shall be readily accessible for operation and locking by Utility personnel at all times. Operation of this switch by the Utility is at the discretion of the Utility without prior notice to the power producer.
d. The Disconnect Switch must be lockable in the open position with a standard Utility padlock.

6.2.2.4.2 *Standards and Ratings*

The Disconnect Switch must be rated for the voltage and current requirements of the installation. The basic insulation level (BIL) of the Disconnect Switch shall be such that it will coordinate with that of the Utility’s equipment. Disconnect devices shall meet applicable UL, ANSI and IEEE standards, and shall be installed to meet all applicable local, state and federal codes.

6.2.2.4.3 *Utility Access*

The Disconnect Switch may be opened by the Utility for any of the following reasons:

a. To eliminate conditions that constitute a potential hazard to Utility personnel or the general public.
b. Pre-emergency or emergency conditions on the Utility system.
c. A hazardous condition is revealed by a Utility inspection.
d. Protective device tampering

The Disconnect Switch may be opened by the Utility for the following reasons, after notice to the power producer has been delivered and a reasonable time to correct (consistent with the conditions) has elapsed:

a. Power producer has failed to properly maintain the protective devices.
b. Power producer's system interferes with Utility equipment or equipment belonging to other Utility customers.
c. Power producer's system is found to affect quality of service of adjoining customers.
d. Failure to make Verification Test records available to the Utility upon request.

6.2.2.4.4 *Notification of Disconnection*

The customer shall be allowed to disconnect from the Utility without prior notice in order to self-generate.

6.2.2.5 Power Factor Correction

If the Developer installs an induction machine or uses an inverter, power factor correction equipment may be required. If the Utility determines in its sole judgment that the use of power factor correction equipment is necessary for VAR support, the Developer shall:

- Install such power factor correction equipment on its systems, as specified and accepted by the Utility; and/or
- Be responsible for all Utility-incurred costs associated with the addition of such power factor correction equipment installed by the Utility on the Utility system.

6.2.2.6 Harmonics

The following is the Utility's policy, based on the most current IEEE standards, regarding harmonic distortion limits that apply to all customers, including IPPs:

> "Harmonic distortion due to a Developer's facility shall be limited such that the harmonic voltage distortion as measured at any point on the Utility system will

not exceed 3% for any single frequency or 5% total harmonic distortion ("THD"), or otherwise be determined by the Utility to cause problems with the Utility or other customers. THD is defined as the square root of the sum of the squares of the harmonic voltages divided by the magnitude of the fundamental (60 hertz) voltage."

If the percent THD is above the limit, the Developer may need to install a filter to meet the requirement.

If a harmonic-related problem with other Utility customers can be traced to a Developer's facility, the Developer must cease operation of the facility and remedy the problem.

6.2.2.7 Flicker

The Developer's facility shall not create unacceptable voltage fluctuation or flicker conditions on the Utility system, as determined by the Utility. Refer to GRAPH 1 (ATTACHMENT 13) for flicker limitations, based on the most current IEEE standards. The Developer shall limit voltage fluctuations in accordance with the 3% curve for transmission or Subtransmission system interconnections, or the 4% curve for distribution system interconnections.

6.2.2.8 Ferroresonance

6.2.2.8.1 *Description*

Studies have shown that ferroresonant overvoltages can occur on Utility T&D systems. These are produced by the discharging and charging of the system capacitance through the highly non-linear magnetizing reactance of the system transformers as they pass into and out of a saturated condition. The result is high overvoltage and distorted waveforms, which not only contain the ferroresonance but also all the natural resonant frequencies of the distribution circuits excited by the ferroresonant pulses.

6.2.2.8.2 *Conditions*

Four conditions must be present for ferroresonant overvoltages to occur:

- The facility must be separated from the Utility source (Islanding condition).
- The kilowatt load in the Island must be less than three times the facility's rating.
- The system capacitance must be greater than 25% of the facility's rating.
- There must be at least one transformer connected to the island.

6.2.2.8.3 *Impact On Customer Equipment*

Ferroresonant overvoltages can result in customer equipment and wiring being subjected to up to three times rated voltage. This can result in damage to both customer-owned appliances and equipment as well as Utility-owned equipment, and may even result in a fire.

6.2.2.8.4 *Equipment Requirements*

If, during the Preliminary Technical Review, it is determined that a ferroresonant overvoltage condition is possible, the Utility protection engineer will investigate if it is feasible to remove capacitor banks from the branch or circuit to which the facility will be connected. If this is determined not to be feasible, then unidirectional Direct Transfer Trip (DTT) equipment will be required to be installed at the Utility substation or line recloser and the generation facility. Through this equipment, the Utility's relays or recloser, upon detection of a short circuit on the feeder or branch, will key a DTT signal to the generation facility via telephone channel to Disconnect the generation from the faulted circuit prior to opening of the Utility breaker or recloser.

6.2.3 Metering

The metering scheme(s) required to measure the power delivered to the Utility, or any service power required by the Developer and supplied by the Utility (i.e., temporary, back-up, maintenance, or permanent service), will be dictated by the Agreement terms negotiated between the Utility and the Developer. The metering scheme(s) will be designed by the Utility.

6.2.3.1.1 *Metering Point at Point of Interconnection*

When the metering point is located at the point of interconnection, the Developer shall provide space and mounting structures for the metering equipment in the Developer's interconnection facilities. A suitable Disconnect Switch(es) (group-operated, with a visible open) operable and lockable by the Utility, shall be provided by the Developer to isolate the metering instrument transformers (VTs and CTs), for maintenance and testing. The metering CTs shall be located on the Utility side of the metering VTs. The Developer shall also provide the conduit(s) required between the instrument transformer secondary junction box(es) and the metering enclosure(s) and for any telephone and SCADA RTU's connections.

a. The Utility will normally purchase, install, test and maintain the metering instrument transformers (VTs and CTs), meters, enclosure(s), and ancillary equipment required for metering of the Developer's facility. The Utility will provide instrument transformer outline drawings and meter enclosure physical information to the Developer to incorporate into the design of the Developer's interconnection facilities. The Developer shall

coordinate the location of the metering equipment with the Utility. The Developer shall provide drawings showing the location and mounting structure details for the metering instrument transformers and meter enclosure, for the Utility's review and acceptance.

b. The Utility will install all connections between the instrument transformer secondaries and the meter test switches, along with meter interconnections and connections to ancillary equipment.

c. When required, the Developer shall supply additional source(s) of 120 volt ac, single phase station power to the meter ancillary equipment. The supply circuit(s) shall be dedicated for the Utility's use only. The Utility will make all connections to the ancillary equipment from a specified demarcation point. The Utility will provide the Developer with power requirements. This supply circuit shall not be interrupted during routine switching and maintenance outages.

d. In some instances, to facilitate construction and installation, the Utility may authorize the Developer to include the purchase and/or installation of meters, metering instrument transformers and meter test switch(es) in the Developer's interconnection facilities. The Utility will provide equipment specifications and accuracy requirements for meters and instrument transformers to be purchased by the Developer. The Developer shall provide equipment drawings and certified test data for the Utility's review and acceptance The requirements detailed in the next section (i.e. 6.2.1.8.6) are applicable in this instance.

e. The Developer shall furnish a dedicated standard "voice-grade POTS" (plain old telephone system) telephone channel and jack to a designated demarcation point for remote meter interrogation (usually at the meter). Also, any wiring between revenue meters and SCADA RTU’s is the developer’s responsibility. Connections between meters and RTU’s are normally made through a fiber optic transceiver unit.

f. The Utility shall have access to all metering equipment located within the Developer's interconnection facilities to perform initial and routine in-service maintenance and testing. The Utility will notify the Developer prior to entering the Developer's facilities.

6.2.3.1.2 *Meter Point at Location Other than the Interconnection Point*

Where interconnect requirements dictate the building of a substation that the Utility will own, operate and maintain, the Developer is required to purchase and install the revenue meter(s), associated revenue grade metering CTs and VTs and meter test switch(es). The metering point is to be located where the change of ownership occurs. The typical ownership line of demarcation is noted on the POI Guide Relay One Line Diagram (CR-8031) as a dashed line. It is important that any additional metering requirements beyond the POI for back-up and/or supplemental service or for black start capabilities be defined

at the outset. Generally, metering equipment for conventional services not involving the POI, will be supplied by the Utility.

For metering at the POI, the Utility will specify the exact meter type(s) and model(s). The developer will purchase and install the meter(s), CT's/VT's, and complete the wiring between CT/VT secondary windings and meter test switches and between the meter test switches and meter case(s). Revenue meters must be powered from a reliable 120 VAC auxiliary source. This source must be uninterruptable.

Revenue meters typically supply MW, MWh, MVAR, Volts, Amps, and Frequency signals to an on site Supervisory Control and Data Acquisition (SCADA) Remote Terminal Unit (RTU) through an RS-485 connection using DNP 3.0 protocol. The developer is required to complete all connections between meters and SCADA RTU's and also between meters and the station telephone demarcation point. Revenue meters require a dedicated 2-wire, half duplex POTS line or dedicated port off a telephone switch. Connections between meters and RTU's are normally made through a fiber optic transceiver unit. The Utility will test and commission the revenue metering equipment.

New York State requires all devices used in revenue metering applications to be PSC approved. The following web site contains a list of approved devices.:

http://www.dps.state.ny.us/approved_meter_list.PDF

During the early design phase of the project, the developer is required to provide the Utility with maximum generator output in units of kVA or MVA and on site minimum load without generation. At this point, the developer should make note of any future plans to expand the facility that will result in increased generation capacity. Because of the range between maximum output and minimum on site load when the facility is not generating, the Utility may require the use of high accuracy (0.15%), extended range CTs. Using expected maximum and minimum load information supplied by the developer, the Utility will size the CT's and, at the developer's request, provide final review of all revenue grade metering devices before any PO's are issued.

For revenue metering applications, only wound type VTs are acceptable; capacitive type voltage transformers cannot be used. Metering VT/CT secondary windings must be dedicated and used for the sole purpose of supplying current and metering potential to the measuring elements of revenue meters. No other devices such as relays, panel meters, transducers, potential sensing devices, etc. are to be connected off the secondary windings of metering VTs and CTs. VTs with dual secondary windings are acceptable under the condition that one of the secondary windings is reserved and dedicated for revenue metering purposes and the connected burden on the remaining windings is kept to a minimum. The minimum conductor size for all secondary connections must be #10 AWG solid or stranded copper wire. Single point grounding of VT/CT secondary windings is required. The location of this ground must be at the meter test switch. Secondary fusing of metering VTs is not permitted.

The Utility requires certified factory test data for all revenue metering CTs and VTs. This test data must be specific to each device (i.e. representative or typical test data is not acceptable). The developer is required to provide the Utility with the following information on all metering CTs and VTs:

REVENUE GRADE VOLTAGE TRANSFORMERS (VT's):

	Phase A	Phase B	Phase C
Acquisition Date:			
Manufacturer:			
Model:			
Serial Number:			
Dual Winding Flag (Y/N):			
Dual Ratio Flag (Y/N):			
In Service Ratio Vpr : Vsec			
Rated % Accuracy (ANSI Class):			
Burden Rating:			
Thermal Rating (VA):			
BIL Rating:			
RCF @ Rated Bdn:			
PACF @ Rated Bdn.:			
RCF @ Zero VA			
PACF @ Zero VA:			

REVENUE GRADE CURRENT TRANSFORMERS (CT's):

	Phase A	Phase B	Phase C
Acquisition Date:			
Manufacturer:			
Model:			
Serial Number:			
Voltage Class:			
Dual Ratio Flag (Y/N):			
In Service Ratio (XXXX:5):			
Rated % Accuracy (ANSI Class):			
Burden Rating:			
BIL Rating:			
TRF:			
RCF @ FL:			
PACF @ FL:			
RCF @ LL:			
PACF @ LL:			

The above information, including factory certified test reports must be sent to the Utility for review and acceptance.

Note that instrument transformers are long lead time items and should be ordered as early as possible. The instrument transformers can be shipped directly to the construction site. Revenue meters on the other hand must be shipped directly from the manufacturer to the Utility Meter Labs so they can be programmed and tested before installation.

Depending on the size of the generation and the existing circuit load, the Utility may require installation of hourly interval metering at the Utility source substation or other upstream device, at the Developer's expense, so the Utility can accurately track circuit loading against generation output.

6.2.3.1.3 *Dedicated Phone Line*

The Developer will be responsible for providing 2-wire, dial-up, dedicated telephone line(s) at the demarcation point adjacent to the Utility's metering location(s). The telephone line(s) shall provide the Utility with remote metering reading capability. The Developer shall be responsible for all costs related to obtaining, installing, testing, commissioning and maintaining the telephone line(s) as those costs may be charged by the telephone company.

6.2.3.1.4 *Instrument Transformers*

Instrument transformers utilized for metering the Developer's generation delivered to the Utility, or any service power required by the Developer and supplied by the Utility will not be used for other functions (i.e., protective relaying, telemetering, etc.).

6.2.3.1.5 *Cost Responsibility*

The Developer will be responsible for all costs associated with the installation, testing and maintenance of the metering equipment. The Utility will retain ownership of all metering equipment.

6.2.4 Data Telemetering

For Developer's generating facilities with an installed capacity of greater than 2 MW, or for Merchant Generators, plant net Kilowatt, Kilovar, Kilowatt-hour output, and bus voltage shall be required to be continuously (every two seconds) sent to the Utility's Energy Control Center. At the Utility's option, circuit breaker status, control and critical alarms may also be required. For Developer's generating facilities 2 MW or less, data telemetering may be required at the Utility's option, depending on the interconnection system requirements.

6.2.4.1.1 *Data Transmittal*

This data may be transmitted, at the Utility's option, to a local Utility facility that has a Remote Terminal Unit ("RTU") on the Utility's Supervisory Control and Data Acquisition ("SCADA") system for retransmission to the Utility's Energy Control Center. Alternatively, a Utility SCADA RTU may be installed directly at the Developer's facility.

6.2.4.1.2 *Dedicated Leased Phone Channel*

If the Utility requires the Developer to install an RTU at their facility, the Developer must provide RTU communications to the Utility's Energy Control Center via a dedicated leased telephone channel. The Developer shall obtain a leased telephone channel to a Utility connection point (located at an AT&T POP facility for all inter-LATA circuits). For intra-LATA circuits, the Developer shall connect to the Utility's Energy Control Center via a dedicated channel. The Developer will be invoiced by the Utility for the connection between the AT&T POP facility and the Utility's Energy Control Center. The Developer shall be responsible for ordering and paying for the telephone channel from the Developer's generating facilities to the dedicated connection point.

6.2.4.1.3 *Telemetry Information Requirements*

A 485 communications interface will be connected to the billing meter to carry the analog measurements, via DNP3.0 protocol, to the RTU communications port. Any IED’s for the analog measurement of volts, watts, and reactive volt-amperes shall conform to ANSI standards C39.1, C39.5, and C37.90A. Instrument transformers shall conform to ANSI standard C57.13.

The Utility will inform the Developer of full scale values for volts, watts and vars. This information will determine the calibration range of the transducer and define scaling resistor requirements.

The Developer shall provide pertinent telemetering information, as noted in Section 4.13, for the Utility's review and acceptance.

The Developer will be required to bring the analog value communications from the billing meter, the digital alarms and the breaker position, and the breaker control wiring to a demarcation block for the RTU. The Developer will also prepare a point list diagram that describes the order of the signals brought to the terminal block. The Utility technicians will deliver the RTU, mount it next to the terminal block, wire from the terminal block into the RTU, and program the RTU.

6.2.4.1.4 *Equipment and Cost Responsibility*

The Developer shall be responsible for all telemetering equipment and be required to pay for all the costs associated with its purchase, installation, operation, test and maintenance of this equipment.

6.2.4.1.5 *Testing*

After initial testing and acceptance, the Developer is required to provide the Utility with certified transducer test results once every two years to coincide with the required protection system periodic test schedule.

6.3 Protective Relay Communications and Monitoring Systems for Independent Power Producer Generation Rated Greater than 2 MW, Merchant Transmission Lines and End User Facilities.

This Section 6.3 specifies the Utility's requirements for the purchase and installation of protective relay communications systems and monitoring equipment. Communication facilities for protective relaying applications (i.e., pilot and/or direct transfer trip), and/or monitoring equipment which are required (as defined in the system modifications) for the Utility's and the Developer's facilities for the purpose of accepting IPP Generation, Merchant Transmission Facilities, and End-User Facilities for interconnection, shall be designed, purchased, and installed in accordance with the following requirements:

6.3.1 Terminal Equipment

6.3.1.1.1 *Ownership*

The metering point will generally establish the demarcation. All equipment on the Developer's side of the metering point will be owned, operated, and maintained by the Developer. All equipment on the Utility side of the metering point will be owned, operated, and maintained by the Utility. At the Utility's option, the Developer may purchase equipment to be installed on the Utility side of the metering point. However, upon Utility acceptance of the equipment for interconnection and energization of the Developer's facilities, the Utility will own, operate and maintain the equipment.

6.3.1.1.2 *Cost Estimates*

Upon identification of the need for a communications and/or monitoring system(s), the Utility will provide the Developer with a cost estimate, which will identify billable costs and functional requirements.

6.3.1.1.3 *Specification and Ordering Responsibilities*

After the Utility furnishes the Developer with communication system requirements and associated costs and responsibilities, the Developer shall be responsible for the procurement of all equipment and associated hardware for the Developer's end of the interconnection. The Utility will provide the Developer with equipment specifications and any unique design requirements. Additionally, the Utility will supply the Developer with a Utility-approved vendors list for the equipment. The Developer shall be the lead contact with the equipment vendor(s).

The Developer shall provide copies of all vendor bid proposals and any subsequent correspondence between the Developer and the equipment supplier(s) dealing with any proposed technical modifications to the Utility specified equipment as well as the equipment delivery schedules. Any vendor exceptions to the Utility supplied specification(s) will require the Utility's review and acceptance. The Utility's review of vendor bid proposals must be completed before purchase orders are placed for the equipment.

6.3.1.1.4 *Documentation*

The Developer shall submit to the Utility a complete set of vendor's equipment drawings throughout various phases of the project. The Utility will review this documentation and provide the Developer with comments regarding equipment modifications. Specific documentation requirements and review procedures are outlined in the Utility-supplied equipment specifications.

6.3.1.1.5 *Installation and Delivery*

Each party will be responsible for equipment installation at their respective ends. The Utility will not install equipment at the Developer's facility.

The Utility-end equipment will be delivered directly to a specified Utility Division Service Center. Upon receipt of the equipment, each party will be responsible for acceptance testing of equipment for their respective ends. The Developer shall test all equipment in accordance with Appendix 1, “IPP Protective Relay Communications and Monitoring Equipment Test Requirements.”

6.3.1.2 Remote Alarming, Control and Metering

Where protective relay communications systems are required, the Developer shall provide remote alarming of the systems’ "off-normal" conditions to a designated Utility location. This can be accomplished through a Utility RTU, if one will be located at the Developer's facility. If an RTU is not required at the Developer's facility, protective relay communication systems alarm information must be provided by alternate means.

In facilities where an RTU is required, the following status points at the facility are required to be monitored by the RTU (“breaker” corresponds to all interrupting devices in the facility that interconnect generation to the Utility system):

- Status of interconnecting breaker(s) and individual generator breakers ("a" switch indication)
- Breaker trouble (interconnecting breaker(s) only)
- Loss of relay DC
- Loss of relay AC potential
- Protective Relay cutoff switches (if any)
- Relay trouble
- Supervisory cutoff of devices controlled through the RTU (Local-Remote)

In addition, where an RTU is required, the Utility requires (through the RTU) control of all breakers in the facility that interconnect generation to the Utility system.

Depending on the MVA capacity of the facility, the Utility requires that various analog data points be monitored by the RTU. These points may include, but are not limited to, the following (also referenced in Section 6.2.3.3):

- Watts, vars, MWH, amperes of each unit within the facility
- Watts, vars, MWH, amperes of the total facility
- Bus voltage at which the plant is interconnected to the Utility

The RTU will be ordered by the Utility (typical lead time is approximately 8 to 12 weeks). Utility System Operations will need approximately 1 week to test, configure and ship the RTU's to the site. The Utility will perform the RTU connections, point-to-point testing and commissioning. Communications and metering wiring required for SCADA inputs and power for the RTU shall be brought to the RTU by the Developer to the actual physical location where the RTU is to be mounted with enough slack that all terminations can be made cleanly. All wires are to be clearly marked as to their origin and final destination. The Developer will need to create point definition sheets associated with the system protection and control drawings, in accordance with Utility alarm and SCADA point definition guidelines. The point definition sheets will be used by the Utility System Operations Group to create termination sheets (T sheets), which the Developer can use to create the RTU external connection diagrams.

6.3.1.3 Spare Parts

The Utility **strongly recommends** that the Developer stock a complete set of spare parts. Loss of a protective relay communications system will compromise the reliability of the protective system, and the Developer will be forced to disconnect the generation from the Utility system until such time that the communications system is back in service.

6.3.2 Communications Media

6.3.2.1 Leased Communications Media

Leased telephone channels for protective relaying shall conform to the Bell Systems Technical Reference - PUB 41011-C6, Transmission Specifications For Voice Grade Private Line Audio Tone Protective Relay Channels.

Leased telephone channels for data shall conform to the Bell Systems Technical Reference - PUB 41004, Data Communications Using Voiceband Private Line Channels; and, PUB 41009, Transmission Parameters Affecting Voiceband Data Transmission - Measuring Techniques.

6.3.2.1.1 ***Standards***

The Developer is responsible to ensure compliance with the most current version of the following standards.

(IEEE Std. 487) - IEEE Guide for Protection of Wire-Line Communications Facilities Serving Electric Power Stations (IEEE Std. 367) -IEEE Guide for Determining the Maximum Electric Power Station Ground Potential Rise and Induced Voltage from a Power Fault.

6.3.2.1.2 ***Liaison and Ordering Responsibilities***

Telephone channel circuit ordering and interface responsibilities with the telephone company(ies) has historically been the sole responsibility of the Developer, but results have frankly been terrible, as the Developer usually does not have the experience dealing with phone company processes and practices related to protection and SCADA circuits. Indeed this task can easily take the telephone company in excess of 12 weeks to engineer and install, from the time the substation building is ready to allow telephone company access to begin installation of circuits. The Utility can not emphasize enough the need to closely follow and manage this process, if the Developer wishes to avoid in-service date delays. Therefore, if the Developer agrees, the Utility will use their communications experts to order the communications circuits that are required for interconnect-related protection, SCADA, and metering, and manage that process to a successful conclusion, for all telephone channels that are routed for these purposes. If the Developer so agrees, Utility time and material costs will be billed to the Developer, and the circuits will be ordered as Utility circuits. The Utility will utilize its best efforts to manage this process, but takes no responsibility for delays caused by the phone company(ies). Note- this offer to order and facilitate communication circuit orders applies only to communications related to the interconnect protection, SCADA, and metering for telephone channels routed for these purposes which may include communication circulates that will be owned by the Utility or the Developer.

6.3.2.1.3 ***Cost Estimates***

For protective relaying applications, the Developer is solely responsible to obtain communication channel installation and monthly rental charges from the appropriate

telephone company(ies). The Utility will assume this responsibility, if applicable per section 6.3.2.1.2 above.

6.3.2.1.4 *Ground Potential Rise Considerations*

If high voltage special protection ("HVSP") equipment is required, as identified by Ground Potential Rise ("GPR") studies, the Developer will incur all expenses for such equipment. If the telephone company(ies) do not allow customer ownership of HVSP equipment, then it will be the responsibility of the Developer to procure HVSP equipment for both ends of the interconnection. The Utility will assume this responsibility, if applicable per section 6.3.2.1.2 above.

Where the local communications carrier's tariff(s) allow customer ownership of HVSP equipment, the Utility will negotiate directly with the telephone company(ies), at the Developer's expense, for ownership and maintenance arrangements for the Utility-end only. If HVSP equipment already exists at the Utility location, the Developer will be informed of this requirement at the outset of the project. The Utility will not estimate the cost of HVSP equipment.

The Utility will provide the short circuit information specific to the location for the Developer to determine the GPR at the Developer's location. The Developer's GPR calculations and associated results (including obtaining the E911 address, soil resistivity measurement data, ground grid resistance measurement data or ground grid resistance calculated values if new) shall be submitted to the Utility for review prior to ordering the leased telephone circuits.

6.3.2.1.5 *Notification Requirements*

The Utility shall be notified of the circuit type requisitioned via copy of the circuit order issued by the Developer to the telephone company(ies). The Developer shall notify the Utility a minimum of two weeks in advance of the telephone channel installation so that proper arrangements can be made to have a Utility representative present during telephone company installation of the leased circuit(s) at the Utility-end.

6.3.2.2 Privately Owned Communications Media

If it is technically and economically feasible to install privately owned fiber optic, hardwire, or power line carrier protective relay, and/or data communications systems, the Developer and the Utility shall mutually agree on the types of systems to be used and the engineering specification, procurement, and installation responsibilities and requirements.

Any communications system designed or proposed by the Developer shall conform to all applicable ANSI, IEEE, NEC, NESC, and Utility standards.

The Utility will have the right to review and accept all systems designed, specified, procured, and installed by the Developer or the Developer's agent.

6.3.3 Other Utilities

Where other foreign electric utilities are involved in the Developer's generation project, the Developer shall be responsible to coordinate the engineering, procurement and installation of protective relay communications and monitoring systems. The Developer shall be responsible for negotiating and/or obtaining any additional agreements or contract requirements.

7 INSPECTION, CERTIFICATION, TESTING, AND MAINTENANCE REQUIREMENTS

7.1 Inspection and Certification Requirements

The Developer's electrical equipment and interconnection wiring shall be in accordance with applicable portions of the NEC, NESC, and all other applicable codes, as required. The Developer shall obtain a written statement from the qualified New York State Licensed P.E. utilized to design the Developer's protection system, certifying that the Developer's facility, as designed and constructed, is in complete accordance with all applicable codes. This statement shall have the P.E.'s seal affixed on it. A copy of the statement shall be furnished to the Utility.

The Utility also requires the Developer to obtain certification that the Developer's electrical equipment and interconnection wiring is in accordance with all applicable codes, from an authorized electrical inspection organization acceptable to the Utility. Names of such organizations will be provided upon request. Once the Developer has selected one of the Utility-approved inspection organizations and the inspection process has been initiated, the selected inspection organization must be retained by the Developer throughout the inspection process until certification is granted. The Utility must be presented with written evidence showing that all electrical equipment and interconnection wiring at the Developer's facility has been inspected and certified by a qualified inspection organization **prior** to the beginning of initial inspection and testing.

7.2 Test Requirements

The Developer shall arrange for qualified personnel to perform calibration and functional tests on the fault and isolation protection systems, along with tests on CTs and VTs utilized in the protection systems, in accordance with typical Utility industry practices. The tests that shall be performed during the initial and periodic tests are detailed in Section 7.2.3. The Developer shall provide the name and qualifications of the individual(s) who will be performing the tests, for the Utility's acceptance.

7.2.1 Initial Inspection and Tests

Prior to the initial parallel operation of the Developer's equipment with the Utility system, or after modifications are made to plant already interconnected with the Utility system, Utility personnel must be present for the protective relay and associated equipment calibration and functional tests, as well as the inspection of the Developer's equipment. The Developer will be invoiced for the costs for Utility personnel to inspect and witness these tests. The Utility requires a minimum of **two (2) weeks** notice prior to witnessing the Developer's protection system calibration and testing.

It is **not** the Utility’s policy to lease test equipment or provide assistance during testing.

The Developer shall provide the Utility a copy of all certified test reports for the initial inspection and tests of the Developer's equipment. Certified test reports must be submitted to the Utility prior to synchronization of the Developer's generation with the Utility's system.

7.2.2 Periodic Tests

Periodic calibration and functional tests of the Developer's isolation protection and protection for detecting faults on the Utility system and within the plant are required on a four-year basis for microprocessor-based relays that include self-test algorithms, or on a biennial (once every two years) basis for all other relays. Copies of certified test reports for microprocessor-based relays that include self-test algorithms shall be submitted to the Utility every six years. Copies of certified test reports for all other relays shall be submitted to the Utility on a biennial basis. Also, a battery maintenance log (if applicable) shall be submitted to the Utility on a biennial basis.

For relays installed in accordance with the “NPCC Criteria for the Protection of the Bulk Power System”, maintenance intervals shall be in accordance with the “NPCC Maintenance Criteria for Bulk Power System Protection”.

In order for the Developer's testing and inspection to be considered certified and accepted by the Utility, it must be performed under the direction of a qualified New York State licensed Professional Engineer ("P.E."). Additionally, test results and Developer's equipment data must be stamped by the qualified P.E. witnessing or performing the checkout and testing. The Developer is responsible to ensure that the P.E. witnessing or performing equipment calibration and start-up testing on the Developer's behalf has an extensive background in this field.

Periodic tests may be witnessed by the Utility at the Utility's option in lieu of P.E. certified tests. The Utility also reserves the right to inspect any of the Developer's equipment upon prior notice.

7.2.3 Tests to be Performed

The following tests shall be performed for the initial and periodic tests:

7.2.3.1 Current Transformer Test (initial tests only)

Field verify that the CT ratio and polarity are correct (Most easily accomplished during assembly). Verify the integrity of the CT insulation and secondary circuit using a 500 volt megger, and check for proper secondary ground connection.

7.2.3.2 Voltage Transformer Test (initial tests only)

Field-verify that the VT ratio is correct. Verify that correct voltages are present at the switchboard locations. Verify the integrity of the VT insulation and secondary circuit using a 500 volt megger and check for proper ground connection.

7.2.3.3 Calibration Test

The purpose of relay testing is to verify that a relay will respond to the appropriate inputs in the required manner as determined by the setting. The actual input quantities must be applied to the relay in accordance with the manufacturer's instruction book. The input quantities shall be determined by the relay settings. The settings must be consistent with those submitted by the Developer and accepted by the Utility. When testing electromechanical relays with time dials, sufficient test points must be taken to define the relay curve. The calibration data shall be documented in a legible format and contain all pertinent relay data. (Utility test forms may be used and are available upon request.)

7.2.3.4 Functional Test

A protective relay cannot function by itself. It is reliant upon other equipment such as instrument transformers, auxiliary relays, circuit breakers, interconnecting cables and control power to perform its protective function. The purpose of functional testing is to verify that the overall operation of the relay and its associated equipment is in accordance with its intended design. Therefore, it is beneficial for the Developer to develop specific test procedures with well-defined parameters for use during testing.

The functional tests must, at a minimum:

a. Verify that end devices from each protective scheme operate from every possible source of trip potential (including, if applicable, confirmation that the communications system operates the transfer trip end devices).
b. Verify that the end device contacts complete the trip circuit to the breaker, actually trip the breaker, and operate all associated auxiliary relays in the close and trip circuit.
c. Check for correct operation of synchronism check relay, block of close, and block of reclose.
d. AC Control Circuit - Verify circuit breaker trips upon loss of ac control power.
e. DC Control Circuit - Verify correct operation of dc control devices in the absence of ac supply. Battery systems shall be checked for proper recovery time after a circuit breaker has been operated.

7.2.3.5 Battery Maintenance

Battery systems must be serviced and maintained on a regular basis by the Developer. Each battery should be visually inspected for corrosion, damage and level of electrolyte. Voltage and specific gravity readings shall be taken for each cell in accordance with manufacturer's instructions and properly documented in a battery maintenance log.

8 ACCEPTANCE FOR INTERCONNECTION

8.1 Requirements for Interconnection

The Utility will notify the Developer in writing that the Developer's facility is accepted for interconnection to the Utility's system only after **ALL** of the following items have been completed:

8.1.1 Protection Design

Formal Acceptance of the Developer's proposed protection design by the Utility.

8.1.2 PE Certification

Developer has obtained a written statement from a qualified New York State licensed P.E. certifying that the facility, as constructed, is in complete accordance with all applicable codes, with a copy of the certification provided to the Utility.

8.1.3 Certificate of Inspection

Developer's facility has been inspected and certified by a Utility-approved inspection organization, with a copy of the certification provided to the Utility.

8.1.4 Utility Inspection

The Utility has inspected and accepted the Developer's protection and interconnection equipment.

8.1.5 Testing Completion

Developer has satisfactorily completed all calibration and functional tests on the protection system(s), witnessed by the Utility.

8.1.6 Safety and Operating Procedures

The Developer is familiar with the Utility's safety and operating procedures, switching and tagging procedures, etc. Copies of these procedures will be provided by the Utility, and the Developer will be required to attend a scheduled training seminar conducted by the Utility.

8.7.1 Other

All other terms of the Agreement are satisfied (i.e., insurance, etc.)

8.2 Interconnection/Synchronization of Developer's Facility

Upon receipt of the Utility's written acceptance of the Developer's facility for interconnection to the Utility system, the Developer shall provide a minimum of **two (2) weeks** prior written notice of the date that the facility will synchronize to the Utility system.

Just prior to interconnection with the Utility's system, the Developer shall verify that the rotational phase sequence of the Developer's voltage matches that of the Utility system.

Immediately after interconnection, a load test shall be performed to verify:

- The correct polarity and phasing of inputs to the directional relays under load conditions.
- The correct current and voltage magnitudes in the CT and VT secondary circuits, under load conditions.

8.3 Maintenance Requirements

The Developer's Facility Disconnect Switch, protection and control equipment, interrupting device and synchronizing and phasing equipment shall be maintained on a regular basis by qualified personnel in accordance with industry and/or manufacturer's practices. The Utility reserves the right to inspect such equipment after interconnection of the Developer's system. A maintenance schedule and log shall be maintained and made available for inspection by the Utility upon request.

8.4 Developer's System Modifications

Subsequent to the Utility's Formal Acceptance and Acceptance for Interconnection for parallel operation of the Developer's facility, the Developer shall not make any modifications or additions to its system without review and Formal Acceptance by the Utility. The Developer shall furnish the Utility with all documentation clearly indicating the modifications or additions being proposed. The Utility must review and Formally Accept these proposed modifications or additions prior to their implementation.

The Developer shall implement any fault and/or isolation protection system modifications identified by vendor defect reports, which would upgrade the interconnection protection to published vendor specifications. Upgrades involving devices that are installed solely for the protection of the Developer's equipment may be implemented at the discretion of the Developer

9 ATTACHMENTS

The following attachments are included in the Bulletin for the Developer's use and reference:

Attachment 1	List of Information Required from Developer
Attachment 2	Independent Power Producer Generator Notice (Form NB-232)
Attachment 3	New York State Standardized Application for Single Phase Attachment of Parallel Generation Equipment 25 kW or Less
Attachment 4	New York State Standardized Application for Attachment of Parallel Generation Equipment above 25 kW up to 2 MW
Attachment 5	Generator Information Sheet
Attachment 6	Exciter Information Sheet
Attachment 7	Governor Information Sheet
Attachment 8	Figure 1: Single Phase Induction Generator One Line Diagram
Attachment 9	Figure 2: Three Phase Induction Generator One Line Diagram
Attachment 10	Figure 3: Synchronous Generator One Line Diagram
Attachment 11	Figures 4.1, 4.2 & 4.3: Methods of Grounding
Attachment 12	Shielded Cable Grounding Procedures for RTU/Tone Telemetry Systems
Attachment 13	Graph 1: Flicker Limitations, Distribution Standard A80
Attachment 14	NPCC Emergency Operating Criteria Underfrequency Load Shedding Curve
Attachment 15	Checkout Forms for Generation Protection by Type Tested and Approved Equipment
Attachment 16	Checkout Forms for Independent Power Producer Generation
Attachment 17	Utility Service Territory Maps

ATTACHMENT 1

INFORMATION REQUIRED FROM THE DEVELOPER

The Developer shall furnish **ALL** of the following information required to complete the Utility's Engineering Review Process:

*1. Utility Form NB-232
2. Project Schedule
*3. Site Plan
*4. Description of Operation
*5. One-Line Electrical Diagram of Complete Facility
*6. One-Line Relay Diagram
*7. Three-Line Relay Diagram or AC Elementary Diagram
8. Generator Elementary Control Diagram
*9. Generator, Exciter & Governor Information Sheets
10. Equipment Nameplate Data and Electrical Ratings for:
    a. Prime Mover(s)
    *b. Interface/Step-up Transformer(s)
    *c. Interrupting Devices (Breakers, Contactors, etc.)
    *d. Current Transformers
    *e. Voltage Transformers
    *f. Line/Disconnect Switches
    g. Capacitor Bank(s)
    h. Battery and Charger or Source of Power Supply to Protective Relays and Interrupting Devices
    i. Surge Arresters
    j. Other (as specifically requested)
11. Proposed Relay Types and Settings for Fault and Isolation Protection Schemes
12. Telemetering Information (When Applicable)
13. Protective Relay Communications and Monitoring Systems Information
14. Method of Excitation
*15. Minimum Site Load Without Generator On-Line
16. Generator Saturation Curve
17. Exciter Saturation Curve
18. Block Diagrams
19. Temporary Construction, Start-up & Station Service Power Information
20. Application for Non-Residential Electric and/or Gas Service NYSEG Form CD942)
21. Developer's Site Environmental Information
22. Regulatory Permits and Approvals
23. Additional Information as Required by the Utility for Completion of the Technical Reviews

NOTE:

1) Items listed above with asterisks (*) are required by NYSEG and RG&E to complete the Preliminary Technical Review.
2) Additional information will be requested from the Developer when facilities are to be constructed by the Developer and transferred to the Utility upon completion.

ATTACHMENT 2

Independent Power Producer Generator Notice (Form NB-232)

NYSEG RGE Independent Power Producer Generator Notice

☐ Preliminary
☐ Final
☐ Revised

Customer Account No. _____ IPP File No. _____ Division _____

Developer Name _____

Developer Address _____

Telephone No. Primary _____ Alternate _____

Proposed Generating Facility Location _____

City/Town/Village _____ County _____ State _____ Zip _____

Service Information

Service Size _____
Utilization Voltage _____
Phase _____
Maximum Demand _____
Transformer Size _____
Line Ext. Required _____
Est. Cost to Serve _____

Electrical Location

Substation Source _____
Circuit No. _____
Line No. _____
Pole No. _____
Voltage & Phase available at nearest connecting primary

Rate

PSC# _____
SC# _____
Rate Code _____
Rev. Class _____
Spec. Prov. _____
Discount _____

Generator Information

Manufacturer _____
Type _____
Rated Output (KVA) _____
Nameplate Voltage _____
Power Factor _____
Phase _____
Disconnect Device _____
Prime Mover _____

Metering Information

	NYSEG	Developer
Type		
Volts		
Phase		
Wire		
KW		
RKVAH		

General Information

Consultant _____ Telephone _____
Electrical Contractor _____ Telephone _____
Equipment Supplier _____ Telephone _____
Date Interconnection requested _____

Accounting Information

Billing Name _____ MBJO/AE No. _____
Billing Address _____ Account No. _____
Billing Contact _____ Telephone No. _____

Remarks

Issued By _____ Date Issued _____
Project Manager - IPP Interconnections

Reorder forms from NYSEG Business Forms & Envelopes - Ithaca NB-232, 1/05

ATTACHMENT 3

NEW YORK STATE STANDARIZED APPLICATION FOR SINGLE PHASE ATTACHMENT OF PARALLEL GENERATION EQUIPMENT 25 KW OR LESS TO THE ELECTRIC SYSTEM OF

Utility:_____

Customer:

Name: _____ Phone: (___)_____

Fax: (___)_____

Email: _____

Address:_____ Municipality: _____

Utility Account Number:_____

Agent (if any):

Name: _____ Phone: (___)_____

Fax: (___)_____

Email: _____

Address:_____ Municipality: _____

Consulting Engineer or Contractor:

Name: _____ Phone: (___)_____

Address:_____

_____

Estimated In-Service Date: _____

Existing Electric Service:

Capacity: _____Amperes Voltage: _____Volts

Service Character: ( )Single Phase ( )Three Phase

Location of Protective Interface Equipment on Property:

(include address if different from customer address)

_____

Energy Producing Equipment/Inverter Information:

Manufacturer: _____

Model No. _____ Version No. _____

( )Synchronous ( )Induction ( )Inverter ( )Other_____

Rating: _____kW Rating: _____kVA

Generator Connection: ( )Delta ( )Wye ( )Wye Grounded

Interconnection Voltage: _____Volts

System Type Tested (Total System): ( )Yes ( )No; attach product literature

Equipment Type Tested (i.e. Inverter, Protection System):

( )Yes ( )No; attach product literature

Three line Diagram attached: ( )Yes

Installation Test Plan attached: ( )Yes

If applicable, Certification to UL 1741 attached: ( )Yes

Signature:

_____	_____	_____
CUSTOMER/AGENT SIGNATURE	TITLE	DATE

ATTACHMENT 4

NEW YORK STATE STANDARIZED APPLICATION FOR ATTACHMENT OF PARALLEL GENERATION EQUIPMENT ABOVE 25 KW UP TO 2 MW TO THE ELECTRIC SYSTEM OF

Utility:_____

Customer:
Name: _____ Phone: (___)_____

Fax: (___)_____

Email: _____

Address:_____ Municipality: _____

Utility Account Number:_____

Agent (if any):
Name: _____ Phone: (___)_____

Fax: (___)_____

Email: _____

Address:_____ Municipality: _____

Consulting Engineer or Contractor:
Name: _____ Phone: (___)_____

Address:_____

_____

Estimated In-Service Date: _____

Existing Electric Service:

Capacity: _____Amperes Voltage: _____Volts
Service Character: ( )Single Phase ( )Three Phase
Secondary 3 Phase Transformer Connection ( )Wye ( )Delta

Location of Protective Interface Equipment on Property:
(include address if different from customer address)

_____

Energy Producing Equipment/Inverter Information:

Manufacturer: _____
Model No. _____ Version No. _____
( )Synchronous ( )Induction ( )Inverter ( )Other_____
Rating: _____kW Rating: _____kVA
Rated Output: ____VA Rated Voltage: ____Volts
Rate Frequency: ____Hertz Rated Speed: ____RPM
Efficiency: ____% Power Factor: ____%
Rated Current: ____Amps Locked Rotor Current: ____Amps
Synchronous Speed: ____RPM Winding Connection:
Min. Operating Freq./Time:
Generator Connection: ( )Delta ( )Wye ( )Wye Grounded
System Type Tested (Total System): ( )Yes ( )No; attach product literature

Equipment Type Tested (i.e. Inverter, Protection System):
( )Yes ( )No; attach product literature
Three line Diagram attached: ( )Yes
Verification Test Plan attached: ( )Yes
If applicable, Certification to UL 1741 attached: ( )Yes

For Synchronous Machines:

Submit copies of the Saturation Curve and the Vee Curve
( )Salient ( )Non-Salient
Torque: _____lb-ft Rated RPM: _____
Field Amperes: _____ at rated generator voltage and current
and _____% PF over-excited
Type of Exciter: _____
Output Power of Exciter: _____
Type of Voltage Regulator: _____
Direct-axis Synchronous Reactance (X_d) _____ohms
Direct-axis Transient Reactance (X'_d) _____ohms
Direct-axis Sub-transient Reactance (X''_d) _____ohms

For Induction Machines:

Rotor Resistance (R_r)_____ohms Exciting Current ____Amps
Rotor Reactance (X_r)_____ohms Reactive Power Required:
Magnetizing Reactance (X_m)_____ohms ___VARs (No Load)
Stator Resistance (R_s)_____ohms ___VARs (Full Load)
Stator Reactance (X_s)_____ohms
Short Circuit Reactance (X''_d)_____ohms Phases:
Frame Size: _____ Design Letter: ____ ( )Single
Temp. Rise: _____^{O}C. ( )Three-Phase

For Inverters:

Manufacturer: _____ Model:
Type: ____ ( )Forced Commutated ( )Line Commutated
Rated Output: _____Amps _____Volts
Efficiency: _____%

Signature:

_____ _____ _____

CUSTOMER/AGENT SIGNATURE TITLE DATE

ATTACHMENT 5
Generator Information Sheet

GENERATOR INFORMATION

DATE _____ DEVELOPER _____
PROJECT NAME _____

UNIT NO.	_____	KVA	_____	Power Factor	_____
MANUFACTURER	_____	KW	_____	VOLTAGE	_____
UNIT SERIAL NO.	_____	Hp	_____	CURRENT	_____
WINDING CONNECTION	_____	FREQUENCY	_____	No. of Phases	_____
DAMPER (Amortisseur)	_____	R.P.M.	_____	Neutral Grounded?	_____
WINDING?	_____	GROUNDING RESISTANCE IN OHMS			_____

GENERATOR MODEL TYPE: (Select One)
ROUND ROTOR, ROUND ROTOR WITH DC OFFSET TORQUE COMPONENT, SALIENT POLE, TRANSIENT LEVEL, INDUCTION, CLASSICAL, OTHER (please specify) _____

IF INDUCTION GENERATOR:

EFFICIENCY	_____%	EXCITING CURRENT	_____Amp
LOCKED ROTOR CURRENT	_____Amp	REACTIVE POWER REQUIRED:	
SYNCHRONOUS SPEED	_____RPM	a)	_____KVAR @ No Load
MAGNETIZING INRUSH CURRENT IF ENERGIZED AT SYNCHRONOUS SPEED	_____Amp	b)	_____KVAR @ Rated Load
ROTOR RESISTANCE (Rr)	_____*	FREQUENCY OF EXPECTED STARTS:	
ROTOR REACTANCE (Xr)	_____*	_____	Per Day
MAGNETIZING REACTANCE (Xm)	_____*	_____	Per Hour
STATOR RESISTANCE (Rs)	_____*	T'	_____ sec.
STATOR REACTANCE (Xr)	_____*	T"	_____ sec.
		X'	_____ *
		X"	_____ *

IF SYNCHRONOUS GENERATOR:

X_d (SYNCHRONOUS)	_____*	T'_d (SHORT CIRCUIT, Transient)	_____
X'_d (TRANSIENT)	_____*	T''_d (SHORT CIRCUIT, Subtransient)	_____
X''_d (SUBTRANSIENT)	_____*	T'_{do} (OPEN CIRCUIT, Transient)	_____
X_2 (NEGATIVE-SEQUENCE)	_____*	T''_{do} (OPEN CIRCUIT, Subtransient)	_____
X_0 (ZERO-SEQUENCE)	_____*	T'_{qo} (OPEN CIRCUIT, Transient)	_____
X_q (SYNCHRONOUS)	_____*	T''_{qo} (OPEN CIRCUIT, Subtransient)	_____
X'_q (TRANSIENT)	_____*	T_a (WITH FIELD SHORTED)	_____
X''_q (SUBTRANSIENT)	_____*		
X (LEAKAGE)	_____*		

INERTIA H	_____*	MAXIMUM NUMBER OF UNITS ON BUS	____
SPEED DAMPING D	_____*	MINIMUM NUMBER OF UNITS ON BUS	____
ACCELERATION FACTOR	_____	AVERAGE NUMBER OF UNITS ON BUS	____

GENERATOR WR^2 IN POUND-FEET SQUARED	_____
FLYWHEEL WR^2 IN POUND-FEET SQUARED	_____
PRIME MOVER WR^2 IN POUND-FEET SQUARED	_____
TOTAL WR^2 IN POUND-FEET SQUARED	_____

* VALUES ARE IN p.u., MACHINE KVA BASE

ATTACHMENT 6
Exciter Information Sheet

EXCITER INFORMATION

DATE _____ DEVELOPER _____
PROJECT NAME _____

UNIT NO. _____
MANUFACTURER _____
REGULATOR TYPE _____
MINIMUM DESIGN RESPONSE RATIO _____
E_{FD} NOMINAL FIELD VOLTAGE _____ VDC

EXCITATION SYSTEM MODEL: (Select One)

1981 IEEE TYPE AC1 ____	1981 IEEE TYPE ST2 ____	Modified 1968 TYPE 1 ____
Modified TYPE AC1 ____	Modified 1981 TYPE ST2 ____	Modified 1968 TYPE 4 ____
1981 IEEE TYPE AC2 ____	1981 IEEE TYPE ST3 ____	1968 IEEE TYPE 1S ____
1981 IEEE TYPE AC3 ____	1968 IEEE TYPE 1 ____	1979 IEEE TYPE 2 ____
1981 IEEE TYPE AC4 ____	1968 IEEE TYPE 2 ____	1979 IEEE TYPE 2A ____
1981 IEEE TYPE DC2 ____	1968 IEEE TYPE 3 ____	1979 IEEE TYPE 3 ____
1981 IEEE TYPE ST1 ____	1968 IEEE TYPE 4 ____	

1979 IEEE TYPE 1 AND 1981 IEEE TYPE DC1 _____
1979 IEEE TYPE 4 AND 1981 IEEE TYPE DC3 _____
BUS OR SOLID FED SCR BRIDGE _____
SIMPLIFIED EXCITATION SYSTEM MODEL _____
OTHER (please specify) _____

GAIN CONSTANTS AND FACTORS:

X_A	REGULATOR GAIN	_____
X_B	GAIN	_____
X_L	EXCITER FIELD CURRENT LIMIT GAIN	_____
X_C	RECTIFIER LOADING FACTOR	_____
X_D	DEMAGNETIZATION FACTOR	_____
X_E	SELF-EXCITED FIELD CONSTANT	_____
X_F	EXCITER FIELD CURRENT RATE COMPENSATION	_____
X_H	EXCITER FIELD CURRENT COMPENSATION	_____

TIME CONSTANTS:

T_A	REGULATOR	_____ sec.
T_D	REGULATOR LAG	_____ sec.
T_C	REGULATOR LEAD	_____ sec.
T_E	EXCITER	_____ sec.
T_F	STABILIZING	_____ sec.
T_R	REGULATOR INPUT FILTER	_____ sec.

VOLTAGE CONSTANTS AND SATURATION FACTORS:

V_{LR}	EXCITER FIELD CURRENT LIMIT VOLTAGE	_____ p.u.
V_{RMAX}	MAXIMUM INTERNAL REGUALTOR OUTPUT VOLTAGE	_____ p.u.
V_{RMIN}	MINIMUM INTERNAL REGULATOR OUTPUT VOLTAGE	_____ p.u.
$E_{FD}max$	VOLTAGE AT SATURATION POINT	_____ p.u.
$S(E_{FX}max)$	SATURATION FACTOR AT SATURATION POINT	_____ p.u.
$E_{FD}(0.75)$	VOLTAGE AT 0.75 OF SATURATION POINT	_____ p.u.
$S(0.75\ E_{FD}max)$	SATURATION FACTOR AT 0.75 OF SATURATION POINT	_____ p.u.

ATTACHMENT 7
GOVERNOR INFORMATION SHEET

GOVERNOR INFORMATION

DATE _____ DEVELOPER _____
PROJECT NAME _____

UNIT NO. _____
MANUFACTURER _____

TURBINE GOVERNOR MODEL TYPE: (Select One)
GAS _____ STEAM _____
HYDRO _____ 1973 IEEE STANDARD _____
OTHER (please specify): _____

GAS TURBINE GOVERNOR:
W (Governor gain, 1/Droop) _____
Z (Governor mode, 1-Droop, D-ISO) _____
T_{RATE} (Turbine Rating) _____ MW
MAX (Limit) _____ p.u.
MIN (Limit) _____ p.u.
K_3 _____
a (valve positions) _____
c (valve positions) _____
K_f _____
K_5 _____
a_{f1} _____
b_{f1} _____
a_{f2} _____
b_{f2} _____
c_{f2} _____
X (Governor Time Constant) _____ sec.
Y (Governor Time Constant) _____ sec.
E_{TD} _____ sec.
T_{CD} _____ sec.
t _____ sec.
E_{CR} _____ sec.
b (valve positions) _____ sec.
τ_f _____ sec.
T_3 _____ sec.
T_4 _____ sec.
τ_t _____ sec.
T_5 _____ sec.
T_R (Rated Temperature) _____ °F
K_6 (Minimum fuel flow) _____ p.u.

HYDRO TURBINE GOVERNOR:
R (Permanent droop) _____
r (Temporary droop) _____
T_r (Governor time constant) _____
T_f (Filter time constant) _____
T_s (Servo time constant) _____
±VELM (Gate velocity limit) _____
G_{MAX} (Maximum gate limit) _____
G_{MIN} (Minimum gate limit) _____
T_W (Water time constant) _____
A_t (Turbine gain) _____
D_{TURB} (Turbine damping) _____
q_{NL} (No-load flow) _____

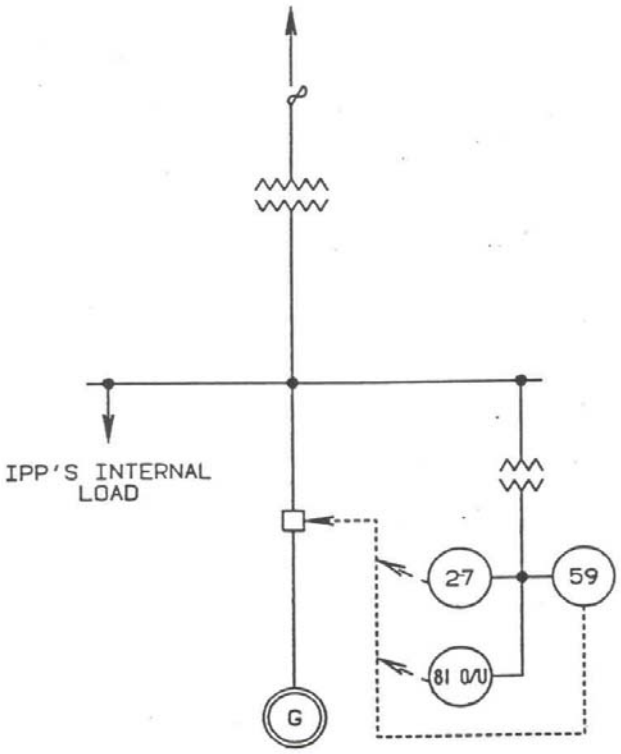
STEAM TURBINE GOVERNOR:
R _____
V_{MAX} _____ *
V_{MIN} _____ *
D_t _____ *
T_1 _____ sec.
T_2 _____ sec.
T_3 _____ sec.

*Values are in p.u. on generator base

1973 IEEE STANDARD TURBINE GOVERNOR:
T_1 (Controller lag) _____ sec.
T_2 (Controller lead compensation) _____ sec.
T_3 (Governor lag) _____ sec.
T_4 (Delay due to steam inlet volumes) _____ sec.
T_5 (Reheater delay) _____ sec.
T_6 (Delay due to IP-LP turbine, cross-over pipes and LP end hoods) _____ sec.
K_1 _____ 1/p.u. regulation
K_2 _____
K_3 _____
P_{MAX} (Upper power limit) _____
P_{MIN} (Lower power limit) _____

ATTACHMENT 8
Typical Single Phase Induction Generator One-Line Diagram

FIGURE 1
SINGLE - PHASE INDUCTION GENERATOR

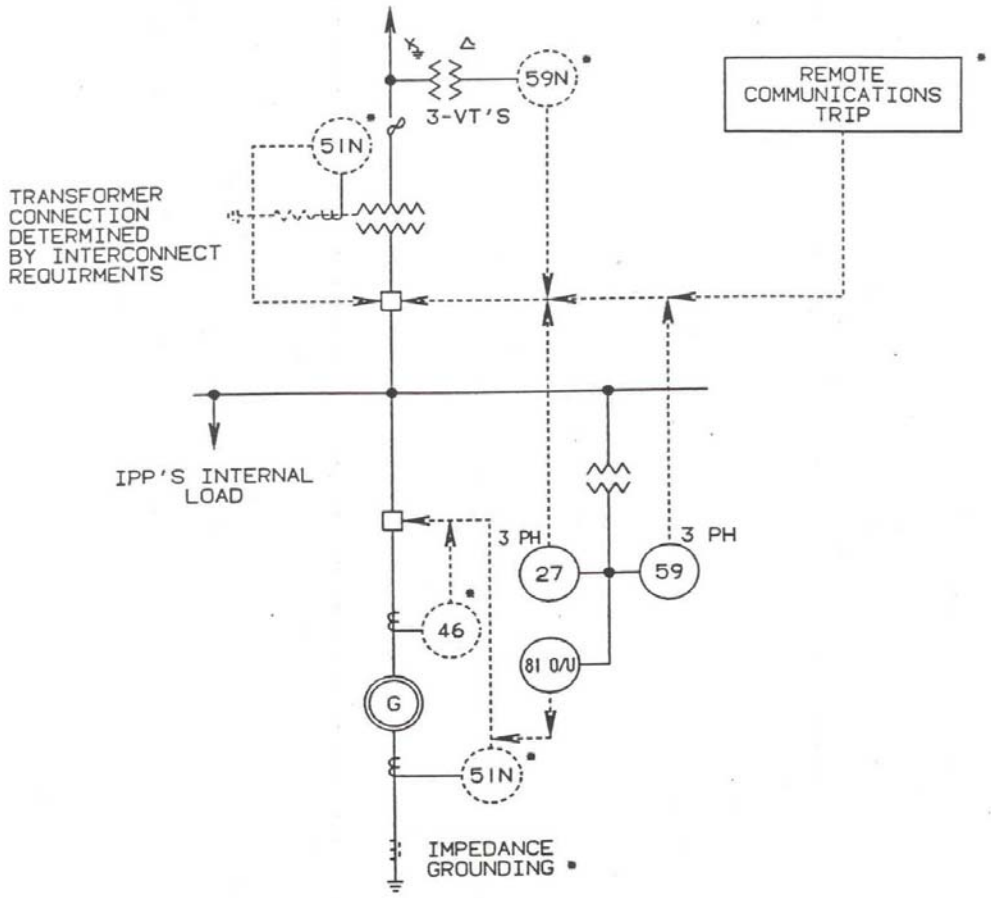


DEVICE	FUNCTION	PROTECTION
81 O/U	OVER/UNDER FREQUENCY	ISOLATION
27	UNDERVOLTAGE	FAULT AND ISOLATION
59	OVERVOLTAGE	ISOLATION

ATTACHMENT 9
Typical Three Phase Induction Generator One-Line Diagram

FIGURE 2

THREE - PHASE INDUCTION GENERATOR

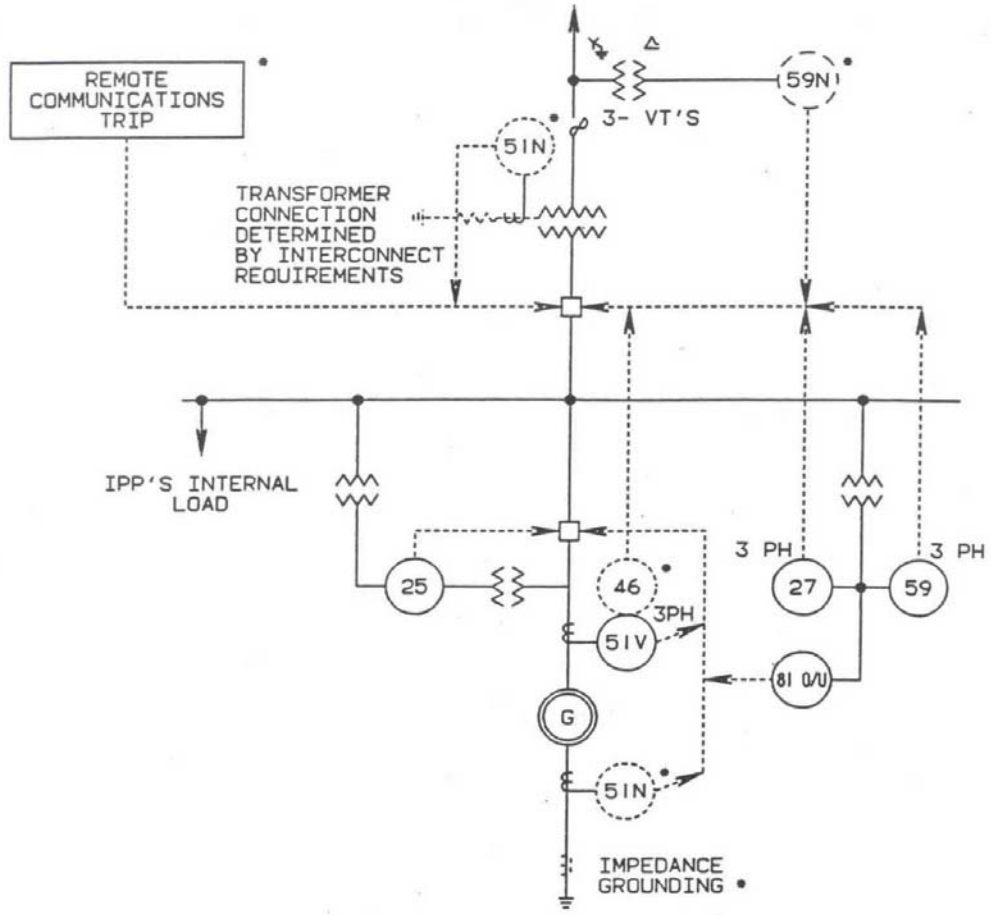


DEVICE	FUNCTION	PROTECTION
81 O/U	OVER/UNDER FREQUENCY	ISOLATION
27	UNDERVOLTAGE (3-PHASE)	ISOLATION AND FAULT
51N•	GROUND TIME-OVERCURRENT	PHASE-TO-GROUND FAULT AND OPEN CONDUCTOR
59	OVERVOLTAGE (3-PHASE)	ISOLATION
59N•	ZERO-SEQUENCE VOLTAGE	PHASE-TO-GROUND FAULT AND OPEN CONDUCTOR
46•	NEGATIVE SEQUENCE	OPEN CONDUCTOR

•NOTE: ADDITIONAL PROTECTION/EQUIPMENT THAT MAY BE REQUIRED, DEPENDING ON SPECIFICS OF INTERCONNECTION.

ATTACHMENT 10
Typical Synchronous Generator One-Line Diagram

FIGURE 3
SYNCHRONOUS GENERATOR



DEVICE	FUNCTION	PROTECTION
81 O/U	OVER/UNDER FREQUENCY	ISOLATION
27	UNDERVOLTAGE (3-PHASE)	ISOLATION
51V	PHASE TIME-OVERCURRENT W/VOLTAGE RESTAINT	3-PHASE AND PHASE-TO-PHASE FAULT
51N	GROUND TIME-OVERCURRENT	GROUND FAULT AND OPEN CONDUCTOR
25	SYNCHRONIZING	OUT-OF-SYNC CLOSE
59	OVERVOLTAGE (3-PHASE)	ISOLATION
59N•	ZERO-SEQUENCE VOLTAGE	GROUND FAULT AND OPEN CONDUCTOR
46•	NEGATIVE SEQUENCE	OPEN CONDUCTOR

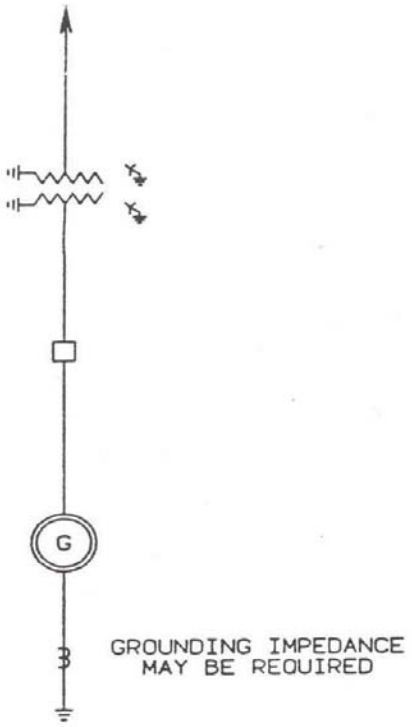
•NOTE: ADDITIONAL PROTECTION/EQUIPMENT THAT MAY BE REQUIRED, DEPENDING ON SPECIFICS OF INTERCONNECTION.

ATTACHMENT 11

Methods Of Providing Ground Sources

FIGURE 4.1

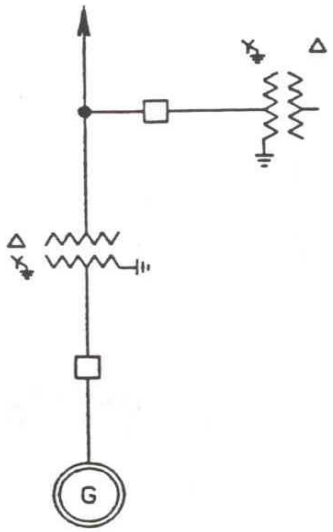
METHODS OF PROVIDING GROUND SOURCES



WYE-GROUNDED, WYE-GROUNDED STEP-UP TRANSFORMER
GENERATOR CONNECTED WYE-GROUNDED
(PREFERRED)

FIGURE 4.2

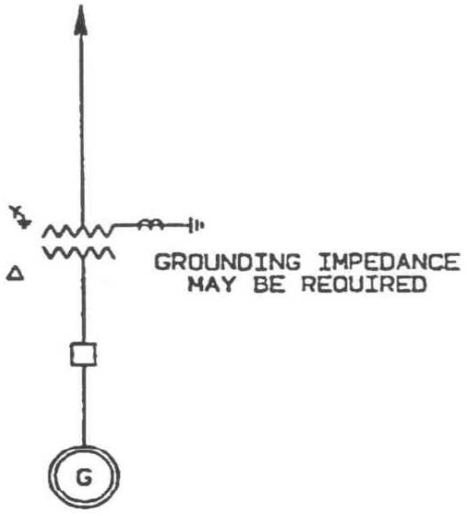
METHODS OF PROVIDING GROUND SOURCES



GROUNDING TRANSFORMER
WYE-GROUNDED/DELTA (SHOWN), OR ZIG-ZAG

FIGURE 4.3

METHODS OF PROVIDING GROUND SOURCES



WYE-GROUNDED, DELTA STEP-UP TRANSFORMER

ATTACHMENT 12

SHIELDED CABLE GROUNDING PROCEDURES FOR RTU/TONE TELEMETRY SYSTEMS

PURPOSE:

1. To prevent induced noise from causing telemetering inaccuracies.
2. To prevent shielded cable ground loops caused by improper installation. (Usually due to both ends of cable being grounded.)
3. To insure compliance with vendor specifications.

A. Shielding Practices for:

TRW - 9550 Remote Terminal Unit (RTU)
QEI - 3150 Remote Terminal Unit
QEI - 4150 Remote Terminal Unit
QEI - 4050 Remote Terminal Unit
QEI - STN 9150 Remote Terminal Unit
RFL - 9800 – 6700 Series Tone Telemetry

1. Insulate and secure the shielded cable ground wire at the RTU/Tone Equipment so that it does not touch other shields, earth ground, chassis ground, power supply references, etc. (See I-E above for example.

2. The source end of the shielded cable (usually at the transducer on a switchboard panel) should have the ground wire for the shields terminated to earth ground. The earth ground should be securely bonded to the station ground grid to dissipate induced noise.

B. General Practices for Installing Shielded Cable:

1. The signal wire pairs should remain twisted as close to the RTU/Tone Equipment and transducer termination as possible to help cancel the affects of induced noise.

2. The RTU/Tone Equipment and the transducer panels must be securely bonded to the station ground grid.

3. If the shielded cable path between the RTU/Tone Equipment and the transducer is not continuous (i.e. a demarcation panel is used for all RTU/Tone Equipment wiring) it is important to maintain continuity of the shield ground between the RTU/Tone Equipment and the transducer and not inject a new ground source at the cable junction.

   At this point where the two shielded cables meet between the RTU/Tone Equipment and transducer, dress each cable end as shown in item 1 above. Ensure that the shielded cable ground wires do not touch each other, earth ground

or chassis ground. Terminate the twisted signal wires and associated shielded ground wire from the RTU/Tone Equipment on three termination points and connect the matching twisted signal wires and associated shielded ground wire from the transducer to the same termination points. This process will insure continuity of the signal and shielded ground between the RTU/Tone Equipment and the source.

4. If a new device or unique situation is being installed where grounding practices are unclear, contact NYSEG/RGE IPP/NUG Coordinator so that procedures may be reviewed.

INSTALLING SHIELDED CABLE FOR TRANSDUCERS
(Single or Multiple Pairs)

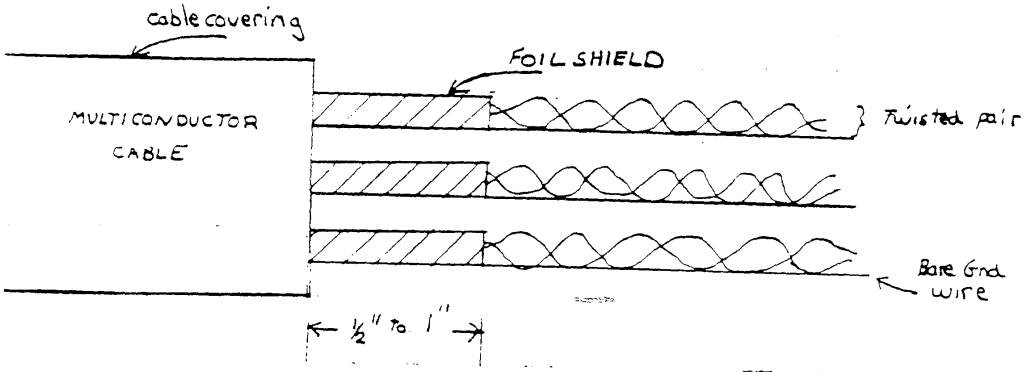
ATTACHMENT 11

I. INSTALLING SHIELDED CABLE FOR TRANSDUCERS
(single or multiple pairs)

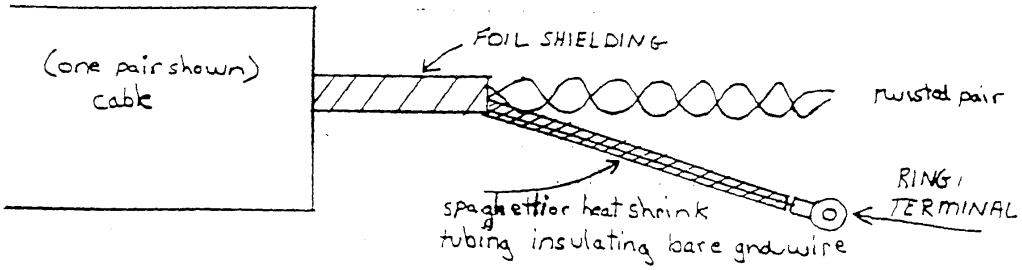
PURPOSE: 1. Keep all Foil Shielding insulated from each other.

2. Keep bare ground wire insulated from other foils, other ground wires and earth ground.

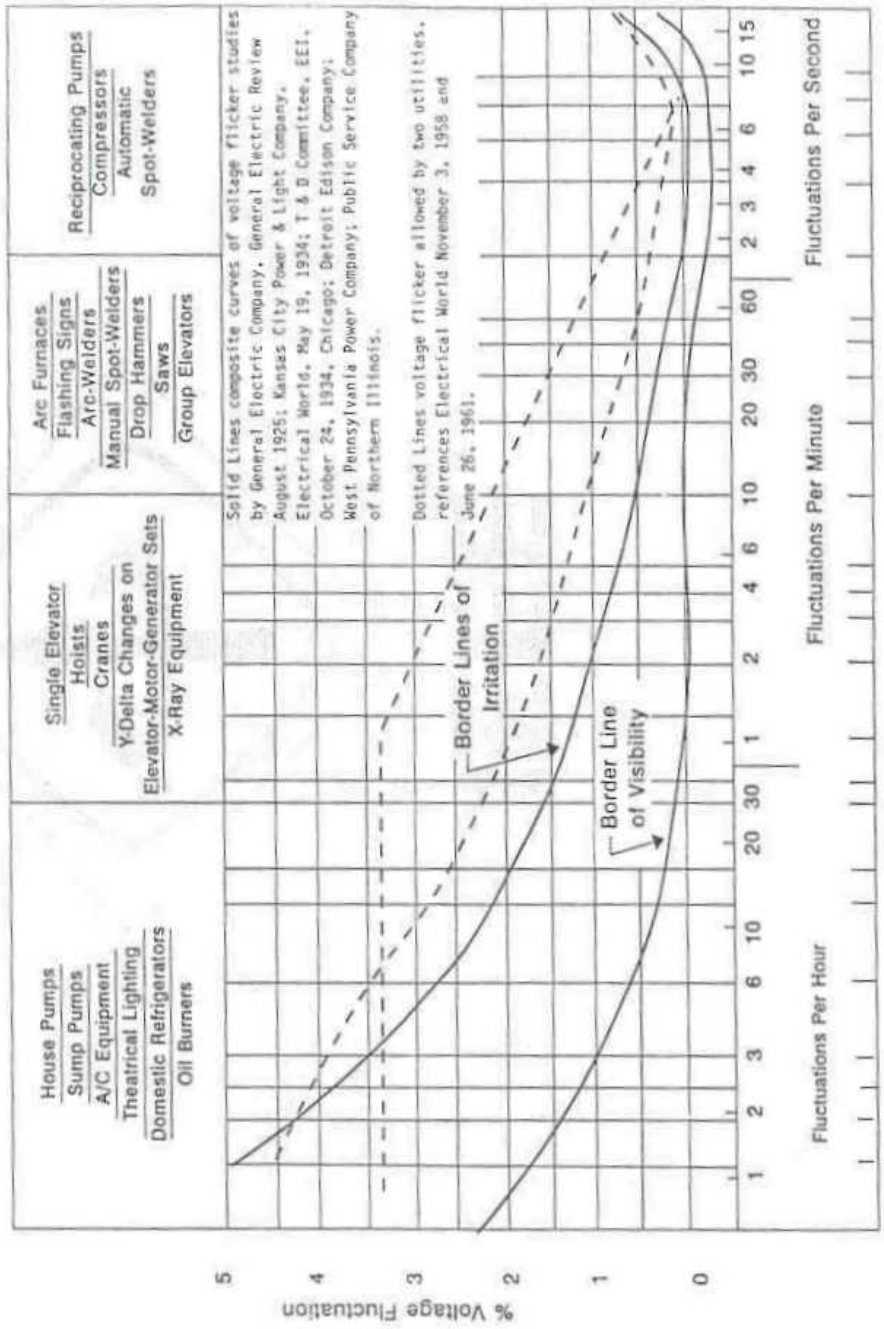
A. Typical shielded cable stripped back for installation.



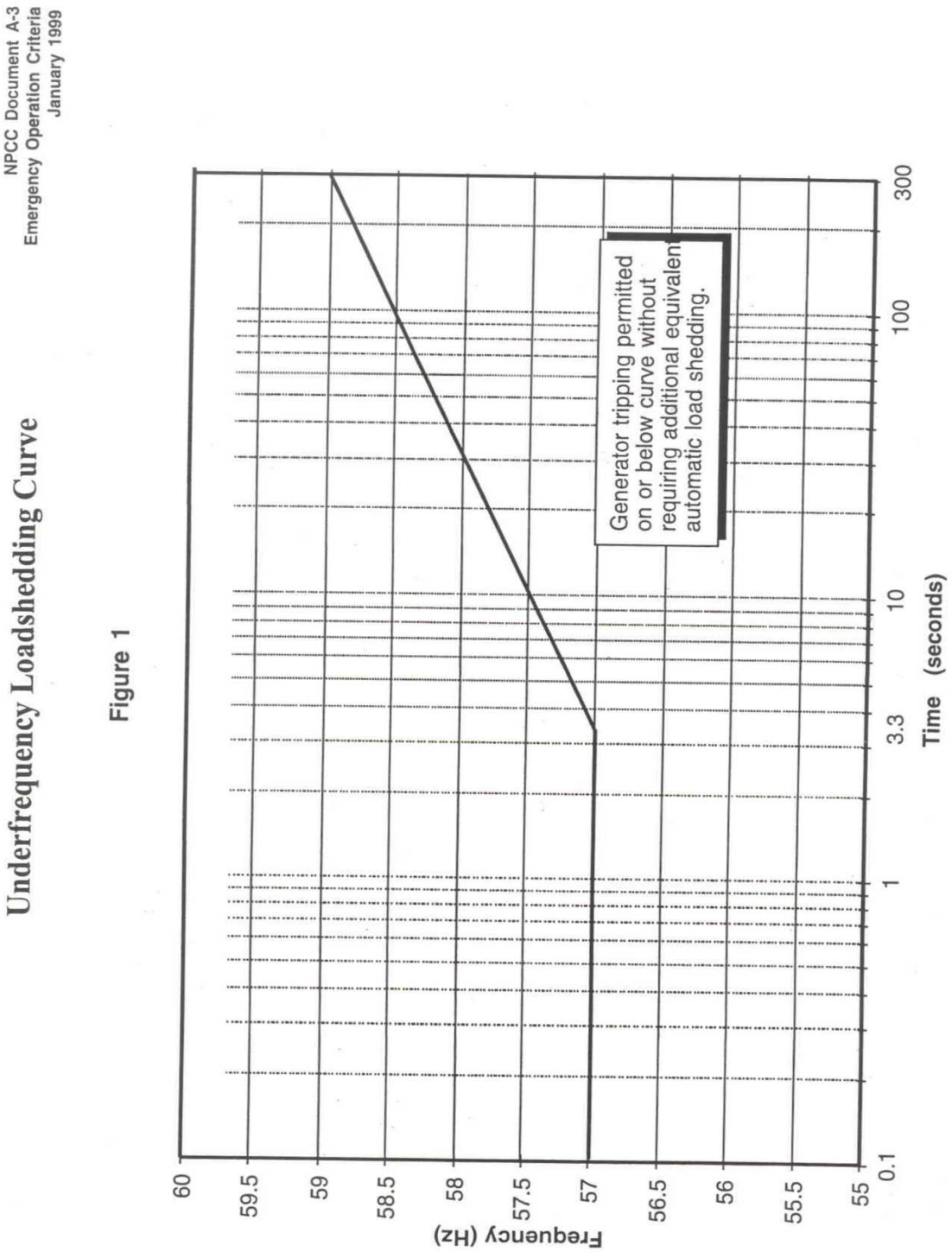
B. Apply insulation to each bare ground wire. Use ring type connector for terminating wire.



ATTACHMENT 13
Graph 1 - Flicker Limitations



ATTACHMENT 14
Underfrequency Load Shedding Curve



ATTACHMENT 15
Checkout Form For Generation Protected
By Type Tested And Approved Equipment

The customer is requested to submit the purposed equipment onto the standard utility field checkout form, to expedite the utility review and keep reimbursable costs and attendant schedule delays to minimum.

Division	
Local Utility Substation	
Project Name	
Address	
Phone	

		Satisfactorily Performed As Required? (√)	**Comments**
1.	SP&C Inspection Form		
2.	Functional Test		
3.	Load Break Disconnect Switch Operable and Lockable by Utility Personnel		
3a.	Switch Operating Mechanism and Mounting Structure Grounded		

Verified By:		**Review By:**		**Accepted By:**	
Date:		**Date:**		**Date:**	

Revision #:
Date:
By:

INSPECTION FORM

Verify that the following data is consistent with equipment installed by the Developer by a checkmark, otherwise supply correct data.

NOTE: N/A means not applicable.

Verification of Developer's Equipment Nameplate Data and Location

1. Generator(s)/Prime Mover(s)

Number of Units	

Generator Data	Unit #1	√	Unit #2	√	Unit #3	√	Comments
Type of Generator							
Manufacturer							
Firmware Version No.							
Rated Output (kVA)							
Rated Output (kW)							
Rated Voltage							
Rated Current							
Rated Frequency (Hz)							
Rated Speed (RPM)							
Power Factor (%)							
Phase (1 or 3)							
Connection							
Type of Grounding							

Grounding Ohms							

Prime Mover

	Unit #1	√	Unit #2	√	Unit #3	√	Comments
Type of Prime Mover							
Rated Output (HP)							
Rated Speed (RPM)							

PV Array (If Applicable)

	Unit #1	√	Unit #2	√	Unit #3	√	Comments
Type of Panels							
Rated Output (kVA)							
No. of Panels							

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INSPECTION FORM (continued)

2. Transformer(s)

	Interface (GSU)	√	Comments
Owner			
Manufacturer			
Rated kVA			
Rated Primary Voltage			
Rated Secondary Voltage			
Connection – Primary			
Connection – Secondary			
Phase			
% Impedance			
Primary Fuse			
No. of Transformers			
Type of Grounding			
Grounding Ohms			
Location – See One Line			

3. Capacitor Bank

		√	Comments
Rated kVAR			
Phase			
Connection			

Location – See One Line			

4. Fault Interrupting Device(s)

	Main	√	Unit #1	√	Unit #2	√	Unit #3	√	Comments
Manufacturer									
Type									
Rated Voltage									
Rated Current									
Interrupting Current									
Operating Time									
Location – See One Line									

5. Disconnecting Switch

		√	Comments
Owner			
Manufacturer			
Type			
Rated Horsepower			
Rated Voltage			
Interrupting Current			
Location – See One Line			

INSPECTION FORM (continued)

6. Fault and Isolation Protection – (For Reference Only – Do Not Check)

Isolation Protection

		√		√		√		√	Comments
Function	27	√	59	√	81U		81O	√	
Trip Interrupt. Dev.	Bkr.	√	Bkr.	√	Bkr.	√	Bkr.	√	
Manufacturer									
Type									
VT/CT Ratio	-		-		-		-		
Tap (Pick-up)	106 V	√	132 V	√	59.3 Hz	√	60.5 Hz	√	
Time Dial	2 sec.	√	2 sec.	√	0.1 sec.	√	0.1 sec.	√	
Set Point	2 sec @ 106 V, 0.1 sec @ 60 V	√	2 sec@ 132 V, 2 cyc@ 165 V	√	0.1 sec @ 59.3 Hz	√	0.1 sec @ 60.5 Hz	√	
Location – See One Line									

7. Metering

Metering Option	**Single**		**Bi-directional**		**Double**	

ATTACHMENT 16
Checkout Form For Independent Power Producer Generation

Division	
Local Utility Substation	
Project Name	
Address	
Phone	

		Satisfactorily Performed As Required? (√)	**Comments**
1.	**SP&C Inspection Form**		
2a.	**Current Transformer Test**		
2b.	**Voltage Transformer Test**		
2c.	**Calibration Test**		
2d.	**Functional Test**		
2e.	**Load Test**		
3.	**Load Break Disconnect Switch Operable and Lockable by Utility Personnel**		
3a.	**Switch Operating Mechanism and Mounting Structure Grounded**		

Verified By:		**Review By:**		**Accepted By:**	
Date:		**Date:**		**Date:**	

CHECKOUT FORM FOR INDEPENDENT POWER PRODUCER GENERATION

Checkout forms for independent power producer generation facilitates, the completion of the review and acceptance of the Developer's generator interconnection. The checkout forms are divided into two parts: The "Inspection Form" and the "Requirements For Initial and Periodic Test."

PART 1

The Inspection Form serves as a vehicle for verifying that the Developer's installed equipment agrees with the design described in the documentation supplied by the Developer and accepted by the Utility. Indicated on the equipment forms is the equipment that the Utility expects the Developer to have installed. During the initial checkout (prior to synchronization with the Utility system), Utility personnel will verify that the information supplied on the Form is consistent with the equipment installed by the Developer.

PART 2

The Requirements For Initial and Periodic Test as designed to verify that the protection scheme operates as designed. The Utility has indicated several tests that are to be performed and documented by the Developer or his agent and witnessed by Utility division personnel.

When the Inspection Form has been satisfactorily completed and the proper tests have been witnessed and documented, the initial checkout is concluded. Final acceptance will

be pending satisfactory review of the checkout forms by the Utility Engineering Department Verify that the following data is consistent wit equipment installed by the Developer by a checkmark; otherwise supply correct data.

NOTE: N/A means not applicable.

Verification of Developer's Equipment Nameplate Data and Location

1. Generator(s)/Prime Mover(s)

Number of Units	

Generator Data (Sync & Ind.)	Unit #1	√	Unit #2	√	Unit #3	√	Comments
Type of Generator							
Manufacturer							
Firmware Version No.							
Rated Output (kVA)							
Rated Output (kW)							
Rated Voltage							
Rated Current							
Rated Frequency (Hz)							
Rated Speed (RPM)							
Power Factor (%)							
Phase (1 or 3)							
Connection							

Type of Grounding							
Grounding Ohms							

Prime Mover

	Unit #1	**√**	**Unit #2**	**√**	**Unit #3**	**√**	**Comments**
Type of Prime Mover							
Rated Output (HP)							
Rated Speed (RPM)							

Induction Only

	Unit #1	**√**	**Unit #2**	**√**	**Unit #3**	**√**	**Comments**
Locked Rotor Current							
Synch. Speed (RPM)							
Efficiency (%)							

(Remainder of page intentionally left blank.)

INSPECTION FORM (continued)

2. Transformer(s)

	Interface (GSU)	√	Ground Bank	√	Comments
Owner					
Manufacturer					
Rated kVA					
Rated Primary Voltage					
Rated Secondary Voltage					
Connection – Primary					
Connection – Secondary					
Phase					
% Impedance					
Primary Fuse					
No. of Transformers					
Type of Grounding					
Grounding Ohms					
Location – See One Line					

3. Capacitor Bank

		√	Comments
Rated kVAR			
Phase			
Connection			

Location – See One Line			

4. Fault Interrupting Device(s)

	Main	√	Unit #1	√	Unit #2	√	Unit #3	√	Comments
Manufacturer									
Type									
Rated Voltage									
Rated Current									
Interrupting Current									
Operating Time									
Location – See One Line									

5. Disconnecting Switch

		√	Comments
Owner			
Manufacturer			
Type			
Rated Horsepower			
Rated Voltage			
Interrupting Current			
Location – See One Line			

INSPECTION FORM (continued)

6. Current Transformer(s)

For:		√		√		√		√	Comments
Manufacturer									
Type									
Accuracy Class									
Ratio – Prim/Sec									
Connection									
Location – See One Line									

7. Voltage Transformer(s)

For:		√		√		√		√	Comments
Manufacturer									
Type									
Accuracy Class									
Primary Voltage									
Secondary Voltage									
Connection – Prim/Sec									
Thermal Rating (VA)									
Location – See One Line									

8. Protective Relays

Fault Protection

		√		√		√		√	Comments
Function									
Trip Interrupt. Dev.									
Manufacturer									
Type									
VT/CT Ratio									
Tap (Pick-up)									
Time Dial									
Set Point									
Location – See One Line									

		√		√		√		√	Comments
Function									
Trip Interrupt. Dev.									
Manufacturer									
Type									
VT/CT Ratio									
Tap (Pick-up)									
Time Dial									
Set Point									
Location – See One Line									

8. Protective Relays (continued)

		√		√		√		√	Comments
Function									
Trip Interrupt. Dev.									
Manufacturer									
Type									
VT/CT Ratio									
Tap (Pick-up)									
Time Dial									
Set Point									
Location – See One Line									

9. Telemetering and Status Indication

		√		√		√		√	Comments
Function									
Manufacturer									
Type									
VT/CT Ratio									
Input Rage									
Output Range									
Scaling Resistor									

10. Battery and Charger

	Battery	√	Charger	√	Comments
Manufacturer					
Type					
Voltage Rating					
Ampere-Hour/Ampere Rating					

11. Surge Arresters

		√		√		√		√	Comments
Location									
Manufacturer									
Catalog Number									
MCOV Rating									

12. Miscellaneous Equipment

		√		√		√		√	Comments

Utility's Initial And Periodic Test Requirements For Independent Power Producer Generation Facilities

I. Interconnection of the Developer's equipment with the Utility system is contingent upon the successful completion of current and voltage transformer tests, as well as calibration and functional tests of the fault and isolation protection systems. The Developer must have these tests performed under the direction of a qualified New York State licensed Professional Engineer ("PE"), using test equipment appropriate for the various relays and equipment being tested and in accordance with typical utility industry practices. The Utility will witness all initial tests of the Developer's protection system. The Utility reserves the right to witness all periodic tests of the Developer's protection system in lieu of PE certified tests. The Utility requires two (2) weeks notice prior to witnessing initial or periodic tests. The following tests and maintenance shall be completed by the Developer.

A. Current Transformer Test:

Field-verify that the CT ratio and polarity are correct. (Most easily accomplished during assembly). Verify the integrity of the CT insulation and secondary circuit using a 500 volt megger, and check for proper secondary ground connection.

B. Voltage Transformer Test:

Field-verify that the VT ratio is correct. Verify that correct voltages are present at the switchboard locations. Verify the integrity of the VT insulation and secondary circuit using a 500 volt megger, and check for proper ground connection.

C. Calibration Test:

The purpose of relay testing is to verify that a relay will respond to the appropriate inputs in the required manner as determined by the setting. The actual input quantities must be applied to the relay in accordance with the manufacturer's instruction book. The input quantities shall be determined by the relay settings. The settings must be consistent with those submitted by the Developer and accepted by the Utility. When testing relays with time dials, sufficient test points must be taken to define the relay curve. The calibration data shall be documented in a legible format and contain all pertinent relay data. (Utility test forms may be used and are available upon request.)

D. Functional Test:

A protective relay cannot function by itself. It is reliant upon other equipment such as instrument transformers, auxiliary relays, circuit breakers, interconnecting cables, and control power to perform its protective function. The purpose of functional testing is to verify that the overall operation of the relay and its associated equipment is in

accordance with its intended design. Therefore, it is beneficial for the Developer to develop specific test procedures with well-defined parameters for use during testing.

The functional tests must, at a minimum:

- Verify that end devices from each protective scheme operate from every possible source of trip potential (including, if applicable, confirmation that the communications system operates the transfer trip end devices).

- Verify that the end device contacts complete the trip circuit to the breaker, actually trip the breaker, and operate all associated auxiliary relays in the close and trip circuit.

- Check for correct operation of synchronism check relay, block of close, and block or reclose.

- AC Control Circuit – Verify circuit breaker trips upon loss of AC control power.

- DC Control Circuit – Verify correct operation of DC control devices in the absence of AC supply. Battery system shall be checked for proper recovery time after a circuit breaker has been operated.

E. Battery Maintenance:

Battery systems must be serviced and maintained on a regular basis by the Developer. Each battery should be visually inspected for corrosion, damage, and level of electrolyte. Voltage and specific gravity readings shall be taken for each cell in accordance with manufacturer's instructions and properly documented in a battery maintenance log.

II. Just prior to interconnection with the Utility system, the Developer shall verify that the rotational phase sequence of the Developer's voltage matches that of the Utility system:

III. Immediately after interconnection, a load test shall be performed to verify:

A. The correct polarity and phasing of inputs to the directional relays under load conditions.

B. The correct current and voltage magnitudes in the CT and VT secondary circuits, under load conditions.