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NEW YORK STATE STANDARDIZED INTERCONNECTION REQUIREMENTS

Section 1 – Application Process

Section 2 – Contract

Section 3 – Application Forms

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New York State
Standardized Interconnection Requirements and Application Process for New Distributed Generators 300 kVA or Less, or Farm Waste Generators 400 kW or less, Connected in Parallel with Radial Distribution Lines

New York State
Public Service Commission
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I. Application Process

Application Process for the Interconnection of New Distributed Generation Units of 300 kVA or Less, or Farm Waste Generators 400 kW or less, Connected to Radial Distribution Lines

A. Introduction

This section provides a framework for processing applications to:

- interconnect new distributed generation facilities with a nameplate rating of 300 kVA or less, or Farm Waste Generators 400 kW or less, [aggregated on the customer side of the point of common coupling[1](PCC)] connected in parallel to radial distribution feeders.[2]

- review any modifications affecting the interface at the PCC to existing distributed generation facilities with a nameplate rating of 300 kVA or less, or Farm Waste Generators of 400 kW or less, (aggregated on the customer side of the PCC) that have been interconnected to the utility radial 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 that have been satisfactorily type-tested[3] 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 type-tested systems, 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,

[1] See Section III: Glossary of Terms for definition.
[2] Ibid.
[3] Ibid.

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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.

Staff of the Department of Public Service (Staff) will monitor the application process to ensure that applications are addressed in a timely manner. To perform this monitoring function, Staff will meet periodically with utility and applicant representatives.

B. 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 project 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 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 and, for systems with a contractual total aggregate nameplate rating exceeding 15 kVA, 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[4] 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 five business days.

For systems of 15 kVA or less, no costs may be charged by the utility to the applicant for completion of the Preliminary Review or the CESIR.

STEP 5: Customer-Generator 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 upon request from the utility.

[4] See Section III: Glossary of Terms for definition.

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

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 kVA on a single-phase branch of a radial distribution circuit; or 150 kVA on a single distribution feeder.

The CESIR shall be completed within 4 weeks (20 business days) of receipt of the information set forth in Step 5 for systems of 15 kVA or less and within 8 weeks (40 business days) for systems larger than 15 kVA. 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 applicant, in writing, the following:

(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) Except for net metering customer-generators, a good faith, detailed estimate of the total cost of completion of the interconnection of the proposed system. Such estimate will include, but not be limited to, the costs associated with any required modifications to the utility system, administration, metering, and on-site verification testing. For net metering customer-generators, the estimate shall be limited to the cost of installing a dedicated transformer.

Photovoltaic, net meter, residential applicants[5] are only responsible for the costs of a dedicated transformer,[6] if applicable, up to a maximum expense of $350. Farm Waste, net meter, farm applicants are only responsible for the costs of a dedicated transformer,[7] if applicable, up to a maximum expense of $3,000.

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

The applicant will:

- execute a standardized contract for interconnection; and
- provide the utility with an advance payment for the utility's estimated costs as identified in STEP 6, except for net metering customer-generators. (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 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 at a mutually agreeable time, and the utility shall be given the opportunity to witness the tests. Single-phase inverter-based systems rated 15 kVA or less will be allowed to interconnect to the utility system prior to the verification test for a period not to exceed two hours, for the sole purpose of assuring proper operation of the installed equipment.

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.

[5] See Section III: Glossary of Terms for definition.
[6] Ibid.
[7] Ibid.

STEP 11: Final Acceptance and Utility Cost Reconciliation.

Within 60 days after interconnection, the utility will review the results of its on-site verification and issue to the applicant a formal letter of acceptance for interconnection. 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 customer-generator may not be charged in excess of the cost of installing the dedicated transformer described above. The applicant may contest the reconciliation through the filing of a formal complaint with the Commission.

II. Interconnection Requirements

A. Design Requirements

1. Common

The generator-owner[8] shall provide appropriate protection and control equipment, including an automatic disconnect device[9], that will automatically disconnect[10] 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[11] condition and upon detection of a utility system fault.

The generator'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.[12] 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

[8] See Section III: Glossary of Terms for definition.
[9] Ibid.
[10] Ibid.
[11] Ibid.
[12] Ibid.

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. It is recommended that voltage protection be wired phase to ground.

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 beconducted by the utility and the revised settings identified in Step 6 of the Application Process.

Voltage Magnitude

The required operating range for the generators shall be from 106 volts rms to 132 volts rms phase-to-ground (on a 120 volt rms base) at the PCC. That is, 88% to110% of nominal voltage magnitude.

The protective device shall automatically initiate a disconnect sequence from the utility system if the rms voltage at the PCC rises above 132 volts or falls below 106 volts on any phase to which the generator-owner's equipment is connected and remains outside the required operating range for two seconds. The two-second time limit is measured from the time the range is initially exceeded until the generator-owner's equipment ceases to energize[13] the PCC and includes detection and intentional time delay.

The protective device shall automatically initiate a disconnect sequence from the utility system if the rms voltage at the PCC falls below 60 volts (50% of nominal voltage magnitude) on any phase to which the generator-owner's equipment is connected and remains below this level for six cycles. The six-cycle time limit is measured from the time the voltage reaches this level until the generator-owner's equipment ceases to energize the PCC and includes detection and intentional time delay.

The protective device shall automatically initiate a disconnect sequence from the utility system if the rms voltage rises above 165 volts (137% of nominal voltage magnitude) or above on any phase to which the generator-owner's equipment is connected and remains above this level for two cycles. The two-cycle time limit is measured from the time the voltage reaches this level until the generator-owner's equipment ceases to energize the PCC and includes detection and intentional time delay.

Frequency

The required operating range for the generators shall be from 59.3 Hz to 60.5 Hz.

[13] See Section III: Glossary of Terms for definition

The protective device shall automatically initiate a disconnect sequence from the utility system if the frequency rises above 60.5 Hz (+0.1/-0.0 Hz) or falls below 59.3 Hz (+0.0/-0.1 Hz) and remains outside these limits for six cycles. The six-cycle time limit is measured from the time the frequency reaches these levels until the generator-owner's equipment ceases to energize the PCC and includes detection and intentional time delay.

2. Additional Protection Equipment

The need for additional protection equipment shall be determined by the utility on a case-by-case basis. The utility shall specify and provide settings for those relays 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.

Protection shall not share electrical equipment associated with utility revenue metering.

A failure of the generator-owner's interconnection protection equipment, 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.

3. 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.

4. 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 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 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.

5. 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 "Type-Tested and Approved Equipment" list maintained by the PSC. Non-type-tested equipment must have dynamic anti-islanding protection as defined by IEEE 929, conform to the maximum harmonic limits delineated in IEEE 519, and be protected by type-tested or utility grade relays (as defined in these requirements) using settings approved by the interconnecting utility and verified in the field. The field verification test must demonstrate that the equipment meets the frequency requirements detailed in this section.

Line-commutated inverters do not require synchronizing equipment if the voltage drop is determined to be acceptable, as defined in Section II.E, Power Quality, of this document. Self-commutated inverters of the utility interactive-type shall synchronize to the utility. Only inverters with utility interactive, line-commutated capabilities shall be used for parallel operation with the utility.

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. 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 Public Service Commission.

Net metering customer-generators shall be afforded the option of selecting a single meter with bi-directional capability or two meters measuring consumption and generator output separately. For photovoltaic, net metering residential applicants, at least one meter in a two meter arrangement shall be non-demand, non-time of use. Applicants are advised that the use of a standard meter, running in reverse, does not meet accuracy standards as documented under

Public Service Law and accordingly, in any billing dispute dependent upon those meter accuracy standards, the applicant will be unable to rely upon net meter readings as a basis for claim against the utility. Applicants selecting the standard meter option, agree to waive in writing, any billing complaint that is unresolvable because of the inaccuracy inherent in running a meter in reverse. Applicant choosing the alternate option will have their billing disputes resolved on the usual standards for evaluating customer complaints. The applicant is responsible for the cost of installing any necessary meter box and socket.

The two-meter (or bi-directional meter) option is required for Time of Use (TOU) metering, unless a suitable single meter option is proven acceptable to the PSC. The customer is responsible for the cost of the second TOU meter installed at the generator.

B. Operating Requirements

The generator-owner shall provide a 24-hour telephone contact(s). 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.

The generator-owner shall not supply power to the utility during any outages of the 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[14] specified 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.[15]

[14] See Section III: Glossary of Terms for definition.

[15] In the event that no disconnect has been provided as required in Section II.D, the utility shall disconnect the generation utilizing an alternate method. The utility shall make a reasonable attempt to assure that the generation is disconnected in a manner so as not to interrupt any on-site customer load.

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 interferes with 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 customer can obtain information about the utility lock-out. The customer shall be allowed to disconnect from the utility without prior notice in order to self generate.

Following a generation facility disconnect as a result of the operation of a protective function trip sequence, the generation facility shall remain disconnected until the utility's service voltage and frequency has recovered to the utility's acceptable voltage and frequency limits for a minimum of five (5) minutes.

Under certain conditions a utility may require direct transfer trip (DTT).[16] The utility shall provide detailed evidence as to the need for DTT.

If an applicant 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 customer has already been executed, then any such modifications must be reviewed and approved by the utility before the modifications are made.

C. Dedicated Transformer

The connecting 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

[16] See Section III: Glossary of Terms for definition.

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.

D. Disconnect Switch

Generating equipment 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 owner of the power-producing facility, and located between the power-producing 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 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 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 standard utility padlock with a 3/8-inch shank.

E. Power Quality

The maximum harmonic limits for electrical equipment shall be in accordance with IEEE 519. The objective of IEEE 519 is 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, Figure 10.3 identified in IEEE 519. This requirement is necessary to minimize the adverse voltage effect upon other customers on the utility system.

F. 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 interconnecting utility prior to installation.

G. 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.

H. Test Requirements

This section describes two separate and distinct tests, which together constitute the necessary and sufficient SIR testing requirements. The first test is the design test and the second is the verification test. The purpose of the design test is to ensure that devices and systems used in a proposed application meet the necessary technical and functional requirements. The purpose of the verification test is to ensure that the devices and systems, which have displayed conformance with the design testing requirements, have been properly installed and are operating properly following installation at the site.

Two paths are possible to the achievement of an accepted installation. The first path requires that the design test and verification test methodologies be reviewed and accepted by the utility. The second path allows the design test and the verification test procedure to be reviewed and conducted by an independent testing laboratory. The second path is referred to as type testing. Type testing is performed or witnessed once by a nationally recognized independent testing laboratory for a specific protection device or system and the results recorded in the document included as Appendix A. Once the device or system meets the type test criteria described in this section, the design and verification test procedure is accepted by all New York State utilities. If any changes are made to the hardware, software, firmware, or the verification test procedure, the manufacturer must notify the independent testing laboratory to determine what, if any, parts of the type-testing must be repeated (this includes modifications to devices already in service). Failure of the manufacturer to notify the independent test laboratory of changes may result in

withdrawal of approval and disconnection of units installed since the change was made. Utility grade relays, as defined in the Glossary of Terms, need not be type tested per the requirements of this section. Manufacturers may elect to have systems comprised of utility grade relays and other devices type tested as complete systems to avoid the utility review required of a non-type tested system.

All interface equipment must include a verification test procedure (unless otherwise noted in this document) as part of the documentation. 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.

The checklist (Appendix A) shall be submitted to the contact listed on the Department web site (http://www.dps.state.ny.us/distgen.htm). Staff will perform a preliminary assessment of the information within 10 days to verify whether it is complete per the requirements and contact the manufacturer to request supplemental information if needed. After a complete documentation package has been provided, Staff shall review the checklist to verify that all the appropriate reviews and tests have been performed. Within 30 days from the submission of the complete package, Staff will make a final determination whether the equipment is approved for interconnection per the SIR. A list of this equipment shall be maintained for posting on the Department's web site as referenced above. The list will indicate specific model numbers and firmware versions approved. The equipment in the field must have a nameplate that clearly shows the model number and firmware version.

At the time of production, all interface equipment, including inverters and discrete relays, must meet or exceed the requirements of ANSI/ IEEE C62.41, Recommended Practices on Surge Voltages in Low Voltage AC Power Circuits, or ANSI/IEEE C37.90.1, IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems. If ANSI/IEEE C62.41 is used, devices shall be tested to a minimum category B3 level as defined in ANSI/IEEE C62.41 and the acceptance criteria shall be the same as that required by ANSI/IEEE C37.90.1. If, during the performance of any of the testing protocols prescribed above, the equipment ceases to export power and in the judgement of the independent testing laboratory fails in a safe manner, this will be considered an acceptable result for the purposes of these requirements.

Isolation transformers specified as required or listed as optional must be connected for the testing process. Each optional isolation transformer connection constitutes a separate type test. Generic isolation transformers may be substituted after type testing. Three-phase isolation transformers and voltage-matching transformers connected wye-grounded/delta on the generator side shall not be permitted.

1. Type Testing

The tests prescribed below to meet the requirements of the SIR apply only to devices and packages associated with protection of the interface between the generating system and the utility. Interface protection is usually limited to voltage function, frequency function, synchronizing function, reverse current or power function, and anti-islanding schemes. Testing of relays or devices associated specifically with protection or control of generating or other customer equipment is recommended, but not required unless they impact the interface protection.

The independent testing laboratory shall conduct the verification test prescribed by the manufacturer to determine if the verification test procedure adequately demonstrates compliance with these SIR requirements. All single-phase and three phase test voltages shall be applied phase to ground.[17]

For the following tests for single-phase and three-phase inverters, the type-testing does not have to be repeated if settings other than those specified in Section II.A.1, Design Requirements – Common are required by the interconnecting utility (i.e., when a transformer connection other than wye grounded-wye grounded is used).

a. Single-Phase Inverters and Relay Packages

All single-phase inverters shall be non-islanding inverters as defined by IEEE 929. Inverters 10 kW and below shall at the time of production meet or exceed the requirements of the most current versions of IEEE 929 and UL 1741. Specifically, the inverter shall automatically disconnect for an islanding condition with load quality factor of 2.5 within two (2) seconds. In addition, all single-phase inverters and single-phase voltage and frequency relay packages shall initiate a trip from a waveform generator for the waveforms listed below to verify they meet the requirements set forth in Section II.A.1, Design Requirements – Common.

> **Non-Volatile Memory Test:** Prior to waveform testing, all batteries shall be disconnected or removed for a minimum of ten (10) minutes. If the system requires no battery, then the device shall be disconnected from its source of power for a minimum of ten (10) minutes. This test is to verify the system has a non-volatile memory and that the protection settings are not lost. A test shall also be performed to determine that failure of any battery used in the power conversion and control process and not used to supply trip power will result in an automatic shutdown.

[17] Test voltages are specified phase to ground for a 120 volt nominal system. Other system voltages require adjusting the test voltages by the appropriate percentages. Over- and undervoltage protection should be wired phase to ground. Phase-to-phase voltage sensing results in less sensitive undervoltage detection and more sensitive overvoltage detection.

Waveform Testing: Each waveform test described below shall be repeated ten (10) times. Unless otherwise noted, the device should cease exporting power to the utility within the relevant time limits specified in Section A.1.

Reset Timer: These tests shall also verify the inverter or power-producing facility shall not automatically reconnect to the waveform generator until after five (5) minutes of continuous normal voltage and frequency. The manufacturer may supply a special production sample with the reset timer disabled or otherwise temporarily reduce or eliminate the delay in software to minimize the waiting time during type testing. At least three of the 60 total tests (6 waveforms, 10 times each) must be performed on a sample with the reset timer set to the required delay time to verify the function and accuracy of the timer. The test will be considered a failure if, in any one of the tests, the inverter automatically reconnects to the utility system prior to the required time interval. Once the delay timer has been tested three times, the phrase "…and resumes to XX for five minutes…" at the end of the test procedures may be ignored.

The voltage magnitudes listed below are given in percent of rms voltage rating of the inverter, followed in parentheses by the rms voltage magnitude on a 120 V basis:

Waveform 1: A 100% of rated voltage (120 V rms) 60 Hz sinusoidal that drops in voltage to 49% of rated (59 V rms) for six (6) cycles beginning and ending at a zero crossing and resuming to 100% of rated voltage (120 V rms) for five minutes.

Waveform 2: A 100% of rated voltage (120 V rms) 60 Hz sinusoidal that drops in voltage to 88 % of rated (105 V rms) for 120 cycles beginning and ending at a zero crossing and resuming to 100% of rated voltage (120 V rms) for five minutes.

Waveform 3: A 100% of rated voltage (120 V rms) 60 Hz sinusoidal that rises in voltage to 111% of rated (133 V rms) for 120 cycles beginning and ending at a zero crossing and resuming to 100% of rated voltage (120 V rms) for five minutes.

Waveform 4: A 100% of rated voltage (120 V rms) 60 Hz sinusoidal that rises in voltage to 138 % of rated (166 volts) for two (2) cycles beginning and ending at a zero crossing and resuming to 100% of rated voltage (120 V rms) for five minutes.

Waveform 5: A 100% of rated voltage (120 V rms) 60 Hz sinusoidal that drops in frequency at a rate of 0.2 Hz/second to 59.2 Hz for six (6) cycles beginning and ending at a zero crossing and then returning to 60 Hz at a rate of 0.2 Hz/second for five minutes.

Waveform 6: A 100% of rated voltage (120 V rms) 60 Hz sinusoidal that rises in frequency at a rate of 0.2 Hz/second to 60.5 Hz for six (6) cycles beginning and ending at a zero crossing and then returning to 60 Hz at a rate of 0.2 Hz/second for five minutes.

b. Three-Phase Inverters and Relays

Non-Volatile Memory Test: Prior to waveform testing, all batteries shall be disconnected or removed for a minimum of ten (10) minutes. If the system requires no battery, then the device shall be disconnected from its source of power for a minimum of ten (10) minutes. This test is to verify the system has a non-volatile memory and that the protection settings are not lost. A test shall also be performed to determine that failure of any battery used in the power conversion and control process and not used to supply trip power will result in an automatic shutdown.

Waveform Testing: Each three-phase waveform test shall be repeated ten (10) times. Failure to trip for any one run constitutes failure of the test.

Reset Timer Test: These tests shall also verify the inverter or power producing facility shall not automatically reconnect to the waveform generator until after five (5) minutes of continuous normal voltage and frequency. The manufacturer may supply a special production sample with the five-minute reset timer disabled to eliminate waiting time during type testing. At least three tests must be performed on a sample with a five minute reset timer to verify the function and accuracy of the timer. The test will be considered a failure if, in any one of the tests, the inverter automatically reconnects to the utility system prior to the required five-minute time interval.

Three-phase inverters and discrete three-phase voltage relays shall be type-tested with three-phase waveforms. The inverter shall disconnect or the protection equipment shall initiate a trip from the waveform generator for each of the waveforms described below.

The voltage magnitudes listed below are given in percent of rms voltage rating of the inverter, followed in parentheses by the rms voltage magnitude for 120 V rated inverters:

Waveform 1: A three-phase sinusoidal operating at 60 Hz and 100% of rated voltage (120 V rms) interrupted by phase A voltage depressed to 49% of rated voltage (59 V rms) for six (6) cycles beginning and ending at a zero crossing while B and C phases continue at 100% of rated voltage (120 V rms). Repeat the same test with B phase depressed, with C phase depressed, with A and B phases depressed, with B and C phases depressed, and finally with all phases depressed to 49% of rated voltage (59 V rms) for six cycles.

Waveform 2: A three-phase sinusoidal operating at 60 Hz and 100% of rated voltage (120 V rms) interrupted by phase A voltage depressed to 49% of rated voltage (59 V rms) for six (6) cycles beginning and ending at a zero crossing while B and C phases are increased 125% of rated voltage (150 V rms) beginning and ending at the same point of discontinuity. Repeat the same test with B phase depressed and A and C phases increased and with C phase depressed and A and B phases increased.

Waveform 3: A three-phase sinusoidal operating at 60 Hz and 100% of rated voltage (120 V rms) interrupted by phase A voltage depressed to 88% of rated (105 V rms) for two seconds (120 cycles) beginning and ending at a zero crossing while B and C phases continue at 100% of rated voltage (120 V rms). Repeat the same test with B and C phases depressed to the same level and for the same duration holding the other two phases at 100%.

Waveform 4: A three-phase sinusoidal operating at 60 Hz and 100% of rated voltage (120 V rms) interrupted by phase A voltage increased to 111% of rated (133 V rms) for two seconds (120 cycles) beginning and ending at a zero crossing while B and C phases continue at 100% of rated voltage (120 V rms). Repeat the same test with B and C phases increased to the same level and for the same duration.

Waveform 5: A three-phase sinusoidal operating at 60 Hz and 100% of rated voltage (120 V rms) interrupted by phase A voltage increased to 138% of rated (166 V rms) for two cycles beginning and ending at a zero crossing while B and C phases continue 100% of rated voltage (120 V rms). Repeat the same test with B and C phases increased to the same level and for the same duration.

Waveform 6: A three-phase sinusoidal operating at 60 Hz and 100% of rated voltage (120 V rms) interrupted by phase A voltage increased to 138% of rated (166 V rms) for two cycles beginning and ending at a zero crossing while B and C phases are decreased to 83% of rated voltage (100 V rms) beginning and ending at the same point of discontinuity. Repeat the same test with B phases increased and A and C phases decreased and for C phase increased and A and B phases decreased to the same levels and for the same duration.

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Waveform 7: A three phase sinusoidal operating at 60 Hz and 100% of rated voltage (120 V rms) ramped to 59.2 Hz at 0.2 Hz/second, held for six cycles and ramped back to 60 Hz at 0.2 Hz/second beginning and ending at the zero crossing on A phase (or the phase on which the device frequency trip measurements).

Waveform 8: A three-phase sinusoidal operating at 60 Hz and 100% of rated voltage (120 V rms) ramped to 59.3 Hz at 0.2 Hz/second, held for six cycles and ramped back to 60 Hz at 0.2 Hz/second beginning and ending at the zero crossing on B phase. At the same time, A and C phase voltages are to be ramped down to 58% of rated (70 V rms) at a rate of at least 10 volts per cycle and held at that depressed voltage during the six cycles when the frequency on B phase is at 59.3 Hz before ramping back to normal voltage.

Waveform 9: A three-phase sinusoidal operating at 60 Hz and 100% of rated voltage (120 V rms) ramped to 60.6 Hz at 0.2 Hz/second, held for six cycles and ramped back to 60 Hz at 0.2 Hz/second beginning and ending at the zero crossing on A phase (or the phase on which the device performs frequency trip measurements).

Recognizing that the waveform testing method may not be practical for larger inverters, alternate testing methods will be acceptable if it can be demonstrated that the alternate methods verify the test points and time delays of the interconnection functions prescribed in the SIR interconnection requirements. The independent testing laboratory will be responsible to determine if the alternate testing method sufficiently verifies the interconnection functions and can be used as a replacement for the waveform testing method.

The tests shall include:

Non-Volatile Memory Test: Prior to waveform testing, all batteries shall be disconnected or removed for a minimum of ten (10) minutes. If the system requires no battery, then the device shall be disconnected from its source of power for a minimum of ten (10) minutes. This test is to verify the system has a non-volatile memory and that the protection settings are not lost. A test shall also be performed to determine that failure of any battery used in the power conversion and control process will result in an automatic shutdown.

Reset Timer Test: These tests shall also verify the inverter or power producing facility shall not automatically reconnect to the waveform generator until after five (5) minutes of continuous normal voltage and frequency. The manufacturer may supply a special production sample with the five-minute reset timer disabled to eliminate waiting time during type testing. At least three tests must be performed on a sample with a five-minute reset timer to verify the function and accuracy of the timer. The test will be considered a failure if, in any one of the tests, the inverter automatically reconnects to the utility system prior to the required five-minute time interval.

Test 1: With the generator and inverter output stabilized at 60 Hz and 100% of rated voltage (120 V rms) and the inverter output between 0.5 and 1.0 per unit power, ramp the generator voltage up to 111% of rated (133 V rms) at a rate no greater than 5 volts per second. Measure and record the frequency and voltage. The frequency must remain within 0.2 Hz of 60 Hz and the voltage may not exceed 114% of rated (137 V rms). The inverter must cease to export power within two seconds (120 cycles) of the first half-cycle reaching 111% of rated voltage (188 V) peak to neutral. Repeat the test with the inverter output below 0.1 per unit power.

Test 2: Insert a tapped transformer and a breaker between A phase of the generator and A phase of the inverter arranged such that when the breaker is opened or closed, A phase of the inverter receives half the voltage of the generator. With the generator and inverter output stabilized at 60 Hz and 99% of rated voltage (119 V rms) and the inverter output between 0.5 and 1.0 per unit power, operate the breaker so A phase of the inverter only receives 48% of rated voltage (58 V rms). Measure and record the frequency and voltage. The frequency must remain within 0.2 Hz of 60 Hz and the voltage may not drop below 46% of rated (55 V rms) on A phase of the inverter or

below 92% of rated (110 V rms) on B or C phases of the inverter. The inverter must cease to export power within six cycles of when the first half cycle of voltage on A phase of the inverter drops below 49% of rated (83 V) peak to neutral. Repeat the test applying half voltage to B and C phases. And repeat the test for all phases with the inverter output below 0.1 per unit power.

Test 3: With the generator and inverter output stabilized at 60 Hz and 100% of rated voltage (120 V rms) and the inverter output between 0.5 and 1.0 per unit power, ramp the generator voltage down to 87% of rated (105 V rms) at a rate no greater than 5 volts per second. Measure and record the frequency and voltage. The frequency must remain within 0.2 Hz of 60 Hz and the voltage must not drop below 82% of rated (99 V rms). The inverter must cease to export power within two seconds (120 cycles) of the first half-cycle reaching 85% of rated voltage (145 V) peak to neutral. Repeat the test with the inverter output below 0.1 per unit power.

Test 4: Insert a tapped transformer and a breaker between A phase of the generator and A phase of the inverter arranged such that when the breaker is opened or closed, A phase of the inverter receives four-fifths the voltage of the generator. With the generator and inverter output stabilized at 60 Hz and 107% of rated voltage (128 V rms) and the inverter output between 0.5 and 1.0 per unit power, operate the breaker so that A phase of the inverter only receives 87% of rated voltage (105 V rms). Measure and record the frequency and voltage. The frequency must remain within 0.2 Hz of 60 Hz and the voltage may not drop below 82% of rated (99 V rms) on A phase of the inverter, or below 92% of rated (110 V rms) on B or C phases of the inverter. The inverter must cease to export power within two seconds (120 cycles) of when the first half cycle of voltage on A phase of the inverter drops below 85% of rated (145 V) peak to neutral. Repeat the test applying low voltage to B and C phases. And repeat the test for all phases with the inverter output below 0.1 per unit power.

Test 5: With the generator and inverter output stabilized at 60 Hz and 100% of rated voltage (120 V rms) and the inverter output between 0.5 and 1.0 per unit power, ramp the generator frequency up to 60.6 Hz at a rate no greater than 0.5 Hz/second. Measure and record the frequency and voltage. The voltage must remain between 96% (115 V rms) and 104% of rated (125 V rms) and the frequency must not exceed 60.8 Hz. The inverter must cease to export power within six cycles of the frequency exceeding 60.5 Hz (8.25 ms between zero

crossings). Repeat the test with the inverter output below 0.1 per unit power.

Test 6: With the generator and inverter output stabilized at 60 Hz and 100% of rated voltage (120 V rms) and the inverter output between 0.5 and 1.0 per unit power, ramp the generator frequency down to 59.3 Hz at a rate no greater than 0.5 Hz per second. Measure and record the frequency and voltage. The voltage must remain between 96% (115 V rms) and 104% of rated (125 V rms) and the frequency must not fall below 59.0 Hz. The inverter must cease to export power within six cycles of the frequency falling below 59.3 Hz (8.33 ms between zero crossings). Repeat the test with the inverter output below 0.1 per unit power.

It is not necessary to perform the 137% (165 V rms) test, the 110 % (132 V rms) unbalanced voltage test, or the anti-islanding test (per IEEE 929) on three-phase inverters.

2. Verification Testing

Upon initial parallel operation of a generating system, or any time interface hardware or software is changed, the 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 connecting utility.

Single-phase inverters and inverter systems rated 15 kVA and below may be verified upon initial parallel operation and once per year as follows: the owner or his agent shall operate the load break disconnect switch and verify the power producing facility automatically shuts down and does not restart for five minutes after the switch is closed. 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 once per month for proper voltage. Once every four (4) years the battery must be either replaced or a discharge test performed.

III. Glossary of Terms

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.

Cease to Energize: cessation of energy flow capability

Coordinated Electric System Interconnection Review: Any studies performed by utilities to ensure that the safety and reliability of the electric grid with respect to the interconnection of distributed generation as discussed in this document.

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

Direct Transfer Trip: Remote operation of a circuit breaker by means of a communication channel.

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.

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

Farm Waste, Net Meter, Farm Applicant: A farm applicant who is proposing to install a farm waste anaerobic digester generating system, not to exceed 400 kW, at a farm, per the requirements of New York State Public Service Law §66-j.

Energy Conversion Device: A machine or solid state circuit for changing direct current to alternating current or a machine that changes shaft horsepower to electrical power.

Generator-Owner: An applicant to operate on-site power generation equipment in parallel with the utility grid per the requirements of this document.

Net Meter Customer Generator: A farm waste, net meter, farm applicant or a photovoltaic, net meter, residential applicant.

Islanding: A condition in which a portion of the utility system that contains both load and distributed generation is isolated from the remainder of the utility system. (Adopted from IEEE 929.)

Photovoltaic, Net Meter, Residential Applicant: A residential applicant who is proposing to install a photovoltaic generating system, not to exceed 10 kW, in an owner occupied residence per the requirements of New York State Public Service Law §66-j.

Point of Common Coupling (PCC): 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. (Adopted from IEEE 929)

Preliminary Review: A review of the Customer-Generator's proposed system capacity, location on the utility system, system characteristics, and general system regulation to determine if the interconnection is viable.

Radial Feeder: A distribution line that branches out from a substation and is normally not connected to another substation or another circuit sharing the common supply.

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 the type testing procedure contained in this document. Excursions outside these ranges must result in the automatic disconnection of the generation within the prescribed time limits

Type Test: A test performed or witnessed once by a qualified independent testing laboratory for a specific protection package or device to determine whether the requirements of this document are met. The type test will typically be sponsored by equipment manufacturers.

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 Conditions Ratings - Current and Voltage Maximum design for all relays 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)

Verification Test: A test performed upon initial installation and repeated periodically to determine that there is continued acceptable performance.

APPENDIX A

New York State Standardized Interconnection Requirements
Checklist for Type Testing of Distributed Generation Protection Equipment

Manufacturer:_____

Product Name:_____

Model Number:_____

Firmware Version:_____

For the device or system to be considered as successfully completing the type testing process, a "Yes" response must be provided in all of the pertinent responses on the checklist below. One or multiple "No" responses indicates failure of the device or system to complete the Type Testing process, or that all of the requirements listed in the SIR for the type testing process for the device or system were not completed.

Is an external isolation transformer provided with the device or system?

( ) Yes ( ) No

If so, describe the winding connection:_____

Separate voltage waveform tests must be performed for each available isolation transformer winding connection.

1. Surge Testing

Does the device or system meet or exceed the requirements of the most current versions of ANSI/IEEE C62.41– Recommended Practices on Surge Voltages in Low Voltage AC Power Circuits, or C37.90.1– IEEE Standard Surge Withstand Capability (SEC) Tests for Protective Relays and Relay Systems, and the acceptance criteria of ANSI/IEEE C37.90? In the event that the device or system ceases to export power after completion of the tests, does it fail in a safe manner?

( ) Yes ( ) No

2. Verification Test Procedure

Has a verification test procedure been included in the report?

( ) Yes ( ) No

If so is the procedure acceptable to demonstrate the functionality of the protective device or system?

( ) Yes ( ) No

Were all sources of power, including batteries, that are included in the system disconnected?

( ) Yes ( ) No

3. Non-Volatile Memory Test

If the device or system has a DC power supply, was it disconnected from its power supply to verify that the system has a non-volatile memory and that protection settings are not lost?

( ) Yes ( ) No

The device or system does not rely on a DC power supply to retain the protection settings. ( )

4a. Voltage and Frequency Waveform Tests – Single Phase Inverters

Has the device or system been tested with Waveforms 1 through 6 as listed in the SIR?

( ) Yes ( ) No

If so, did the device or system perform as required by these waveform tests?

( ) Yes ( ) No

Were the test voltages applied phase to ground?

( ) Yes ( ) No

Were the waveform tests repeated ten times?

( ) Yes ( ) No

4b. Voltage and Frequency Waveform Tests – Three-Phase Inverters

Has the device or system been tested with Waveforms 1 through 9 as listed in the SIR?

( ) Yes ( ) No

If so, did the device or system perform as required by these waveform tests?

( ) Yes ( ) No

Were the test voltages applied phase to ground?

( ) Yes ( ) No

Were the waveform tests repeated ten times?

( ) Yes ( ) No

4c. Voltage and Frequency Waveform Tests – Three-Phase Inverters – Alternative Test Method.

Has the device or system been tested with Tests 1 through 6 as listed in the SIR?

( ) Yes ( ) No

If so, did the device or system perform as required by these waveform tests?

( ) Yes ( ) No

Were the test voltages applied phase to ground?

( ) Yes ( ) No

Were the waveform tests repeated five times?

( ) Yes ( ) No

5. Five-Minute Reconnect Test

If the device or system is capable of automatically reconnecting to the utility system, following at least three test runs, was a test conducted to verify that the inverter does not automatically reconnect to the utility system until after five (5) minutes of continuous normal voltage and frequency?

( ) Yes ( ) No

If so, did the device or system reconnect to the utility in a time period equal to or exceeding five minutes?

( ) Yes ( ) No

The device or system is not capable of automatically reconnecting to the utility system ( )

Testing Laboratory Information

Name:_____

Address:_____

_____

_____

Dated: _____

Party Responsible for Completion of the Testing: _____

Date Testing Completed: _____

APPENDIX B

NEW YORK STATE
STANDARDIZED CONTRACT
FOR INTERCONNECTION OF NEW DISTRIBUTED GENERATION UNITS WITH CAPACITY OF 300 kVA OR LESS, OR FARM WASTE GENERATORS OF 400 kW OR LESS, TO BE OPERATED IN PARALLEL

Customer Information: **Company Information:**

Name: _____ Name: _____

Address: _____ Address: _____

Telephone: _____ Telephone: _____

Unit Application No. _____

DEFINITIONS

Dedicated Facilities means the equipment and facilities on the Company's system necessary to permit operation of the Unit in parallel with the Company's system.

Delivery Service means the services the Company may provide to deliver capacity or energy generated by Customer to a buyer to a delivery point(s), including related ancillary services.

"SIR" means the New York State Standardized Interconnection Requirements for new distributed generation units with a nameplate capacity of 300 kVA or less, or farm waste generators 400 kW or less that qualify under the SIR Glossary definitions of "farm waste, net meter, farm applicants" and "net meter customer generators," to be operated in parallel with the Company's radial system on radial distribution feeders.

"Unit" means the distributed generation Unit with a nameplate capacity of 300 kVA or less, or Farm Waste generators 400 kW or less that qualify under the SIR Glossary definitions of "farm waste, net meter, farm applicants" and "net meter customer generators," located on the Customer's premises at the time the company approves such Unit for operation in parallel with the Company's system. This Agreement relates only to such Unit, but a new agreement shall not be required if the customer makes physical alterations to the Unit that do not result in an increase in its nameplate generating capacity. The nameplate generating capacity of the unit shall not exceed 300 kVA, or 400 kW for a Farm Waste generator.

I. TERM AND TERMINATION

1.1 Term: This Agreement shall become effective when executed by both Parties and shall continue in effect until terminated.

1.2 Termination: This Agreement may be terminated as follows:

a. The Customer may terminate this Agreement at any time, by giving the Company sixty (60) days' written notice.

b. Failure by the Customer to seek final acceptance by the Company within twelve (12) months after completion of the utility construction process described in the SIR shall automatically terminate this Agreement.

c. Either Party may, by giving the other Party at least sixty (60) days' prior written notice, terminate this Agreement in the event that the other Party is in default of any of the material terms and conditions of this Agreement. The terminating Party shall specify in the notice the basis for the termination and shall provide a reasonable opportunity to cure the default.

d. The Company may, by giving the customer at least sixty (60) days' prior written notice, terminate this Agreement for cause. The Customer's non-compliance with an upgrade to the SIR, unless the Customer's installation is "grandfathered," shall constitute good cause.

1.3 Disconnection and Survival of Obligations: Upon termination of this Agreement the Unit will be disconnected from the Company's electric system. The termination of this Agreement shall not relieve either Party of its liabilities and obligations, owed or continuing at the time of the termination.

1.4 Suspension: This Agreement will be suspended during any period in which the Customer is not eligible for delivery service from the Company.

II. SCOPE OF AGREEMENT

2.1 Scope of Agreement: This Agreement relates solely to the conditions under which the Company and the Customer agree that the Unit may be interconnected to and operated in parallel with the Company’s system.

2.2 Electricity Not Covered: The Company shall have no duty under this Agreement to account for, pay for, deliver, or return in kind any electricity produced by the Facility and delivered into the Company’s System.

III. INSTALLATION, OPERATION AND MAINTENANCE OF UNIT

3.1 Compliance with SIR: Subject to the provisions of this Agreement, the Company shall be required to interconnect the Unit to the Company’s system, for purposes of parallel operation, if the

Company accepts the Unit as in compliance with the SIR. The Customer shall have a continuing obligation to maintain and operate the Unit in compliance with the SIR.

3.2 Observation of the Unit - Construction Phase: The Company may, in its discretion and upon reasonable notice, conduct reasonable on-site verifications during the construction of the Unit. Whenever the Company chooses to exercise its right to conduct observations herein it shall specify to the Customer its reasons for its decision to conduct the observation. For purposes of this paragraph and paragraphs 3.3 through 3.5, the term "on-site verification" shall not include testing of the Unit, and verification tests shall not be required except as provided in paragraphs 3.3 and 3.4.

3.3 Observation of the Unit - Fourteen-day Period: The Company may conduct on-site verifications of the Unit and observe the performance of verification testing within a reasonable period of time, not exceeding fourteen days, after receiving a written request from the Customer to begin producing energy in parallel with the Company's system. The Company may accept or reject the request, consistent with the SIR, based upon the verification test results.

3.4 Observation of the Unit - Post-Fourteen-day Period: If the Company does not perform an on-site verification of the Unit and observe the performance of verification testing within the fourteen-day period, the Customer may begin to produce energy after certifying to the Company that the Unit has been tested in accordance with the verification testing requirements of the SIR and has successfully completed such tests. After receiving the certification, the Company may conduct an on-site verification of the Unit and make reasonable inquiries of the Customer, but only for purposes of determining whether the verification tests were properly performed. The Customer shall not be required to perform the verification tests a second time, unless irregularities appear in the verification test report or there are other objective indications that the tests were not properly performed in the first instance.

3.5 Observation of the Unit - Operations: The Company may conduct on-site verification of the operations of the Unit after it commences operations if the Company has a reasonable basis for doing so based on its responsibility to provide continuous and reliable utility service or as authorized by the provisions of the Company's Retail Tariff relating to the verification of customer installations generally.

3.6 Costs of Dedicated Facilities: During the term of this Agreement, the Company shall design, construct and install the Dedicated Facilities. The Customer shall be responsible for paying the incremental capital cost of such Dedicated Facilities attributable to the Customer's Unit. All costs associated with the operation and maintenance of the Dedicated Facilities after the Unit first produces energy shall be the responsibility of the Company.

IV. DISCONNECTION OF THE UNIT

4.1 Emergency Disconnection: The Company may disconnect the Unit, without prior notice to the Customer (a) to eliminate conditions that constitute a potential hazard to Company personnel or the general public; (b) if pre-emergency or emergency conditions exist on the Company system; (c) if a hazardous condition relating to the Unit is observed by a utility inspection; or (d) if the Customer has tampered with any protective device. The Company shall notify the Customer of the emergency if circumstances permit.

4.2 Non-Emergency Disconnection: The Company may disconnect the Unit, after notice to the responsible party has been provided and a reasonable time to correct, consistent with the conditions, has elapsed, if (a) the Customer has failed to make available records of verification tests and maintenance of his protective devices; (b) the Unit system interferes with Company equipment or equipment belonging to other customers of the Company; (c) the Unit adversely affects the quality of service of adjoining customers.

4.3 Disconnection by Customer: The Customer may disconnect the Unit at any time.

4.4 Utility Obligation to Cure Adverse Effect: If, after the Customer meets all interconnection requirements, the operations of the Company are adversely affecting the performance of the Unit or the Customer's premises, the Company shall immediately take appropriate action to eliminate the adverse effect. If the Company determines that it needs to upgrade or reconfigure its system the Customer will not be responsible for the cost of new or additional equipment beyond the point of common coupling between the Customer and the Company.

V. ACCESS

5.1 Access to Premises: The Company shall have access to the disconnect switch of the Unit at all times. At reasonable hours and upon reasonable notice consistent with Section III of this Agreement, or at any time without notice in the event of an emergency (as defined in paragraph 4.1), the Company shall have access to the Premises.

5.2 Company and Customer Representatives: The Company shall designate, and shall provide to the Customer, the name and telephone number of a representative or representatives who can be reached at all times to allow the Customer to report an emergency and obtain the assistance of the Company. For the purpose of allowing access to the premises, the Customer shall provide the Company with the name and telephone number of a person who is responsible for providing access to the Premises.

5.3 Company Right to Access Company-Owned Facilities and Equipment: If necessary for the purposes of this Agreement, the Customer shall allow the Company access to the Company's equipment and facilities located on the Premises. To the extent that the Customer does not own all

or any part of the property on which the Company is required to locate its equipment or facilities to serve the Customer under this Agreement, the Customer shall secure and provide in favor of the Company the necessary rights to obtain access to such equipment or facilities, including easements if the circumstances so require.

VI. DISPUTE RESOLUTION

6.1 Good Faith Resolution of Disputes: Each Party agrees to attempt to resolve all disputes arising hereunder promptly, equitably and in a good faith manner.

6.2 Mediation: If a dispute arises under this Agreement, and if it cannot be resolved by the Parties within ten (10) working days after written notice of the dispute, the parties agree to submit the dispute to mediation by a mutually acceptable mediator, in a mutually convenient location in New York State, in accordance with the then current CPR Mediation Procedure, or to mediation by a mediator provided by the New York Public Service Commission. The parties agree to participate in good faith in the mediation for a period of 90 days. If the parties are not successful in resolving their disputes through mediation, then the parties may refer the dispute for resolution to the New York Public Service Commission, which shall maintain continuing jurisdiction over this agreement.

6.3 Escrow: If there are amounts in dispute of more than two thousand dollars ($2,000), the Customer shall either place such disputed amounts into an independent escrow account pending final resolution of the dispute in question, or provide to the Company an appropriate irrevocable standby letter of credit in lieu thereof.

VII. INSURANCE

7.1 Disclosure: The Customer is not required to provide general liability insurance coverage as part of this Agreement, the SIR, or any other Company requirement. Due to the risk of incurring damages, the Public Service Commission recommends that every distributed generation customer protect itself with insurance, and requires insurance disclosure as a part of this Agreement. The Customer hereby discloses as follows:

(Note: Check off one of the boxes below.)

[ ] the Customer has obtained, or already has in effect under an existing policy, general liability insurance coverage for operation of the Unit and intends to maintain such coverage for the duration of this Agreement (attach Certificate of Insurance or copy of Policy); or

[ ] the Customer has not obtained general liability insurance coverage for operation of the Unit and/or is self-insured.

7.2 Effect: The inability of the Company to require the Customer to provide general liability insurance coverage for operation of the Unit is not a waiver of any rights the Company may have to pursue remedies at law against the Customer to recover damages.

VIII. MISCELLANEOUS PROVISIONS

8.1 Third Parties: This Agreement is intended solely for the benefit of the parties hereto. Nothing in this Agreement shall be construed to create any duty to, or standard of care with reference to, or any liability to, any person not a party to this Agreement.

8.2 Severability: If any provision or portion of this Agreement shall for any reason be held or adjudged to be invalid or illegal or unenforceable by any court of competent jurisdiction, such portion or provision shall be deemed separate and independent, and the remainder of this Agreement shall remain in full force and effect.

8.3 Entire Agreement: This Agreement constitutes the entire Agreement between the parties and supersedes all prior agreements or understandings, whether verbal or written.

8.4 Waiver: No delay or omission in the exercise of any right under this Agreement shall impair any such right or shall be taken, construed or considered as a waiver or relinquishment thereof, but any such right may be exercised from time to time and as often as may be deemed expedient. In the event that any agreement or covenant herein shall be breached and thereafter waived, such waiver shall be limited to the particular breach so waived and shall not be deemed to waive any other breach hereunder.

8.5 Applicable Law: This Agreement shall be governed by and construed in accordance with the law of the State of New York.

8.6 Amendments: This Agreement shall not be amended unless the amendment is in writing and signed by the Company and the Customer.

8.7 Force Majeure: For purposes of this Agreement, "Force Majeure Event" means any event: (a) that is beyond the reasonable control of the affected Party; and (b) that the affected Party is unable to prevent or provide against by exercising reasonable diligence, including the following events or circumstances, but only to the extent they satisfy the preceding requirements: acts of war, public disorder, insurrection, or rebellion; floods, hurricanes, earthquakes, lightning, storms, and other natural calamities; explosions or fires; strikes, work stoppages, or labor disputes; embargoes; and sabotage. If a Force Majeure Event prevents a Party from fulfilling any obligations under this Agreement, such Party will promptly notify the other Party in writing, and will keep the other Party informed on a continuing basis of the scope and duration of the Force Majeure Event. The affected Party will specify in reasonable detail the circumstances of the Force Majeure Event, its expected duration, and the steps that the affected Party is taking to mitigate the effects of the event on its

performance. The affected Party will be entitled to suspend or modify its performance of obligations under this Agreement, other than the obligation to make payments then due or becoming due under this Agreement, but only to the extent that the effect of the Force Majeure Event cannot be mitigated by the use of reasonable efforts. The affected Party will use reasonable efforts to resume its performance as soon as possible.

8.8 Assignment to Corporate Party: At any time during the term, the Customer may assign this Agreement to a corporation or other entity with limited liability, provided that the Customer obtains the consent of the Company. Such consent will not be withheld unless the Company can demonstrate that the corporate entity is not reasonably capable of performing the obligations of the assigning Customer under this Agreement.

8.9 Assignment to Individuals: At any time during the term, a Customer may assign this Agreement to another person, other than a corporation or other entity with limited liability, provided that the assignee is the owner, lessee, or is otherwise responsible for the Unit.

8.10 Permits and Approvals: Customer shall obtain all environmental and other permits lawfully required by governmental authorities prior to the construction and for the operation of the Unit during the term of this Agreement.

8.11 Limitation of Liability: Neither by inspection, if any, or non-rejection, nor in any other way, does the Company give any warranty, express or implied, as to the adequacy, safety, or other characteristics of any structures, equipment, wires, appliances or devices owned, installed or maintained by the Customer or leased by the Customer from third parties, including without limitation the Unit and any structures, equipment, wires, appliances or devices appurtenant thereto.

ACCEPTED AND AGREED:

Customer: _____

Date: _____

Company: _____

Date: _____

APPENDIX C

NEW YORK STATE STANDARIZED APPLICATION
FOR SINGLE PHASE ATTACHMENT OF PARALLEL
GENERATION EQUIPMENT 15 KVA OR SMALLER
TO THE ELECTRIC SYSTEM OF

Utility:_____

Customer:
Name: _____Phone: (___)_____

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
One Line Diagram attached: ( )Yes
Installation Test Plan attached: ( )Yes

Signature:

_____	_____	_____
CUSTOMER SIGNATURE	TITLE	DATE

APPENDIX D

NEW YORK STATE STANDARIZED APPLICATION
FOR ATTACHMENT OF PARALLEL GENERATION
EQUIPMENT 300 KVA OR SMALLER,
OR FARM WASTE GENERATORS 400 kW OR SMALLER,
TO THE ELECTRIC SYSTEM OF

Utility:_____

Customer:
Name: _____Phone: (___)_____

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
One Line Diagram attached: ( )Yes

Installation Test Plan 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 ___VA Rs (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 SIGNATURE	TITLE	DATE