### STATE OF NEW YORK PUBLIC SERVICE COMMISSION

OPINION NO. 99-13

CASE 94-E-0952 - In the Matter of Competitive Opportunities Regarding Electric Service, filed in C 93-M-0229.

> OPINION AND ORDER ADOPTING STANDARD INTERCONNECTION REQUIREMENTS FOR DISTRIBUTED GENERATION UNITS

Issued and Effective: December 31, 1999

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### STATE OF NEW YORK PUBLIC SERVICE COMMISSION

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CASE 94-E-0952 - In the Matter of Competitive Opportunities Regarding Electric Service, filed in C 93-M-0229.

OPINION NO. 99-13

OPINION AND ORDER ADOPTING STANDARD INTERCONNECTION REQUIREMENTS FOR DISTRIBUTED GENERATION UNITS

(Issued and Effective December 31, 1999)

BY THE COMMISSION:

#### BACKGROUND

Recognizing the importance of distributed generation units as an energy choice for customers, Chairman Helmer at our July 15, 1998 session requested Staff of the Department of Public Service (Staff) to examine interconnection issues for small generating facilities beyond photovoltaics and report back to the Commission. A Staff team representing several divisions and offices was formed in August 1998. The Staff team initiated a collaborative investigation into standardizing and streamlining existing interconnection requirements for small distributed generation units. Utilities, equipment manufacturers, ESCOs/marketers, environmental groups and consumer advocates all participated in the collaborative process.

The issues were divided into technical and nontechnical areas and were addressed by separate working groups of interested parties. In spring of 1999, the results of the investigations were set forth in two reports to Staff from the technical and non-technical working groups. Consensus was reached on many issues, including testing requirements, voltage and frequency relay settings, and the majority of the application process. Where consensus could not be reached by the parties, Staff proposed solutions in a formal proposal to the parties. The Staff proposal also included some modifications to consensus language where deemed necessary and appropriate. In formulating the proposal, Staff sought to make adjustments intended to satisfy most of the concerns raised by the parties. The proposal would standardize and streamline technical requirements for interconnection to utility facilities, in addition to offering a standardized application process and a standardized, simplified contract for interconnecting new distributed generation units with a nameplate rating of 300 kVA or less (aggregated on the customer side of the point of common coupling) connected in parallel to radial distribution lines.

Staff released its proposal for public comment on July 19, 1999. In September, numerous parties submitted comments regarding the proposal. A notice pursuant to the State Administrative Procedure Act (SAPA) regarding the interconnection proposal was published in the <u>State Register</u> on August 4, 1999. The minimum SAPA comment period expired on September 20, 1999. The comments submitted are described and analyzed below.

#### COMMENTS AND DISCUSSION

Individual comments were submitted by New York State Consumer Protection Board (CPB), 1<sup>ST</sup> Rochdale Cooperative Group LTD. (Rochdale), American Wind Energy Association (AWEA), Azure Mountain Power Company (Azure) Capstone Turbine Corporation (Capstone), Consolidated Edison Company of New York, Inc. (Con Edison), Distributed Power Coalition of America (DPCA), NewEnergy East, L.L.C. (NewEnergy), Plug Power, Strategic Resource Solutions (SRS), US Fuel Cell Council (US Fuel Cell), and Zenith Controls, Inc. Joint comments were submitted by Central Hudson Gas & Electric Corporation, New York State Electric & Gas Corporation, Niagara Mohawk Power Corporation, and Rochester Gas & Electric Corporation (Joint Utilities); and Natural Resources Defense Council, Pace Energy Project, Plug Power, American Wind Energy Association, Bergey Windpower Co., BP

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Solarex, Solar Energy Industries Association, and American Solar Energy Society (NRDC).

#### General Scope

By consensus of the collaborative parties, it was agreed that the standard interconnection requirements would apply to distributed generation units of 300 kVA or less operating in parallel with the radial distribution systems of the utilities. Joint Utilities objected to the use of the word "new" in the Staff proposal to identify the type of distributed generation units to which the standard interconnection requirements would be applicable. Joint Utilities also objected to the use of the words "isolated from the utility grid" as ambiguous and argued that no distributed generation units should be "grandfathered" or otherwise exempted from the new requirements. DPCA argued that the standard interconnection requirements should make a distinction between a generation unit that cannot export power to the grid and one that does. DPCA also argued that applying the standard interconnection requirements to small distributed generation units would impose greater costs, studies and interconnection requirements than for equivalently-sized motors "which have the identical impact on the system from an electrical perspective." NewEnergy proposed expanding the standard interconnection requirements to facilities as large as 2 MW and to include interconnection to network distribution systems. Finally, DPCA was critical of the technical expertise of Staff in advising the Commission on technical issues related to the interconnection of distributed generation units.

#### Discussion

To clarify, the words "isolated from the utility grid" will be deleted. As to the "grandfathering" issue, the standard interconnection requirements should in general only apply to units connected after the issuance of this Opinion and Order. In most cases, the standard interconnection requirements should not force retrofits on generator-owners that have already complied

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with pre-existing utility and other code requirements. The only exceptions would be if the utility can demonstrate to the Commission that the safety and reliability of the electric system would be threatened without a retrofit, or if the pre-existing tariff or agreement underlying the approval to interconnect required upgrades upon a change in technical standards. The standard interconnection requirements are quite clear that they do not apply to situations where a unit is not connected to the grid and is therefore not in parallel operation. As to the purported double standard treatment of generators versus motors, it is simply observed that motors are not identical to generators: generators are a source of electricity which, unless prevented, can feed back into the grid; motors are not. However, if instances are identified where motors are causing electricity to feed back into the electric system, even if only for a few cycles, the utilities should see to it that adequate protection devices are installed to protect the system. The system impacts of units up to 2 MW are of such increased size and complexity that they do not lend themselves to the same streamlined and standardized requirements of units of only 300 kVA or less. The same is true for applying streamlined requirements to complex network systems. Thus, the Commission will maintain the upward limit of 300 kVA until the impacts of larger units and interconnection to network systems can be examined. The Commission is mindful of the technical nature of some interconnection issues and thanks the parties for their assistance and input in the collaborative sessions. The Commission is satisfied that the technical input provided by all parties has given sufficient guidance to decide these issues in a fair and thorough manner.

## Smaller Unit Size Threshold

The Staff proposal contained many special provisions to make it easier to install distributed generation units that typically would be sized at 10 kVA or less to serve only a single dwelling unit or small business. Staff proposed that such units

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benefit from an exemption from application fees, reduced insurance coverages and requirements, an exemption from operation and maintenance (O&M) assessments, and reduced ongoing verification procedures. Many non-utility parties sought to increase the smaller unit threshold to 50 kVA.

#### Discussion

The non-utility parties have not made an adequate demonstration that potential customers that would install distributed generation units as large as 50 kVA cannot meet the requirements for larger units. No average homeowner would ever need such a large unit, and any commercial customer having need for so much electricity and being able to afford such a large unit would certainly have the ability to comply with the slightly more difficult requirements for larger units. However, to ensure that even the owners of unusually large dwelling units and those seeking to install double-units as a hedge against unit outages can take advantage of the reduced requirements, the Commission has increased the threshold size to 15 kVA. The Commission has also provided for a shorter application form and reduced review periods for such units, as described below.

#### APPLICATION PROCESS

The proposed standard interconnection requirements provide a multi-step framework for processing interconnection applications. Although Joint Utilities previously agreed to the contrary in a consensus that was reached, they now claim that they should not be required to process applications for equipment that has not been "type-tested", that is, certified by a qualified independent testing laboratory as having met the standard protection requirements for interconnection. The Commission disagrees. All utilities should be responsible for reviewing and processing both type-tested and non-type-tested systems. Type-testing is a new concept intended to streamline the interconnection process, but the availability of type-testing should not foreclose non-type-tested applications.

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Capstone would have the utility forego a review process and automatically approve any type-tested system that would not export power to the grid, or provide an explanation of why the device cannot be interconnected within 10 business days. The Commission finds Capstone's proposal to be unworkable. The utility must make a review of every application no matter how small the unit to ensure that there is no adverse impact to the safety and reliability of the distribution system or to other customers.

#### Step 1 - Initial Communication from the Potential Applicant

Staff's proposal eliminated the time allowed in the consensus document (3 business days) for the utility to have the correct utility representative respond to an initial inquiry. This means that a technical utility representative not only must discuss the project with the potential applicant, but also must mail the appropriate materials within 3 business days as envisioned in Step 2. The Commission believes this time frame is more appropriate to expedite and streamline the process.

## Step 2 - The Inquiry is Reviewed by the Utility to Determine the Nature of the Project\_\_\_\_\_

The consensus document stated that the utilities "should" send the appropriate documentation materials to the applicant in no more than 3 business days, whereas the Staff proposal is more forceful and requires that the materials "must" be sent in the required time frame. Joint Utilities and Con Edison objected to the mandatory time limit. The Commission will maintain Staff's more restrictive language to demonstrate that it is important to expedite these matters and to provide some assurance to the distributed generation industry that these applications will be handled in a timely and fair manner.

DPCA proposes that the standard interconnection requirements include a standard application form and recommends a modification of one being considered in Texas. The Commission agrees that a standard application would be helpful to

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applicants, marketers and manufacturers, and the Commission believes it would also be useful for utilities in processing the applications more efficiently. Attached to this Opinion and Order are two standard application forms to be used on a statewide basis: one for interconnecting units of 15 kVA or less and one for larger units up to 300 kVA. These forms are based on forms now used by the utilities.

Finally, DPCA and Capstone would have the Commission clarify that where reference is made throughout the relevant documents to "utility interconnection guidelines" it now means the Standard Interconnection Requirements. The Commission agrees and conforming language has been included.

## Step 3 - Potential Applicant Files an Application

The Staff proposal deviated from the consensus document which called for each utility to establish its own "nonrefundable, cost-based Application Fee." Staff proposed a standard fee of \$350, but would waive the application fee for interconnections involving units of 10 kVA or less. NewEnergy proposed a similar fee schedule. Joint Utilities found the \$350 fee to be reasonable, but not the waiver for smaller units. Joint Utilities and Con Edison believe that an application fee will discourage frivolous applications and will help avoid spending unnecessary time and money reviewing interconnection proposals that will never be completed. CPB strongly supports Staff's application fee proposal, especially the exemption of small units because the economics of these very small units is already marginal, and because according to CPB it is the policy of New York State to promote distributed generation. DPCA proposes to delete the \$350 fee at the present time and for the Commission to determine the fee at a later date.

The Commission finds Staff's application fee proposal to be reasonable until all the cost issues are examined in a subsequent phase, and waiving the fee for the smallest distributed generation units is consistent with the State's interconnection treatment of photovoltaics. The \$350 application

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fee would be applied against the utility's total cost of interconnection for larger units and, for interconnections of 15 kVA and less, the applicant would still have to pay for the utility's review of the electrical system and design package, as well as any utility modifications to the electric system. The Commission recognizes that some applicants with smaller units might not follow through to completion, but the utility review costs would be minor up to the point that the applicant has to choose between making an advance payment to the utility in Step 5 or abandoning the project. The Commission will direct the utilities to track the number of projects that are not completed and all costs associated with processing applications.

## Step 4 - Utility Initiates a Coordinated Electric System Interconnection Review and Develops a Cost Estimate

Staff's proposal states that the utility should initiate a coordinated interconnection review. While a full coordinated interconnection review "may" be needed to determine if any problems are created on the system, a full review "may not be needed if the total generation is less than 50 kVA on a single phase circuit or 150 kVA on a single distribution feeder." Staff's proposal has no time limit for the full review. NRDC objects to the discretion given the utilities over when to require a full review and asserts that type-tested units 50 kVA and under should never require a full review. DPCA and Capstone assert the same for type-tested units 300 kVA and less that do not export to the grid. On the other hand, Joint Utilities and Con Edison opposed Staff's suggestion that a full review may not be needed if the aggregated generation capacity does not exceed a certain level on a circuit. NRDC also objects to the omission of any time limit to complete Step 4 and recommends no more than a month. NewEnergy proposed an overall time limit of four weeks for processing applications for type-tested units and six weeks for non-type-tested units. While Joint Utilities agreed with setting no time limit on the review, if a time period is to be

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set they recommend allowing 8 to 14 weeks after receipt of all required information and payment of required fees.

While The Commission understands the reluctance to set time limits on the electrical system study -- (Joint Utilities' change in terminology to clarify and distinguish the review is accepted) due to uncertainty about both the nature and the number of applications that may be filed -- there is a need to provide some guidance to the utilities on this issue and to provide some assurances to the applicants who will be paying the utilities directly for the services provided. The 8 to 14 weeks recommended by Joint Utilities seem excessive, especially when all applications will not require a full study. The Commission will adopt a 4 to 8 week time frame for Step 4 as a guideline. The utilities will maintain a log of these applications and their progress and will be expected to explain and justify in the log the need for any Coordinated Electric System Interconnection Reviews that go beyond 4 weeks (20 business days) for interconnections of less than 15 kVA and beyond 8 weeks (40 business days) for larger units. The Commission will have Staff monitor the review times closely and report back to us with any needed changes to the standard interconnection requirements.

## Step 5 - Applicant Commits to the Utility's Review of the Applicant's Proposed Interconnection Design Package

In this step of Staff's proposal, the applicant must submit a detailed interconnection design package, provide the utility with a cost-based payment for its review of the proposal, and confirm with the utility a mutually agreeable project schedule. DPCA and Capstone would have this step apply only to interconnections that are not type-tested and/or do not export power. In addition, Capstone would set a payment of \$10/KW as a contribution to the utility's cost of review.

As discussed above, the Commission will not excuse any project operating in parallel from being reviewed by the utility to ensure that it meets the standard interconnection requirements. The nature and extent of that utility review will

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be reflected in the reduced time and cost for type-tested units as demonstrated in Step 6.

As for the cost payment, the applicant is expected to pay the utility's cost of the electric system review that is not covered by the application fee. Capstone's fee proposal may or may not cover those costs and is therefore unworkable. This issue may be revisited in the future.

## Step 6 - Utility Performs a Review of the Applicant's Proposed Interconnection Design Package

In Staff's proposal, the utility will conduct its review of the design package to ensure that it satisfies the technical requirements for interconnection and will notify the applicant of the outcome of the review. The utility will complete its review of type-tested systems in 10 business days. Its review of non-type-tested systems may require more time. CPB supports the 10-day limit on type-tested systems. Capstone and DPCA would amend this Step to clarify that the study is only conducted if the system is not type-tested or is exporting to the grid and, therefore, that the study must be completed within 4 weeks. In addition, Capstone would allow someone other than the utility to perform the study. Joint Utilities and Con Edison observed that even type-tested systems may require more than 10 days if utility personnel are busy with other duties and responsibilities, so they do not want a strict time limit. They also want to revise the purpose of conducting the review of the design package "to ensure that the design satisfies the goal of attaining a safe and reliable, and efficient interconnection."

Contrary to the current position of DPCA and Capstone, it was the consensus of the parties that type-tested systems must be reviewed, and the Commission will not change that. The Commission will also adopt the consensus of a 10 business day time frame for type-tested systems and 4 weeks for the non-typetested systems. The Commission expects the applications to be reviewed within those time frames. However, the Commission does not expect every non-type-tested system to take the maximum

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review time. The Commission agrees that standard interconnection requirements should be comprehensive and contain the consensus language regarding "...the goal of attaining a safe, reliable and efficient interconnection..." and have added conforming language.

Finally, utilities are responsible for reviewing the interconnection design package to ensure that it meets the requirements of the standard interconnection requirements. If the utilities wish to contract that review work out to another party, they may, but the Commission will not require them to do so as they shall remain ultimately responsible for any conclusions reached.

## Step 7 - Applicant Commits to Utility Construction of Utility System Modification

Staff's proposal follows closely the consensus reached by the parties under which the applicant will execute a standard interconnection contract and pay the utility in advance for the utility's costs of system modifications, metering and on-site verification. In addition to an advance payment, DPCA proposed to allow "other procedures of reimbursement which may be approved by the Commission." Capstone would have the applicant and the utility agree, as a commercial matter, as to who would pay for the dedicated equipment; ownership of the equipment would then reside with the party making payment.

At this time, the Commission sees no reason to change the consensus of the parties regarding advance payment. If the Commission modifies the procedure after further addressing costs, the Commission can change it at that time. The question of ownership could also be addressed then.

## Step 8 - Project Construction

This Step spells out the responsibilities of the applicant to build its unit in accordance with the utilityaccepted design, and of the utility to commence construction or installation of system modifications and metering requirements.

## Step 9 - The Applicant's Facility is Tested in Accordance with the Standard Interconnection Requirements\_\_\_\_\_

The Staff proposal is exactly the same as the consensus reached by the parties. However, Joint Utilities have recommended adding a sentence stating, "The test plan shall include the verification test procedure(s) published by the manufacturer(s) of the interconnection equipment." The Commission approves this change. It should facilitate the utility's review of the application.

Con Edison proposes that if the customer's completion of construction is delayed, the utility must be able to enforce any new requirements being implemented before the customer can begin operation on an interconnected basis. The Commission will treat this proposal similar to the "grandfathering" issue. The standard interconnection requirements shall in general only apply to units connected after the issuance of this Opinion and Order. In most cases, the standard interconnection requirements should not force retrofits on generator-owners that have already complied with pre-existing utility and other code requirements. The only exceptions would be if the utility can demonstrate to the Commission that the safety and reliability of the electric system will be threatened without a retrofit, or if the preexisting tariff or agreement underlying the approval to interconnect required upgrades upon a change in technical standards.

## Step 10 - Interconnection

The Staff proposal is consistent with the consensus reached by the parties. Joint Utilities, however, believe that the language needs to be revised to provide clarity. The Commission will clarify that the applicant must continue to comply with the contract and the technical requirements after the initial startup and operation.

## Step 11 - Final Acceptance and Utility Cost Reconciliation

The Staff proposal generally follows the language of the consensus reached by the parties, but adds that the applicant may contest the reconciliation of actual costs against the application fee and advance payments. Joint Utilities and Con Edison object to this addition. Capstone would add a time limit of five business days for the utility to review the results of the on-site verification and issue a formal letter of acceptance. Also, if it is agreed that the applicant will purchase dedicated equipment, Capstone would also have those costs reconciled by then. The Commission will reject the objections to the statement, "The applicant may contest the reconciliation." It should be obvious that the applicant must have this right as a check for reasonableness. With regard to setting a time limit, the Commission understands Capstone's desire to provide some certainty to the applicant, however, five business days may be insufficient in all instances to review all the results and to provide a full reconciliation. The time limit here is not critical to the operation of the distributed generation unit. The unit may be operated following the successful completion of the tests in Step 9. Thus, the Commission will not adopt a limit in this case, but again shall direct the utilities to track this data and Staff to monitor actual time frames.

#### INTERCONNECTION REQUIREMENTS

## A. <u>Design Requirements</u>

NRDC and AWEA sought a prohibition on the utility having the freedom to impose additional interconnection requirements in specific instances. In the alternative, NRDC requested that the utility be required to provide an explanation of the specific reliability and safety concerns that warrant modifications or additional equipment. Rochdale requested that if the customer is required to provide additional protection equipment, that the customer be notified in writing of the utility's reasoning and the additional costs payable to the utility. Regarding relay settings, Rochdale sought a requirement

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that utility-specified settings only be permitted where standard practices indicate they are needed, with the utility being required to reference such practices. AWEA requested that the utilities not be allowed to charge for witnessing site verification tests. Plug Power requested that the requirement to "disconnect" in certain instances be replaced by a requirement to "cease transferring power to the utility grid" since it believes that capability can be realized without the inverter physically disconnecting from the grid. Finally, Con Edison recommended that the thresholds for frequency rises specified should be 60.5 Hz and 59.5 Hz.

### Discussion

The Commission believes there may be instances where utility-specified equipment will be required as part of the overall design package because of specific requirements on a section of a utility system. Absent the utility's ability to protect its system on a case-by-case basis the safety of the utility system may be compromised. This may be especially true in those instances where the customer is attempting to attach non-type-tested equipment. Therefore, the Commission will allow the utilities to exercise reasonable engineering judgment in all instances in finalizing the overall design package, but admonish that every utility should, in every instance, make every effort to treat similar situations uniformly. The requests for customer information concerning the reasoning and rationale of the necessity of additional protection equipment are reasonable and the Commission will require that where any specific equipment requirements are imposed by the utility as part of the overall design package, that the utility is to document its reasoning for such requirements.

Regarding Plug Power's change in lieu of "disconnect," the Commission will adopt this change since the objective of the standards is to prevent the transfer of power to the utility grid, and if the inverter technology is such that this can be accomplished and reasonably demonstrated, a total disconnect from

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the utility system would be unnecessary. Regarding thresholds for frequency rises, the Commission notes that a pending standard (IEEE P929) proposes the use of 59.3 Hz and 60.5 Hz and many parties have supported this standard without opposition, therefore the Commission will adopt the standard subject to later review if a different national standard is adopted. It was agreed upon by all the parties that the site verification testing, if necessary, would be an additional charge by the utility. The Commission sees no reason to alter that agreement.

#### B. Operating Requirements

DPCA argued that the technical operating requirements will force a customer's generation unit to trip off line unnecessarily, forcing generation off the system when the system support offered by the generator is needed the most. As to reconnection, DPCA argued that requiring the generator to disconnect for five minutes before reconnecting is too long and is an example of the grid's failure to keep up with technology. DPCA would set a standard of 30 seconds for reconnection after normal voltage and frequency levels have been obtained. DPCA's members are willing to take the risk of being shut down repeatedly because they believe that the number of times that they would be disconnected after reconnecting is minimal and will represent a small percentage of combined total disconnect situations. SRS requested that if the utility locks the disconnect switch open with its own lock, the utility should be required to tag the lock with the name of the individual who locked out the generator and a telephone number to call to inquire about the situation. On the customer side, NRDC requested that distributed generation of 50 kVA and under not be required to provide a 24-hour telephone contact other than the residential or business phone, and Plug Power requested that the requirement be waived altogether. NRDC and Plug Power objected to language in the proposal concerning generation units not operating in parallel with the utility system that would require notice to the utility and design review to ensure non-parallel

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interconnection. Finally, Joint Utilities commented that the proposal authorizes the utility to disconnect a generation unit where it fails to make available records of verification tests and maintenance of its protective devices, but not where a power producer in fact fails to conduct proper verification tests and maintenance.

#### Discussion

The interconnection requirements under consideration herein do not contemplate the generator providing utility system support. In fact, customers will have an absolute right to disconnect their units at any time. Therefore, in reviewing the standards regarding the need for automatic disconnect in certain instances, utility support is not a consideration. DPCA is correct that not all utility systems require the full five minute reconnection time. However, the requirement that the generation unit stay off line for five minutes before reconnecting would cover the requirements of all electric utilities and thus set a statewide standard, allowing certainty for manufacturers and uniformity regardless of location. DPCA's proposed reconnection standard of 30 seconds would require many of the utilities to upgrade their systems to allow for this standard. Without a cost-benefit analysis or other demonstration justifying such an effort the Commission will not contemplate forcing the utilities to upgrade their systems. Regarding lockouts, the Commission agrees with SRS to the extent that the Commission will require that a utility company name and telephone number be provided such that the customer can obtain information about the utility lockout, however, the Commission sees no reason to require the utility to post the name of the individual that locked out the generator. Regarding NRDC and Plug Power's concerns about customer contacts, all customers must provide a 24 hour contact number for use by the utility, regardless of the size of the generation unit, but by this requirement the Commission does not intend to require that an answering service or paging service be provided. Upon review, the Commission agrees with NRDC and Plug

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Power that utility notice and design review regarding distributed generation units that do not operate in parallel with the utility system is beyond the scope of these requirements and is not necessary or appropriate. The inconsistent language has been omitted. Regarding failure to conduct proper verification tests and maintenance, such failure would be a material breach of the contract and in such instance the utility already has a remedy in that upon proper notice and the opportunity to cure it could terminate the contract. The additional remedy proposed by Joint Utilities is unnecessary.

## C. <u>Dedicated Transformer</u>

Many non-utility parties requested that the utility be made to demonstrate the need for a dedicated transformer before requiring one to be purchased and installed. NRDC sought an exemption from any dedicated transformer requirement for distributed generation units of 50 kVA or less.

## Discussion

The Commission agrees with CPB and others that the utility must bear the burden of proof that a dedicated transformer is indeed necessary. The interconnection requirements provide for a written notice and justification to be made by the utility to the applicant. While it is contemplated that in many instances there will be no need for the installation of dedicated transformers, there are also instances where a dedicated transformer will be required to best counterbalance load at the interconnection point. Accordingly, the Commission cannot grant the blanket exemption sought by NRDC.

## D. Disconnect Switch

No substantive comments were received regarding this portion of the technical requirements.

## E. Power Quality

NewEnergy argued that customers whose pre-existing power quality does not comply with the standards of IEEE 519 should not have to bring their power quality up to the full standard just because they are installing a distributed generation unit. Similarly, SRS requested that some discretion be allowed regarding flicker and inrush currents rather than requiring that IEEE standards be met.

### Discussion

Ideally, power quality should always be in compliance with IEEE 519. Voltage drops upon the start-up of equipment that cause lights to momentarily dim (flicker) and inrush currents, the surge of current into a device, if uncontrolled, can damage customer and utility equipment. Distributed generation units can be a source of flicker and inrush problems, and particularly in poor power quality situations, could exacerbate potential problems. The Commission is convinced that compliance with the IEEE 519 standards is necessary to avoid power quality impacts on other customers and the utility distribution system. Therefore, the exceptions proposed would be counter-productive and will not be permitted.

## F. <u>Power Factor</u>

As with power quality discussed above, NewEnergy argued that customers whose pre-existing power factor does not comply with the proposed standard should not have to bring their power factor up to the full standard just because they are installing a distributed generation unit.

## Discussion

The addition of distributed generation units with poor power factors, or in poor power factor situations, may degrade the quality of service for the customer or for other customers. The exception proposed by NewEnergy is not adopted as it might lead to service degradations.

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## G. Islanding

A number of non-utility parties questioned the need for requirements that prevent islanding, especially as concerns smaller distributed generation units. More specifically, NRDC and Plug Power argued that distributed generation units should be exempted from "direct transfer trip" requirements.

### Discussion

In the context of distributed generation, the condition known as "islanding" occurs when power is unavailable from the utility system due to an outage or other interruption, but one or more customers continue to receive power from a local non-utility distributed generation source. The power quality received is not under the direct control of the utility and its protective devices, and may be of a character that it can cause damage to customer or utility equipment. Utility personnel may also be at risk if they are unaware of the generation source and that the lines are energized. Direct transfer trip devices automatically disconnect or shut off distributed generation units when they sense that the utility power source has been interrupted. While direct transfer trip devices are expensive, they are singularly effective in preventing islanding conditions which could be potentially damaging. The interconnection requirements the Commission is approving do not require direct transfer trip devices in every instance, but in appropriate instances the utility should be able to require them. In such instances the utility will be required by the interconnection requirements to demonstrate the specific need for the transfer trip device.

## H. Test Requirements - Waveform Tests

The interconnection requirements provide, in testing, that all single-phase inverters and single-phase voltage and frequency relay packages shall initiate a trip from a waveform generator for certain waveforms to verify they meet the requirements set forth in the design section of the interconnection requirements. AWEA argued that the waveform tests are unique to New York and exceed national standards.

#### Discussion

Contrary to AWEA's arguments, there is a growing consensus nationwide on the efficacy of the waveform tests and they are appropriate. Our understanding is that they are soon likely to become the nationally adopted standard. However, in the event an inconsistent nationwide standard is adopted, the Commission will revisit this issue.

### STANDARDIZED CONTRACT

Our goal in providing for a standardized contract is to minimize disputes between applicants and utilities and to streamline the process for obtaining approval for interconnection of distributed generation units. In developing the standard contract, the Commission weighed and balanced many competing interests. Many parties argued for as simple a contract as possible so as not to discourage potential customers of distributed generation units. While the Commission shares that goal, the contract must also serve as a disclosure tool and clearly set forth the essential elements that will govern the interplay between the customer and the utility so as to provide the customer with a complete understanding of its rights and responsibilities, rather than relying on the customer's ability to ferret out the essential elements in a utility tariff. With that important balance in mind, the contract issues between the parties were resolved as set forth below.

### I. Term and Termination

This portion of the standard contract provides for a five-year term of agreement followed by automatic annual renewals unless thereafter terminated by the utility, or for earlier termination by the utility in cases of default by the customer. The customer can terminate the agreement at any time upon sixtydays' notice to the utility. Many parties objected to the

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limited term of the contract, and in particular, the ability of the utility to terminate the contract essentially at will after the initial five-year term. Azure, DPCA, SRS, and NRDC sought an extension of the term for the useful life of the unit with no contract termination by the utility being allowed except for cause and with Commission approval. In a similar vein, NewEnergy sought elimination of the contract term limitations or an extension of the minimum contract term to at least ten years, and AWEA sought automatic five-year renewals except for just cause. The objectors uniformly argued that a five-year term is insufficient for a customer to obtain a sufficient return on the capital and interconnection costs associated with the generation unit, thereby discouraging the installation of such units, and without a showing of cause, there is no reason to disconnect the unit or end the contract.

Con Edison and Joint Utilities sought clarification that upon any termination of the Agreement, the generating facility would be disconnected from the utility's system. They also sought a provision requiring termination of the contract if the customer's right to delivery service is terminated pursuant to HEFPA and the non-residential rules, as reflected in utility retail tariffs. In addition, Joint Utilities sought summary rights of termination upon a financial default and a provision that the contract be subject to the filing and approval requirements of any federal, state, or local authorities, such as FERC or local code enforcement officials.

#### Discussion

The five-year initial term was modelled after our net metering rules that limited contracts to five-years so as not to create long term obligations for the utilities during a period of industry restructuring. Our primary concern in the case of net metering was not to create long term buy-back contracts for the utilities with the potential for future stranded costs if the transmission and distribution (T&D) companies are further restructured. In this case, the proposed interconnection

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contract does not provide for buy-back of the electricity by the utility. Another possible concern about a long term contract is that the Commission may amend the standard interconnection requirements in the future. For example, if the Commission were to adopt nationwide standards in lieu of our own, which is a very real possibility, the Commission would want the utilities to retain the flexibility to require generation units to upgrade to the new standards. For instance, the Commission may in the future determine that existing generation units should not be grandfathered as to improved safety related standards. Accordingly, the five-year term is dropped, but the utilities will be given the right to terminate the contracts for cause upon proper notice. An upgrade of the standard interconnection requirements by the Commission, if done without grandfathering, shall constitute good cause.

As to whether the standard contract should be clarified that upon any termination of the contract, the generating facility would be disconnected from the utility's system, the Commission agrees that such a clarification is appropriate and the language is so modified. The Commission does not agree, however, that automatic termination of the contract should occur if the customer's right to delivery service is terminated pursuant to HEFPA and the non-residential rules, as reflected in utility retail tariffs. Such terminations are often of short duration and contract termination would be too draconian and in many instances would merely add confusion to an already difficult situation. Because valid delivery service is obviously a prerequisite to interconnection, the interconnection contract will be deemed to be in suspension if the customer's right to delivery service is terminated. Upon reconnection of delivery service, the interconnection contract will automatically resume. Similarly, the Commission does not agree that summary terminations for financial defaults should be allowed. Most. payments are required in advance and there will be little if any harm to the utility in the event of financial default, therefore the sixty-day notice and cure period is reasonable. Finally, the

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proposal to make the interconnection contract specifically subject to the filing and approval requirements of any federal, state, or local authorities would unnecessarily complicate the process and create too much doubt as to the commencement date of the contract. Nothing in the contract supersedes any filing and approval requirements of any federal, state, or local authorities, and Section 8.10 of the contract already specifically requires customers to obtain necessary permits prior to construction and operation. The Commission shall leave it to such authorities to enforce their own provisions, although utilities are encouraged to inform applicants of such requirements, where possible.

### II. Scope of Agreement

This portion of the standard contract makes clear that the contract only relates to conditions for interconnection and operation of certain generation units and does not pertain to the sale of electricity. Con Edison and Joint Utilities sought additional language limiting the scope and adding detailed reference to potential sales agreements to be filed with FERC. Rochdale cautioned that the contract provisions may violate the Public Utility Regulatory Policy Act (PURPA) or the utility's buy back tariff. Finally, NewEnergy sought to expand the scope of the contract to cover the buy-back of excess generated electricity.

### Discussion

The additional language sought by Con Edison and Joint Utilities is unnecessary because it pertains to electric sales agreements that are not the subject of the contract. Similarly, since the contract does not concern electricity sales, either in substance or as a prohibition, Rochdale's concerns about violations of PURPA or the utility's buy back tariff are misplaced. Finally, expansion of the contract to cover exported electricity as requested by NewEnergy would go significantly beyond the scope of matters discussed in the collaborative

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sessions and would require the parties to start all over again before the matter would be ripe for Commission action. The Commission sees no reason to alter this portion of the contract language, therefore it will remain unchanged.

### III. Installation, Operation & Maintenance of the Unit

This portion of the standard contract requires that the distributed generation unit be in compliance with the standard interconnection requirements, provides for observation of the unit by the utility during on-site construction, verification and operation phases, and requires the owners of distributed generation units greater than 10 kVA to pay for certain capital costs and operations and maintenance costs (O&M) of dedicated facilities. Con Edison sought a clarification acknowledging that the customer has a continuing obligation to keep its unit in compliance with the technical requirements for interconnected facilities. Joint Utilities and Con Edison also sought clarification regarding notice prior to verification testing, and Con Edison requested that certain verification testing requirements stated in the interconnection requirements be repeated in the contract. Rochdale argued that the utility should be required by the contract to make a request in writing and specify the basis for the request for all on-site verification of the operation of the distributed generation unit after it commences operation.

Judging by the large number of comments received, the most controversial part of this section dealt with the imposition on customers of O&M costs related to dedicated facilities. Many non-utility parties opposed imposition of such costs, and in particular the amount of such costs as being arbitrary and high enough to create a market barrier. Some sought no imposition of such costs until the Commission examines the overall costs and benefit of distributed generation. Others argued that customers should reimburse utilities only for the actual costs of any necessary maintenance of the dedicated facilities. Still others questioned whether such charges would be duplicative of costs

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embedded in charges paid by customers for back-up and maintenance power. To avoid subsidies by other ratepayers, Joint Utilities sought escalation of the O&M costs over time and argued that owners of units 10 kVA and less should pay O&M costs just like owners of larger units.

### Discussion

The clarification sought by Con Edison is appropriate and the language has been revised to acknowledge that the customer has a continuing obligation to keep its unit in compliance. The Commission sees no reason to repeat the interconnection requirements in the contract as requested by Con Edison, but the Commission has revised the language regarding notice prior to verification testing. The Commission agrees with the Rochdale proposal to the point where the Commission will require a utility exercising its option to observe operation of a unit where it has "a reasonable basis for doing so based on its responsibility to provide continuous and reliable utility service" to specify to the customer the basis for its action.

Regarding O&M charges, the Commission will continue to follow a policy of not subsidizing individual customer units. In the absence of a detailed cost study related to the units in question, it is difficult to establish O&M charges with precision. Given the minimal size and impact of units 300 kVA and less and the likelihood that any O&M costs related to dedicated facilities for such units would be inconsequential, the Commission will apply the general policy by not imposing an O&M charge for such units until such time as we have better cost information.

## IV. Disconnection of the Unit

This portion of the standard contract makes provisions for the utility to disconnect the generation unit in emergencies and certain non-emergency situations. The customer may disconnect the unit at any time. This portion also obligates utilities to cure certain utility operations that are adversely

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affecting the performance of the distributed generation unit. Con Edison and Joint Utilities sought to expand the meaning of "emergency" to include situations where the customer has failed to perform required testing or maintenance and in non-payment situations. Rochdale raised a concern that no emergency disconnection be made unless the utility has first made "every practicable effort to notify the customer prior to disconnection by beeper, telephone or e-mail." In-lieu of disconnection, Joint Utilities sought the right to "install, at the Company's option and at the Customer's cost, corrective measures on the Company's side of the system." Regarding the utility obligation to cure adverse effects, Joint Utilities sought to have the customer pay all the utilities' costs associated with such action, not just capital costs. SRS argued that if the cause of the disruption is a substandard condition or damage to the utility system, repairs or upgrades should be performed at the utility's cost. AWEA argued that customers should not be charged for capital costs associated with correcting distribution system problems that preexist the proposed distributed generation facility. Finally, Joint Utilities submit that they should not be held to a higher standard for timely cures than customers by being required to cure problems immediately while the customers get notice and a reasonable opportunity to cure.

### Discussion

No persuasive arguments have been presented for expanding the meaning of "emergency" to include certain nonhazardous situations. Emergency disconnection is a draconian measure that is only justified in truly hazardous situations. While the Commission sympathizes with the notion that every practical effort should be made to notify the customer prior to disconnection, the Commission recognizes that in most true emergencies it will be necessary to disconnect first and notify later so as to ensure the maximum safety and protection of human life and property. Joint Utilities' proposal to install protective measures at the option of the utility, but at the cost

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of the customer, reeks with the potential for disputes and abuse and is unacceptable. SRS and AWEA raise good points about certain repairs and upgrades, and in order to ensure that the utilities limit imposition of future upgrades at customer cost to the minimum necessary, the Commission has amended the standard contract language to incorporate the points raised by SRS and AWEA. As regards cures, the Commission does not agree that the utilities are being held to a higher standard than customers, although that fact alone, even if true, would not likely be a particular cause for concern. The utilities have around-theclock in-house expertise in these matters whereas the customer will most likely be relying on outside contractors. In addition, the utilities maintain a right of immediate disconnection in the case of an emergency. Therefore, given the respective situations of the parties, the balance of measures proposed is appropriate.

### V. Access

This portion of the standard contract makes provisions for the utility to have access to the customer's premises when necessary in certain situations. Joint Utilities sought additional language to specifically provide access for "disconnection of the unit" and "as authorized under applicable laws, regulations, and tariffs."

## Discussion

The additional language is unnecessary verbiage and will not be included. Section 5.1 of the contract already provides for utility access to the disconnect switch of the unit "at all times" which would include any time the utility is authorized to disconnect the unit. If access is already authorized under applicable laws, regulations, and tariffs, as Joint Utilities claim, nothing in the contract can supersede such legal requirements. Restatement of existing legal requirements would be imprecise and superfluous.

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### VI. Dispute Resolution

This portion of the standard contract makes provisions for the good faith resolution of disputes, mediation in the event of an impasse, and the posting of escrow if the amount in dispute exceeds \$2,000. Many parties raised a concern about the cost and expertise of outside mediators, Joint Utilities questioned the Commission's jurisdiction over contract disputes, and Rochdale suggested that the mediation period be shortened to 30 days for most mediations and that the escrow provision should allow deposits to be provided alternatively by escrow in the form of cash, letter of credit or bond.

#### Discussion

The resources of the Commission will be made available to parties seeking a mediator so as to provide expert mediation at the lowest possible cost. It is anticipated that most disputes will arise over the financial costs to be charged by utilities for services or equipment to be supplied to customers. As to such claims, the Commission has no hesitancy in exercising its jurisdiction over such disputes. The 90-day mediation period sets a reasonable outside limit for the length of mediation and the Commission shall monitor to ensure that the time period is not abused. Many mediations should be capable of resolution within 30 days, as proposed by Rochdale, and the Commission encourages parties to do their utmost to work out their differences expeditiously. Bonds present collection problems not inherent in cash or letters of credit, and should not be permitted. Irrevocable standby letters of credit will be permitted as escrow in lieu of posting cash.

## VII. <u>Insurance</u>

This portion of the standard contract makes provisions for insurance. For generation units of 10 kVA or less, it is proposed that the customer need only provide proof of at least \$100,000 in liability coverage through a homeowner's or a commercial insurance policy, the same requirement in effect for

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net-metering. For larger generation units, the customer must provide the utility company with a certificate of insurance demonstrating \$1,000,000 in coverage and naming the utility company as an additional insured. While some parties complained that any insurance requirement was onerous given the cost of insurance, many questioned the 10 kVA cut-off point and sought to raise that point up to 50 kVA or to provide intermediate levels of insurance requirements. On the other hand, the utility parties complained that all the insurance provisions were insufficient given their exposure to claims and urged a universal requirement of \$2 million to \$3 million with various detailed requirements regarding coverages and notices to prevent ratepayer subsidization of claims.

#### Discussion

Given the risk of harm inherent in electric generation units and the inexperience of the public with such units, it is not unreasonable for the Commission to require some minimal level of insurance. If interconnected or operated improperly, such units could easily be the cause of personal injury or property damage. DPCA's analogy to the potential risk of surges created by large electric motors does not dissuade the Commission from an insurance requirement for units specifically intended to generate electricity. The Commission will make the \$100,000 requirement applicable to small units of 15 kVA or less as a minimal requirement and one most likely already in place for the average reasonably-responsible small property owner or tenant. Most residential, small commercial, non-profit or family-farming customers should qualify for the lesser requirements. The \$1,000,000 requirement for larger generation units reflects that such larger units would only be installed by tenants or owners of substantially larger properties for which \$1,000,000 of coverage and the associated premiums are not more than a minimal amount and again is most likely already in place for the average reasonably-responsible larger property owner or tenant. Similarly, the certificate of insurance and related requirements

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for these more substantial properties are not onerous or unusual. For the sake of simplicity, the Commission declines to provide for more intermediate levels of insurance, particularly the sliding scale approach offered by some parties, as too confusing for customers. The more detailed coverage and notice requirements proposed by the utility parties are too overbearing to be adopted.

#### VIII. Miscellaneous Provisions

This portion of the standard contract includes provisions that commonly are referred to as "boilerplate" provisions that clarify the rights of the contract parties, particularly as those rights relate to third-parties. Joint Utilities and Con Edison sought inclusion of a new provision stipulating that the parties agree to submit to the personal jurisdiction and venue of the Courts in the State of New York, yet Con Edison also sought an additional seemingly inconsistent provision that would exclude the use of New York conflict of law Joint Utilities supported the provision on assignment to rules. corporate parties as it relates to customers, but not as it relates to utility companies. Regarding assignment to individuals, Joint Utilities sought a requirement that any individual assignee must first be a customer in good standing with the utility under its retail tariff. Con Edison urged that utilities be exempted from liability for damage or losses except to the extent attributable to the utility's gross negligence or willful misconduct. Joint Utilities agreed with Con Edison and sought an additional provision limiting their liability to direct damages. Con Edison and Joint Utilities also sought indemnification provisions, including reimbursement of attorneys fees. Finally, Joint Utilities requested the inclusion of a representations and warranties section.

#### Discussion

The Commission sees no reason to resolve most of the issues raised by Con Edison and Joint Utilities. The protections

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sought by the utilities appear to be one-sided and in many cases unnecessary and overzealous. It is difficult at this time to anticipate the types of claims that may arise out of the installation of small distributed generation units, but the risks involved are inherently less of a concern than those involved in large-scale independent power producer contracts from which these provisions were derived. The Commission is content at this time to leave these commercial concerns regarding liability and indemnification to private actions for resolution. The type of blanket immunity sought by the utilities does not appear to be necessary, and given our inexperience and uncertainty over the types of claims that may arise, would be an inappropriate imposition of our authority at this time. Regarding assignment issues, the Commission agrees with Joint Utilities regarding assignments to corporations and have revised the language to apply only to customer assignments, but do not agree that any individual assignee must first be a customer in good standing with the utility under its retail tariff. Obviously, if the assignee does not obtain delivery service the interconnection contract is of little value, but in terms of timing of any assignment Joint Utilities' proposal adds unnecessary complications and is not adopted. Finally, the proposed section on representations and warranties would merely restate the obvious and would add little if anything of substance to the contract and is not adopted as unnecessary verbiage.

#### ADDITIONAL COMMENTS

In addition to the request for comments on the standard interconnection requirements, the parties were asked to comment on other issues related to the costs and benefits of distributed generation, the cost of standby or back-up service, and the need to revise the previously adopted "Appendix B" requirements<sup>1</sup>

<sup>&</sup>lt;sup>1</sup> Cases 97-E-1951, <u>et al</u>., Order on Net Metering of Residential Photovoltaic Generation, Appendix B (Issued February 11, 1998).

applicable to net metering of residential photovoltaic generation.

#### A. <u>Demand Ratchets</u>

DPCA and others argued that a customer should not be required to pay for retail tariff changes that arise out of the requirement that a tripped generation unit not come back on line for five minutes. According to DPCA, where a 15-minute demand interval is in effect, a five-minute delay in restarting could produce demand charges in excess of 30% of the incremental load taken from the grid representing a substantial penalty to the generator that could exceed the cost of appropriately priced back-up service.

#### Discussion

The efforts in this proceeding did not originally contemplate resolving back-up charges, and thus, no cost data was developed that would allow the Commission to form a basis for a decision on back-up charges. In addition, it is noted that there will be no easy solution to the issue as presented because there is currently no sensing equipment to simultaneously record periods of forced outage and customer usage during such periods. A more detailed exploration of this issue would be necessary before the Commission could resolve it.

#### B. <u>Costs, Benefits and Rates</u>

The parties provided various comments on such issues as cost of back-up power; system benefits of distributed generation; unbundling of tariffs to avoid double payment of interconnection costs, if such exists; and consideration of a methodology to assure that distributed generation is considered as an alternative to T&D upgrades. DPCA, NRDC, Capstone, Con Edison, Joint Utilities, NewEnergy, and CPB all submitted suggestions for development of a Phase II proceeding for distributed generation. In varying degrees, each of them suggested issues for Phase II in the area of costs, benefits, further technical interconnection requirements, and tariff issues.

#### Discussion

In general, these comments paralleled each other and were somewhat overlapping, although new issues were raised that Staff had not contemplated such as dispatch of distributed generating units under 300 kVA by the distribution utility. The Commission appreciates the time the parties have taken to outline what they believe are issues for a Phase II proceeding and note that provision will be made for such a proceeding in a separate order.

#### C. Revisions to Photovoltaic Interconnection Standards

In their additional comments, the parties identified two technical revisions that should be made to the Photovoltaic Interconnection Standards for residential solar electric power producing facilities of 10 kW or less. The first is a change to the thresholds for frequency rises to conform to those being approved generally for distributed generation units and the pending national standard. The second is a change to the typetesting requirements to conform to the more specific requirements being approved for distributed generation units.

#### Discussion

Both changes are appropriate as part of our overall effort to standardize and streamline interconnection requirements and for the reasons discussed above for distributed generation in general. The new type-testing procedures will provide the same results as the ESEERCO wave forms tests they replace in a manner that is simpler to apply and requiring less complicated equipment. The Photovoltaic Interconnection Standards, with the revisions approved herein fully incorporated, are attached as Appendix B.

#### STATE ENVIRONMENTAL QUALITY REVIEW ACT EVALUATION AND FINDINGS

In conformance with the State Environmental Quality Review Act (SEQRA), the Commission issued on May 20, 1996, a Final Generic Environmental Impact Statement (FGEIS), which evaluated the actions adopted in this Case 94-E-0952. The Commission also required individual utilities to file an environmental assessment of their restructuring proposals.<sup>1</sup> Each restructuring proposal was thereafter approved by the Commission with environmental disclosure as a component. In conjunction with our decision herein regarding interconnection requirements, and considering all factors, the potential environmental impacts of the interconnection requirements adopted are found to be within the bounds and thresholds evaluated in the FGEIS and contemplated by our individual decisions on the restructuring proposals. Therefore, no further SEQRA action is necessary.

#### CONCLUSION

Staff's proposal regarding standardized interconnection requirements, as modified above, developed in significant collaboration with the parties, is a feasible, streamlined approach to providing for customer interconnection of distributed generation units. The proposal achieves our goal of

<sup>1</sup> Cases 96-E-0987, 96-E-0916, 97-E-0029 and 97-E-0032, Opinion and Order Adopting Terms of Settlement Subject to Conditions and Understandings, Opinion No. 97-16 (issued November 3, 1997) at Appendix C, p. 8; Case 96-E-0900, Opinion and Order Adopting Terms of Settlement, Opinion No. 97-20 (issued December 31, 1997) at Appendix, p. 6; Case 96-E-0898, Opinion and Order Adopting Terms of Settlement Subject to Conditions and Changes, Opinion No. 98-1 (issued January 14, 1998) at Appendix C, p. 7; Cases 96-E-0891, 93-E-0960 and 94-M-0349, et al., Opinion and Order Adopting Terms of Settlement Subject to Modifications and Conditions, Opinion No. 98-6 (issued March 5, 1998) at Appendix C, p. 18; Cases 94-E-0098 and 94-E-0099, Opinion and Order Adopting Terms of Settlement Agreement Subject to Modifications and Conditions, Opinion No. 98-8 (issued March 20, 1998) at Appendix C, p. 27; and Case 96-E-0909, Opinion and Order Adopting Terms of Settlement Subject to Modifications and Conditions, Opinion No. 98-14 (issued June 30, 1998) at Appendix D, p. 19.

standardizing technical requirements and application procedures, which will, in turn, lead to greater customer choice in energy supply. It is adopted as modified above. Staff of the Department of Public Service shall monitor utility activities in this regard and report its findings to the Commission whenever appropriate. The photovoltaic revisions are also adopted as appropriate refinements.

#### The Commission orders:

Central Hudson Gas & Electric Corporation, 1. Consolidated Edison Company of New York, Inc., New York State Gas & Electric Corporation, Niagara Mohawk Power Corporation, Orange and Rockland Utilities, Inc., and Rochester Gas & Electric Corporation are directed to make tariff filings to incorporate into their electric tariffs the Standard Interconnection Requirements and revised Photovoltaic Interconnection Standards set forth in the appendices to this Order, and to remove any inconsistent tariff provisions. The tariff amendments shall become effective on a temporary basis on not less than one day's notice, to take effect on or before February 1, 2000. These amendments shall not become effective on a permanent basis until approved by the Commission. The requirement of Section 66(12) of the Public Service Law as to newspaper publication of these amendments is waived.

2. The above listed electric utilities are directed to maintain logs of interconnection activity, including written justifications for requirements in certain instances, as described in the body of this Order, and to make such logs available for inspection to Staff on demand.

3. The requirements approved herein do not supersede the existing statewide requirements for interconnection and net metering of photovoltaic systems except as specifically set forth in Appendix B of this Order.

4. Nothing herein will preclude the Commission from considering the adoption of any future national standards related

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to the interconnection of distributed generation at an appropriate time.

5. This Order does not address the costs, benefits, and other rate issues regarding distributed generation except as specifically described in the body of this Order. Those issues will be addressed in a separate undertaking.

6. This proceeding is continued.

By the Commission,

(SIGNED)

DEBRA RENNER Acting Secretary CASE 94-E-0952

<u>APPENDIX\_A</u>

# NEW YORK STATE STANDARDIZED INTERCONNECTION REQUIREMENTS, APPLICATION PROCESS, CONTRACT & APPLICATION FORMS FOR NEW DISTRIBUTED GENERATORS, 300 KILOVOLT - AMPERES OR LESS, CONNECTED IN PARALLEL WITH RADIAL DISTRIBUTION LINES

New York State Public Service Commission December, 1999

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## I. Application Process

### Application Process Steps for the Interconnection of New Distributed Generation Units of 300 kVA or Less Connected to Radial Distribution Lines

#### Introduction

This section provides a framework for processing applications to interconnect new distributed generation facilities with a nameplate rating of 300 kVA or less (aggregated on the customer side of the point of common coupling) connected in parallel to radial distribution feeders.<sup>1</sup> Generation not operating in parallel 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. The section will also provide applicants with understanding of the process and information required to permit 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<sup>2</sup> 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 nondiscriminatory 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.

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.

<sup>&</sup>lt;sup>1</sup>See Glossary for definition.

<sup>&</sup>lt;sup>2</sup>See Glossary for definition.

# **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 files an application. The filing must include the completed standard application form and a non-refundable \$350 application fee. There will be no application fee for units with a total rating of 15 kVA or less. (If the applicant proceeds with the project to completion, the application fee will be applied as a payment by the applicant to the utility's total cost for interconnection.) 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. Several exchanges of information between the utility and applicant might occur until the application has been completed according to the standardized interconnection requirements.

# STEP 4 - Utility Initiates a Coordinated Electric System Interconnection Review and Develops a Cost Estimate.

The utility initiates a Coordinated Electric System Interconnection Review<sup>1</sup> and informs the applicant of the utility's necessary system additions/modifications and of contractual requirements for interconnection. The utility will provide the applicant with a written assessment of the technical feasibility of the proposed interconnection, a preliminary schedule, and a good-faith, detailed estimate of the interconnection costs. Contract elements might include a parallel interconnection agreement, coverage of interconnection costs, requirements for design, and O&M specifications. A full Coordinated Electric System Interconnection Review will not be required in all instances.

A full Coordinated Electric System Interconnection Review may need to be performed by the utility to determine if the generation on the circuit results in any relay coordination, fault current, and/or voltage regulation problems. A full Coordinated Electric System Interconnection Review 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 utility should complete its Coordinated Electric System Interconnection Review within 4 weeks (20 business days) for the interconnection of units of 15 kVa or less and within 8 weeks (40 business days) for larger units.

The utilities will review application-screening processes, as they are developed nationally, to minimize the cost of these studies.

## STEP 5 - Applicant Commits to the Utility's Review of the Applicant's Proposed Interconnection Design Package.

The applicant is required to:

- submit a detailed interconnection design package;
- provide the utility with a cost-based advance payment for the utility's reviews including for the Coordinated Electric System Interconnection Review not covered by the application fee and for the utility review of the proposed interconnection design package, and

<sup>&</sup>lt;sup>1</sup>See Glossary for definition.

- confirm with the utility a mutually agreeable schedule for the project based on the applicant's work plans and the discussions held in STEP 4.

It may take several exchanges of information between the utility and the applicant until the design package has been completed according to the technical requirements for interconnection.

# STEP 6 - Utility Performs a Review of Applicant's Proposed Interconnection Design Package.

The utility will:

- conduct a review of the design package to ensure that the plans/design satisfy the goal of attaining a safe, reliable, and efficient interconnection and satisfy the technical requirements for interconnection;
- upon completion of the review, notify the applicant of its final acceptance of the applicant's design or an explanation of the technical requirements the design fails to meet. In addition, this notice will include any sitespecific test requirements applicable to STEP 9.

For type-tested systems, the utility will complete its review in ten (10) business days. For non-type-tested systems the utility will complete its review in 4 weeks (20 business days).

## STEP 7 - Applicant Commits to Utility Construction of Utility's System Modifications

The applicant will:

- execute a standardized interconnection contract; and
- provide the utility with an advance payment for the utility's estimated costs associated with system modifications, metering, and on-site verification. (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 4.

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 5.

# STEP 9 - The Applicant's Facility is Tested in Accordance With the Standard Interconnection Requirements.

The applicant will develop a written testing plan to be submitted to the utility for review and acceptance. The test plan shall include the verification test procedure(s) published by the manufacturer(s) of the interconnection equipment. This testing plan will be designed to verify compliance of the facility with the applicant's utility-accepted drawings and details of the interconnection. The final testing will include testing in accordance with the standardized interconnection requirements and the 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.

## 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/or technical requirements.

## STEP 11 - Final Acceptance and Utility Cost Reconciliation

Within a reasonable time 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. 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. The applicant may contest the reconciliation.

## **II.** Interconnection Requirements

## A. Design Requirements

#### 1. Common

The generator-owner shall provide appropriate protection and control equipment, including an interrupting device, that will disconnect<sup>1</sup> 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 disconnecting the generation upon detection of an islanding<sup>2</sup> condition and upon detection of a utility system fault.

The generator-owner's protection and control scheme shall be designed to allow the generation, at steady state, to operate only within the limits specified in this proposal for frequency and voltage. Upon request from the utility, the generator-owner shall provide documentation detailing compliance with the requirements set forth in this proposal.

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 generatorowner'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 interrupting device(s) sized to meet all applicable local, state and federal codes and operated by over and under voltage protection (installed in each phase and wired phase to ground), as well as additional loss of phase protection. The interrupting device(s) shall also be operated by over and under frequency protection.

- The interrupting device shall automatically initiate a disconnect sequence from the utility system within six (6) cycles if the voltage falls below 60 V rms phase to ground (nominal 120 V rms base) on any phase.
- The interrupting device shall automatically initiate a disconnect sequence from the utility system within two (2) seconds if the voltage rises above 132 V rms phase to ground or falls below 104 V rms phase to ground (nominal 120 V rms base) on any phase.

<sup>2</sup>lbid.

<sup>&</sup>lt;sup>1</sup>See Glossary for definition.

- The interrupting device shall automatically initiate a disconnect sequence from the utility system within two (2) cycles if the voltage rises above 165 V rms phase to ground (nominal 120 V rms base) on any phase.
- The interrupting device shall automatically initiate a disconnect sequence from the utility system within six (6) cycles if the frequency rises above 60.5 Hz or falls below 59.3 Hz.

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.

To avoid out-of-phase reclosing, the design of the generator-owner's protection and control scheme shall take into account the utility practice of automatically reclosing the feeder without synchronism check as quickly as 12 cycles after being tripped.

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 be connected with utility revenue metering.

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

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

## 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.

## 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 point of common coupling is acceptable based on current inrush limits. The same requirements also apply to induction generation connected at or near synchronous speed because a similar voltage dip is present due to an inrush magnetizing current. The generator-owner shall submit number of starts per specific time period and maximum starting kVA draw data for the utility to verify that the voltage dip due to starting is within the visible flicker limits as defined by IEEE 519-1992, Recommended Practices and Requirements for Harmonic Control in Electric Power Systems (IEEE 519)".

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 point of common coupling<sup>1</sup>, the utility will review these measures and may require the customer to install additional equipment.

## 4. DC 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.

Line-commutated inverters do not require synchronizing equipment if the voltage drop is determined to be acceptable, as defined in Section IV(E), Power Quality, of this document. Self-commutated inverters of the utility-interactive type shall synchronize to the utility. Stand-alone, self-commutated inverters shall not 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.

# 5. Metering

The need for additional 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.

<sup>&</sup>lt;sup>1</sup>See Glossary for definition.

## **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.

The generator-owner shall not supply power to the utility during any outages of the system that serves the point of common coupling. 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.

Generation that does not operate in parallel with the utility's system is not subject to these requirements.

The disconnect switch<sup>1</sup> specified in Section IV(D) of this proposal 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.

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 power producer has failed to make available records of verification tests and maintenance of its protective devices;
- b. A power producer's system interferes with utility equipment or equipment belonging to other utility customers;
- c. A power producer's system is found to affect quality of service of 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.

<sup>&</sup>lt;sup>1</sup>See Glossary for definition.

Following a generation facility disconnect as a result of a voltage or frequency excursion, 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.

A utility may require direct transfer trip (DTT)<sup>1</sup> whenever: 1) the minimum load to generation ratio on a circuit is such that a ferroresonance condition could occur; 2) it is determined that the customer's protective relaying may not operate for certain conditions or faults and/or 3) the installation could increase the length of outages on a distribution circuit or jeopardize the reliability of the circuit. The utility will be required to demonstrate the need for DTT.

# C. Dedicated Transformer<sup>2</sup>

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 dedicated 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.

## 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.

<sup>&</sup>lt;sup>1</sup> See Glossary for definition.

<sup>&</sup>lt;sup>2</sup> Ibid.

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, or the location and nature of the distributed power disconnection switches 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 IV(B) of this proposal.

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 point of common coupling. In addition, any voltage flicker 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 power factor, as measured at the point of common coupling, 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 point of common coupling 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 radial distribution circuits. The requirements listed in this document are designed and intended to prevent islanding.

### H. Test Requirements

This section is divided into type-testing and verification testing. Type-testing is performed or witnessed once by an independent testing laboratory for a specific protection package. Once a package meets the type-test criteria described in this section, the design is accepted by all New York State utilities. If any changes are made to the hardware, software, firmware, or verification test procedures, the manufacturer must notify the independent testing laboratory to determine what, if any, parts of the type-testing must be repeated. 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. Verification testing is site-specific, periodic testing to assure continued acceptable performance.

Type-testing results shall be reported to the New York State Department of Public Service. Department staff shall review the test report to verify all the appropriate tests have been performed. The Department of Public Service will maintain a list of equipment that has been type-tested and approved for interconnection in New York State. The list will contain discrete protective relays as well as inverters with integrated protection and control. 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 (if applicable).

These test procedures 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 relays, frequency relays, synchronizing relays, reverse current or power relays, and anti-islanding schemes. Testing of relays or devices associated specifically with protection or control of generating equipment is recommended, but not required unless they impact the interface protection.

At the time of production, all interconnecting equipment including inverters and discrete relays must meet or exceed the requirements of ANSI/IEEE Standards C37.90.1-1989, IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems, or the most current version or one year after the issuance of the revised standard, but not earlier than one year after the commercial availability of test equipment required to demonstrate conformance.

# 1. Type Testing

All interface equipment must include a type-testing procedure as part of the documentation. Except for the case of small single-phase inverters discussed below, the type-testing must determine if protection settings meet these requirements. The independent testing laboratory shall conduct the test prescribed by the manufacturer to determine if it has been satisfactorily completed.

Prior to testing, all batteries shall be disconnected or removed for a minimum of ten (10) minutes. This test is to verify the system has a non-volatile memory and that protection settings are not lost. A test shall also be performed to determine that failure of any battery not used to supply trip power will result in an automatic shutdown.

## a. Single-Phase Inverters

All single-phase inverters shall be non-islanding inverters as defined by IEEE P929. Inverters 10kW and below shall at the time of production meet or exceed the requirements of IEEE P929 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 the design section of this document.

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

Waveform 2 – A 120 V rms 60 Hz sinusoidal that drops in voltage to 103 V rms for 120 cycles beginning and ending at a zero crossing and resuming to 120 V rms for five minutes.

Waveform 3 – A 120 V rms 60 Hz sinusoidal that rises in voltage to 133 V rms for 120 cycles beginning and ending at a zero crossing and resuming to 120 V rms for five minutes.

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

Waveform 5 - A 120 V rms 60 Hz sinusoidal that drops in frequency to 59.2 Hz for six (6) cycles beginning and ending at a zero crossing and resuming to 60 Hz for five minutes.

Waveform 6 - A 120 V rms 60 Hz sinusoidal that rises in frequency to 60.4 Hz for six (6) cycles beginning and ending at a zero crossing and resuming to 60 Hz for five minutes.

Waveform 7 - A 120 V rms 60 Hz sinusoidal that drops in voltage to 103 V rms for 120 cycles beginning and ending at a zero crossing, resumes to 120 V rms for 1 minute, rises in frequency to 60.4 Hz for six (6) cycles beginning and ending at a zero crossing, resumes to 60 Hz for 1 minute, drops in voltage to 103 V rms for 120 cycles beginning and ending at a zero crossing and resumes to 120 V rms for 5 minutes.

Each waveform test shall be repeated ten (10) times. Failure to cease to export power for any one run constitutes failure of the 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.

## b. Three-Phase Inverters

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:

Waveform 1 - A three-phase sinusoidal operating at 60 Hz and 120 V rms interrupted by phase A voltage depressed to 59 V rms for six (6) cycles beginning and ending at a zero crossing while B and C phases continue at 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 59 V for six cycles.

Waveform 2 – A three-phase sinusoidal operating at 60 Hz and 120 V rms interrupted by phase A voltage depressed to 59 V rms for six (6) cycles beginning and ending at a zero crossing while B and C phases are increased to 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 120 V rms interrupted by phase A voltage depressed to 103 V rms for two seconds (120 cycles) beginning and ending at a zero crossing while B and C phases continue at 120 V rms. Repeat the same test with B and C phases depressed to the same level and for the same duration. Waveform 4 – A three-phase sinusoidal operating at 60 Hz and 120 V rms interrupted by phase A voltage increased to 133 V rms for two seconds (120 cycles) beginning and ending at a zero crossing while B and C phases continue at 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 120 V rms interrupted by phase A voltage increased to 166 V rms for two seconds (120 cycles) beginning and ending at a zero crossing while B and C phases continue at 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 120 V rms interrupted by phase A voltage increased to 166 V rms for two cycles beginning and ending at a zero crossing while B and C phases are decreased to 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.

Waveform 7 – A three phase sinusoidal operating at 60 Hz and 120 V rms interrupted with six (6) cycles of 59.2 Hz beginning and ending at the zero crossing on A phase.

Waveform 8 – A three-phase sinusoidal operating at 60 Hz and 120 V rms interrupted with six (6) cycles of 59.2 Hz beginning and ending at the zero crossing on B phase and with A and C phase voltages depressed to 70 V rms beginning and ending at the same point of discontinuity.

Waveform 9 - A three-phase sinusoidal operating at 60 Hz and 120 V rms interrupted with six (6) cycles of 60.4 Hz beginning and ending at the zero crossing on A phase.

Waveform 10 – A three-phase sinusoidal operating at 60 Hz and 120 V rms interrupted with six (6) cycles of 60.4 Hz beginning and ending at the zero crossing on C phase and with A and B phase voltage depressed to 70 V rms beginning and ending at the same point of discontinuity.

Each three-phase waveform test shall be repeated ten (10) times. Failure to trip for any one run constitutes failure of the 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. Alternatively, three-phase inverters with integrated protection and control may be tested with a generator to simulate abnormal utility voltages. The tests shall include:

Test 1: With the generator and inverter output stabilized at 60 Hz and 120 V rms and the inverter output between 0.5 and 1.0 per unit power, ramp the generator voltage up to 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 137 V rms. The inverter must cease to export power within two seconds (120 cycles) of the first half-cycle reaching 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 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 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 55 V rms on A phase of the inverter or below 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 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 120 V rms and the inverter output between 0.5 and 1.0 per unit power, ramp the generator voltage down to 103 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 99 V rms. The inverter must cease to export power within two seconds (120 cycles) of the first half-cycle reaching 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 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 103 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 99 V rms on A phase of the inverter, or

below 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 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 120 V rms and the inverter output between 0.5 and 1.0 per unit power, ramp the generator frequency up to 60.4 Hz at a rate no greater than 0.5 Hz per second. Measure and record the frequency and voltage. The voltage must remain between 115 V rms and 125 V rms and the frequency must not exceed 60.6 Hz. The inverter must cease to export power within six cycles of the frequency exceeding 60.4 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 120 V rms and the inverter output between 0.5 and 1.0 per unit power, ramp the generator frequency down to 59.2 Hz at a rate no greater than 0.5 Hz per second. Measure and record the frequency and voltage. The voltage must remain between 115 V rms and 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 59.2 Hz (8.22 ms between zero crossings). Repeat the test with the inverter output below 0.1 per unit power.

Test 1 through 6 above shall be repeated five (5) times. Failure to cease to export power for any one run where the frequency and voltage are recorded and fall outside of the accepted limits shall constitute failure of the test. Following at least one run of each test group, the generator is to remain running to verify that the inverter does not automatically reconnect until after five (5) minutes of continuous normal voltage and frequency.

It is not necessary to perform the 165 V rms test, the 132 V rms unbalanced voltage test, or the anti-islanding test on three phase inverters.

## 2. Verification Testing

Upon initial parallel operation of a generating system, or any time interface hardware or software is changed, a verification test must be performed. A licensed professional engineer or otherwise 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 performed.

Verification testing shall be performed 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 rated 15 kVA and below may be verified once per year as follows: once per year, 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.

**Coordinated 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 proposal.

**Dedicated Service Transformer or Dedicated Transformer** – A transformer with a secondary winding that serves only one customer.

**Direct Transfer Trip (DTT)** - 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.

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

**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.

**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, draft 9].

**Point of Common Coupling (PCC)** – The point at which the electric utility and the customer interface occurs. Typically, this is the customer side of the utility revenue meter. [Adopted from IEEE 929, draft 9].

**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.

**Type-tested** - A protection device or system that has been certified by a qualified independent testing laboratory as to meeting the requirements listed in the testing section of this proposal is considered "type-tested". Type-testing will typically be sponsored by equipment manufacturers.

#### NEW YORK STATE STANDARDIZED CONTRACT FOR INTERCONNECTION OF NEW DISTRIBUTED GENERATION UNITS WITH CAPACITY OF 300 kVA 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 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 less than 300 kVA 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.

## 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 onsite 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 betwwen 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 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 Units of 15 kVA or Less:** If the Customer's Unit has a nameplate rating of 15 kVA or less, the Customer shall demonstrate prior to the date on which the Unit is first placed into operation, and continuing during the term of this Agreement, the underwriting of at least \$100,000 in liability coverage through a homeowner's or commercial policy issued by an insurer licensed to do business in the State of New York.

**7.2 Units Greater Than 15 kVA:** If the Customer's Unit has a nameplate rating greater than 15 kVA, the Customer, at its cost and expense, shall maintain and keep in

full force and effect, for the term of this Agreement, General Liability Insurance with minimum per occurrence limits of liability of \$1,000,000, subject to the following:

- a. The Company, its directors, officers, agents, and employees, shall be named as additional insureds.
- b. Provisions will be included stating that the policy will respond to claims or suits by additional insureds against the Customer or any other insured thereunder.
- c. The policy will be issued by an insurer licensed to do business in the State of New York.
- d. The insurance carrier shall notify the Company of any material change in, or cancellation of, any of the insurance required hereunder at least thirty (30) days prior to the effective date of any such change or cancellation.
- e. Prior to the date on which the Unit is first placed into operation, and continuing during the term of this Agreement, the Customer shall provide a certificate of insurance verifying the existence of insurance coverages in compliance with the requirements of this Agreement.

## 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 or devices or devices or devices or devices appurtenant thereto.

CASE 94-E-0952

# ACCEPTED AND AGREED:

Customer: \_\_\_\_\_

Date: \_\_\_\_\_

Company: \_\_\_\_\_

Date: \_\_\_\_\_
NEW YORK STATE STAN	DARIZED APPLICATION CHMENT 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 Service Character: ()Single Phase (	Voltage:Volts Dnly			
Location of Generator on Property: (include address if different from customer a	ddress)			
Generator Information: Manufacturer: Model No ( )Synchronous ( )Induction ( )Inverse Rating:kW Rating: Generator Connection: ( )Delta ( )W Type Tested: ( )Yes, Documentation_ ( )No Interconnection Voltage:Y One Line Diagram attached: ( )Yes	erter ( )Other :kVA /ye ( )Wye Grounded /volts			

CASE 94-E-0952

# Signature:

CUSTOMER SIGNATURE

TITLE

DATE

NEW YORK STATE STANDARIZED APPLICATION FOR ATTACHMENT OF PARALLEL GENERATION EQUIPMENT 300 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 Secondary 3 Phase Transformer Connection ()Wye ()Delta Location of Generator on Property: (include address if different from customer address)				
Generator Information: Manufacturer: Model No ( )Synchronous ( )Induction ( )Inver Rating:kW Rating: Rated Output:VA Rated V Rate Frequency:Hertz Rated Efficiency:% Power Fac Rated Current:Amps Locked Synchronous Speed:RPM Win Min. Operating Freq./Time: Generator Connection: ( )Delta ( )Wy	rter ()Other /oltage:Volts Speed:Volts stor:% d Rotor Current:Amps ding Connection:			

Type Tested: ()Yes, Documenta	tion_	
( )No		
One Line Diagram attached: ()Y	es	

## 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 <sub>d</sub> )ohms		
Direct-axis Transient Reactance (X'd)ohms		
Direct-axis Sub-transient Reactance (X <sup>"</sup> <sub>d</sub> )ohms		
-		
Induction Machines:		

# For

Rotor Resistance	(R <sub>r</sub> )	ohms	Exciting CurrentAmps
Rotor Reactance	(X <sub>r</sub> )	ohms	Reactive Power Required:
Magnetizing Reactance	(X <sub>m</sub> )	ohm	nsVARs (No Load)
Stator Resistance	(R <sub>s</sub> )	ohms	VARs (Full Load)
Stator Reactance	(X <sub>s</sub> )	ohms	
Short Circuit Reactance	(X" <sub>d</sub> )	ohms	s Phases:
Frame Size:	Des	ign Lett	ter: ()Single
Temp. Rise:	°C.		()Three-Phase

## For Inverters:

Manufacturer:	Model:	
Туре: (	)Forced Commutated	()Line Commutated
Rated Output:	Amps	Volts
Efficiency:	%	

# Signature:

CUSTOMER SIGNATURE

TITLE

DATE

### <u>APPENDIX\_B</u>

### PHOTOVOLTAIC INTERCONNECTION STANDARDS FOR RESIDENTIAL SOLAR ELECTRIC POWER PRODUCING FACILITIES OF 10 kW OR LESS (Revised: December 1999)

Technical Requirements For Interconnecting Residential Photovoltaic Power Producing Facilities 10 kW or Less, Single Phase, 600 Volts or Less, In Parallel With a Utility System

#### 1. <u>Design Requirements</u>

- A. The power producing facility shall be tested by a nationally recognized testing laboratory and conform to all applicable local, state and federal building codes and National Standards and any authorities having jurisdiction.
- B. The power producing facility shall have an automatic switching device operated by over and under voltage protection and over and under frequency protection:
  - 1) The power producing facility shall automatically disconnect from the utility system within six cycles if the voltage falls below 60 volts (nominal 120 volt base) at the inverter interface point.
  - 2) The power producing facility shall automatically disconnect from the utility system within two seconds if the voltage rises above 132 volts or falls below 104 volts (nominal 120 volt base) at the inverter interface point.
  - The power producing facility shall automatically disconnect from the utility system within two cycles if the voltage rises above 180 volts (nominal 120 volt base) at the inverter interface point.
  - 4) The power producing facility shall automatically disconnect from the utility system within six cycles if the frequency rises above 60.5 Hertz or falls below 59.3 Hertz at the inverter interface point.
  - 5) Following a power producing facility disconnect as a result of a voltage or frequency excursion as stated in Section (1)(B)(1-4) above, the power producing facility shall remain disconnected until the utility service voltage has recovered to utility acceptable voltage and frequency limits for a minimum of five minutes.

- 6) The above set points shall not be changed or modified by the power producing facility owner or representative.
- 7) All devices or systems used for voltage and frequency measurement and automatic disconnection shall be type tested by the manufacturer for both static and dynamic performance. Type testing requirements for photovoltaics may be found in the <u>New York Standardized Interconnection</u> <u>Requirements for New Distributed Generators 300 Kilovolt-Amperes or Less, Connected in Parallel with Radial Distribution Lines</u> under "Test Requirements, Type Testing." Proof of proper performance shall be in the form a certified test report. At the time of production, design and performance must meet or exceed requirements of ANSI/IEEE Standards C37.90.1 and 929. If the power producing facility does not comply with these requirements, utility grade protective relays, approved by the utility, are required.

#### 2. <u>Manual Disconnect Device</u>

- A. The power producing facility shall be capable of being isolated from the utility system by means of an external, manual, visible load break, disconnecting switch installed by the owner of the power producing facility, electrically located between the power producing facility and the utility system.
- B. The disconnect switch shall be located within 10 feet of the external electric service meter.
- C. The disconnect switch shall be readily accessible for operation by utility personnel at all times and be capable of being padlocked only in the open position. Operation of this switch is at the sole discretion of the utility without prior notice.
- D. The disconnect switch shall be clearly marked, "Generator Disconnect Switch" with permanent 3/8 inch letters or larger.

#### 3. <u>Dedicated Distribution Transformer</u>

A. The connecting utility reserves the right to require that the power producing facility connects to the utility's system through a dedicated distribution transformer if the utility decides that the transformer is necessary to ensure conformance with utility safe work practices, to enhance service restoration operations or to prevent detrimental effects to other utility customers.

#### 4. <u>Network\_Application</u>

A. The utility reserves the right to exclude the power producing facility from connection to secondary network utility systems.

#### 5. <u>Power\_Producing\_Facility\_Performance</u>

A. The electrical output of the power producing facility shall meet the latest IEEE Standard 519 and ANSI C84.1 at the time of placement into service.

#### 6. <u>Testing and Maintenance</u>

- A. Upon initial parallel operation of the photovoltaic system, or any time a photovoltaic system adjustment or revision is made, a system functional test demonstrating compliance with Section (1)(B)(1-5) above is required, including written certification of compliance with all of the terms of this Appendix, by a licensed or qualified installation contractor acceptable to the utility. This test is a system acceptance test demonstrating to utility personnel that the photovoltaic system controls are operational and disconnect from the utility when the utility voltage and frequency parameters are outside of the limits described in Section (1)(B)(1-5) above. Built-in software testing routines may be used to verify, on demand, correct operation of the photovoltaic system controls. The software testing routines shall be production verified and tested.
- B. The connecting utility reserves the right to require the power producing facility owner to operationally test the photovoltaic system controls. The utility will either witness the test or will require written certification by a licensed or qualified installation contractor acceptable to the utility.