

The Public Utility Commission of Texas (commission) proposes new §25.211 relating to Interconnection of Distributed Generation and §25.212 relating to Technical Requirements for Interconnection and Parallel Operation of On-Site Distributed Generation Units. Project Number 21220 has been assigned to this proceeding. The commission began an investigation into distributed generation in 1998 as part of Project Number 19827, *Investigation into the Adequacy of Capacity for 1999 and 2000 Peak Periods* in Texas. In part, the commission initiated this project because it was interested in utilizing distributed generation as a beneficial resource to help meet the State's growing capacity shortfall during the summer months of 1999 and 2000. As part of this project, a task force was formed to develop interconnection guidelines for distributed generation. On February 4, 1999, the commission adopted interconnection guidelines for distributed generation and requested that staff continue its investigation of distributed resources. The Public Utility Regulatory Act (PURA) §39.101(b)(3) now entitles all Texas electric customers to access on-site distributed generation. The proposed sections state the terms and conditions that govern the connection and operation of small power generation. The proposed sections also establish technical requirements to promote the safe and reliable operation of distributed generation resources, while the customer is connected to both its own distributed generation facility and the utility distribution system (referred to as parallel operation). Additionally, the proposed sections promote the use of distributed resources in order to provide electric system benefits during periods of capacity constraints, to enhance both the reliability of electric service and economic efficiency in the production and consumption of electricity, and to

provide customers greater opportunities to control the price and quality of electricity within their facilities.

The commission requests that interested parties provide relevant comments on the proposed rules. When commenting on specific subsections of the proposed section(s), parties are encouraged to describe "best practice" examples of regulatory policies and their rationale that have been proposed or implemented successfully in other states already undergoing electric industry restructuring, if the parties believe that Texas would benefit from application of the same policies. The commission is interested in receiving only "leading edge" examples that are specifically related and directly applicable to the Texas statute, rather than broad citations to other state restructuring efforts. In addition, the commission requests comments on several matters:

First, the commission seeks comment on the necessity of conducting pre-interconnection studies for distributed generation units. Section 25.211(g) allows utilities to conduct a service study, coordination study, or a utility system impact study prior to interconnection of a distributed generation facility. Please describe the differences between and applicability of these studies as they relate to requests for interconnecting distributed generation. Is it always necessary to conduct pre-interconnection studies for distributed generation units? Are there some instances where a pre-interconnection study would not be necessary? If so, under what circumstances? To what extent does the exportation of power from a distributed generation facility onto the electric network require the utility to conduct a study? Please state all of the components that would be

included in any interconnection study and please explain why each of these study components is necessary. Additionally, is it necessary for the distribution company to conduct the pre-interconnection studies or would it be possible to allow an independent third-party to conduct the studies? For example, could a third party perform a role similar to the Independent System Operator (ISO) when it performs interconnection studies for large generators that seek interconnection to the transmission grid? Please state why you believe an independent third party should or should not conduct these studies and if you believe an independent third party should conduct these studies, please give examples of entities that you believe could be capable of performing such studies.

Second, the commission seeks comment on the appropriate level of fees, if any, a utility or other entity may charge to a customer to offset its costs incurred to conduct a pre-interconnection study for distributed generation units. Generally, what factors affect the costs of interconnection studies? Should the distribution company offer tariffed rates for studies? What is the appropriate pre-interconnection study fee, if any, for a distributed generation unit less than or equal to two megawatts (MW)? Additionally, please list all relevant items that would be included in such a pre-interconnection study and their associated costs. Please state why it would be necessary to include the listed items in the pre-interconnection study. Also, for a distributed generation unit that is greater than two MW what is the appropriate pre-interconnection study fee, if any? What are the relevant items that would be included in such a pre-interconnection study and what are their associated costs? Additionally, please state why it would be necessary to include the listed items in the pre-interconnection study. Please identify and explain any

system benefits of distributed generation that warrant the spreading of some or all of the costs of the studies among all distribution customers?

Third, the commission seeks comment on the necessity of including a universal indemnification requirement in this section. If you believe that a universal indemnification requirement is necessary, please provide proposed language. If you do not believe that a universal indemnification requirement is necessary please state why.

Fourth, the commission seeks comment on interconnection of distributed generation to network systems. In what instances, if any, should there be exceptions to the interconnection guidelines set forth in §25.211(h)?

Fifth, the commission seeks comment on an expedited complaint handling and arbitration procedure for interconnection disputes. Should interconnection disputes be handled in an expedited manner? If your answer is no, please explain why. If you feel that complaints relating to interconnection disputes should be handled in an expedited manner, please provide examples of how this process should work. In your answer, please provide examples of expedited processes that have been utilized for handling complaints in the telecommunications industry or alternative dispute resolution under the provisions of this title relating to open-access comparable transmission service for electric utilities in the Electric Reliability Council of Texas (ERCOT). If you feel that only certain types of complaints relating to interconnection disputes should be

handled in an expedited manner, please specify appropriate criteria for assessing which complaints should be handled in an expedited manner.

Sixth, the commission seeks comment on the term "inverter-based protective functions" as stated in §25.211 (h)(1) of this title. Should this term be defined and does it need to be tied to a specific industry operating standard? If you believe that this term should be defined, please provide specific language.

Gillan Taddune, Economic Policy Analyst, in the Office of Policy Development has determined that for each year of the first five-year period the proposed sections are in effect there will be no fiscal implications for state or local government as a result of enforcing or administering the sections.

Ms. Taddune has determined that for each year of the first five years the proposed sections are in effect the public benefit anticipated as a result of enforcing the sections will be rate and reliability benefits to customers from increased use of distributed generation in Texas. There will be no effect on small businesses or micro-businesses as a result of enforcing this sections. There is no anticipated economic cost to persons who are required to comply with the sections as proposed.

Ms. Taddune has also determined that for each year of the first five years the proposed sections are in effect there should be no effect on a local economy, and therefore no local employment impact statement is required under Administrative Procedure Act §2001.022.

The commission staff will conduct a public hearing on this rulemaking under Government Code §2001.029 at the commission's offices, located in the William B. Travis Building, 1701 North Congress Avenue, Austin, Texas 78701, on Monday, October 25, 1999, at 9:00 a.m.

Comments on the proposed new rules (16 copies) may be submitted to the Filing Clerk, Public Utility Commission of Texas, 1701 North Congress Avenue, PO Box 13326, Austin, Texas 78711-3326, within 20 days after publication. The commission invites specific comments regarding the costs associated with, and benefits that will be gained by, implementation of the proposed section. The commission will consider the costs and benefits in deciding whether to adopt the section. All comments should refer to Project Number 21220.

These new sections are proposed under the Public Utility Regulatory Act, Texas Utilities Code Annotated §14.002 (Vernon 1998) (PURA), which provides the Public Utility Commission with the authority to make and enforce rules reasonably required in the exercise of its powers and jurisdiction, and PURA §39.101(b)(3) which requires the commission to ensure that customers have access to providers of energy efficiency services, to on-site distributed generation and to providers of energy generated by renewable energy resources.

Cross Reference to Statutes: Public Utility Regulatory Act: §§14.001, 14.002, 31.002, 39.101(a), 39.101(b)(3).

§25.211. Interconnection of On-Site Distributed Generation.

- (a) **Application.** Unless the context clearly indicates otherwise, in this section the term "electric utility" applies to all electric utilities as defined in the Public Utility Regulatory Act (PURA) §31.002 that own and operate a distribution system in Texas.
- (b) **Purpose.** The purpose of this section is to clearly state the terms and conditions that govern the interconnection and parallel operation of on-site distributed generation in order to implement PURA §39.101(b)(3), which entitles all Texas electric customers to access to on-site distributed generation, to provide cost savings and reliability benefits to customers, to establish technical requirements that will promote the safe and reliable parallel operation of on-site distributed generation resources, to enhance both the reliability of electric service and economic efficiency in the production and consumption of electricity, and to promote the use of distributed resources in order to provide electric system benefits during periods of capacity constraints. Sales of power by a distributed generator in the wholesale market are subject to the provisions of this title relating to open-access comparable transmission service for electric utilities in the Electric Reliability Council of Texas (ERCOT).
- (c) **Definitions.** The following words and terms when used in this section and §25.212 of this title (relating to Technical Requirements for Interconnection and Parallel Operation

of On-Site Distributed Generation) shall have the following meanings, unless the context clearly indicates otherwise:

- (1) **Application for interconnection and parallel operation with the utility system or application** — The standard form of application approved by the commission.
- (2) **Company** — An electric utility operating a distribution system.
- (3) **Customer** — Any entity interconnected to the company's utility system for the purpose of receiving or exporting electric power from or to the company's utility system.
- (4) **Facility** — An electrical generating installation consisting of one or more on-site distributed generation units. The total capacity of a facility's individual on site distributed generation units may exceed ten megawatts (MW); however, no more than ten MW of a facility's capacity will be subject to the provisions of this section and §25.212 of this title.
- (5) **Interconnection** — The physical connection of distributed generation to the utility system in accordance with the requirements of this section so that parallel operation can occur.
- (6) **Interconnection agreement** — The standard form of agreement, which has been approved by the commission. The interconnection agreement sets forth the contractual conditions under which a company and a customer agree that one or more facilities may be interconnected with the company's utility system.
- (7) **Network service** — Network service consists of two or more utility primary distribution feeder sources electrically tied together on the secondary (or low

voltage) side to form one power source for one or more customers. The service is designed to maintain service to the customers even after the loss of one of these primary distribution feeder sources.

- (8) **On-site distributed generation (or distributed generation)** — An electrical generating facility located at a customer's point of delivery (point of common coupling) of ten megawatts (MW) or less and connected at a voltage less than or equal to 60 kilovolts (kV) which may be connected in parallel operation to the utility system.
- (9) **Parallel operation** — The operation of on-site distributed generation by a customer while the customer is connected to the company's utility system.
- (10) **Point of common coupling** — The point where the electrical conductors of the company utility system are connected to the customer's conductors and where any transfer of electric power between the customer and the utility system takes place, such as switchgear near the meter.
- (11) **Pre-certified equipment** — A specific generating and protective equipment system or systems that have been certified as meeting the applicable parts of this section relating to safety and reliability by an entity approved by the commission.
- (12) **Pre-interconnection study** — A study or studies which may be undertaken by a company in response to its receipt of a completed application for interconnection and parallel operation with the utility system. Pre-interconnection studies may include, but are not limited to, service studies, coordination studies and utility system impact studies.

- (13) **Stabilized** — A company utility system is considered stabilized when, following a disturbance, the system returns to the normal range of voltage and frequency for a duration of two minutes or a shorter time as mutually agreed to by the company and customer.
 - (14) **Tariff for interconnection and parallel operation of distributed generation.**
— The commission-approved tariff for interconnection and parallel operation of distributed generation.
 - (15) **Unit** — A single power generator.
 - (16) **Utility system** — A company's distribution system below 60 kV to which the generation equipment is interconnected.
- (d) **Obligation to serve.** No later than 30 days after the effective date of this section each electric utility shall modify existing tariffs or offer a new tariff for interconnection and parallel operation of distributed generation customers in conformance with the provisions of this section. Such tariffs shall ensure that back-up, supplemental, and maintenance power are available to all customers and customer classes that desire such service until January 1, 2002. Any modifications of existing tariffs or offerings of new tariffs relating to this subsection shall be submitted on the commission approved form.
- (e) **Disconnection and reconnection.** A utility may disconnect a distributed generation unit under the following conditions:

- (1) **Expiration or termination of interconnection agreement.** The interconnection agreement specifies the effective term and termination rights of company and customer. Upon expiration or termination of the interconnection agreement with a customer, in accordance with the terms of the agreement, the utility may disconnect customer's facilities.
- (2) **Non-compliance with the technical requirements specified in §25.212 of this title.** A utility may disconnect a distributed generation facility if the facility is not in compliance with the technical requirements specified in §25.212 of this title. Within two business days from the time the customer notifies the utility that the facility is subsequently in compliance with the technical requirements of §25.212 of this title, the utility shall have an inspector verify such compliance. Upon such verification, the customer in coordination with the utility may reconnect the facility.
- (3) **System emergency.** A utility may temporarily disconnect a customer's facility without prior written notice in cases where continuance of interconnection will endanger persons or property. During the forced outage of a utility system, the utility shall have the right to temporarily disconnect a customer's facility to make immediate repairs on the utility's system. When possible, the utility shall provide the customer with reasonable notice and reconnect the customer as quickly as reasonably practical.
- (4) **Routine maintenance, repairs, and modifications.** A utility may disconnect a customer or a customer's facility with seven business days prior written notice of a

service interruption for routine maintenance, repairs, and utility system modifications. The utility shall reconnect the customer as quickly as reasonably possible following any such service interruption.

- (5) **Lack of approved application and interconnection agreement.** In order to interconnect distributed generation to a utility system, a customer must first submit to the utility an application for interconnection and parallel operation with the utility system and sign an interconnection agreement on the forms prescribed by the commission. The utility may disconnect the customer's facility if such application has not been received and approved.
- (f) **Incremental demand charges.** During the term of an interconnection agreement a utility may require that a customer disconnect its distributed generation unit and/or take it off-line as a result of utility system conditions as described in subsection (e)(3) and (4) of this section. Incremental demand charges arising from disconnecting the distributed generator as directed by company during such periods shall not be assessed by company to the customer. After January 1, 2002, the distribution utility shall not be responsible for the provision of generation services or their related charges.
- (g) **Pre-interconnection studies.** A utility may conduct a service study, coordination study or utility system impact study prior to interconnection of a distributed generation facility. In instances where such studies are deemed necessary, the scope of such studies shall be

based on the characteristics of the particular distributed generation facility to be interconnected and the utility's system at the specific proposed location.

(1) **Distributed generation facilities for which no pre-interconnection study fees**

may be charged. A utility may not charge a customer a fee to conduct a pre-interconnection study for the following types of distributed generation facilities:

- (A) Distributed generation facilities that will not or do not export power to the utility system;
- (B) Individual single-phase distributed generation units exporting less than 50 kilowatts (kW) to the utility system on a single transformer;
- (C) Individual three-phase units exporting not more than 150 kW to the utility system on a single transformer;
- (D) Pre-certified distributed generation units up to 500 kW that export not more than 15% of the total load on a single radial feeder and also contribute not more than 25% of the maximum potential short circuit current on a single radial feeder.

(2) **Distributed generation facilities for which pre-interconnection study fees**

may be charged. Prior to the interconnection of a distributed generation facility not described in paragraph (1) of this subsection, a utility may charge a customer a fee to offset its costs incurred in the conduct of a pre-interconnection study. In those instances where a utility conducts an interconnection study the following shall apply:

- (A) The conduct of such pre-interconnection study shall take no more than four weeks;
- (B) A utility shall prepare written reports of the study findings and make them available to the customer;
- (C) The study shall consider both the costs incurred and the benefits realized as a result of the interconnection of distributed generation to the company's utility system; and
- (D) The customer shall receive an estimate of the study cost before the utility initiates the study.

(h) **Network interconnection of distributed generation.** Certain aspects of secondary network systems create technical difficulties that may make interconnection more costly to implement. In instances where customers request interconnection to a secondary network system, the utility and the customer shall use best reasonable efforts to complete the interconnection and the utility shall utilize the following guidelines:

- (1) A utility shall approve applications for distributed generation facilities that use inverter-based protective functions unless total distributed generation (including the new facility) on affected feeders represents more than 25% of the total load on those feeders.
- (2) A utility shall approve applications for other on-site generation facilities whose total generation is less than the local customer's load unless total distributed

generation (including the new facility) on affected feeders represents more than 25% of the total load on those feeders.

- (3) A utility may postpone processing an application for an individual distributed generation facility under this section if the total existing distributed generation on the targeted feeder represents more than 25% of the total load on that feeders. If that is the case, the utility should conduct interconnection and network studies to determine whether, and in what amount, additional distributed generation facilities can be safely added to the feeder or accommodated in some other fashion. These studies should be completed within six weeks, and application processing should then resume.
- (4) A utility may reject applications for a distributed generation facility under this section if the utility can demonstrate specific reliability or safety reasons why the distributed generation should not be interconnected at the requested site. However, in such cases the utility shall work with the customer to attempt to resolve such problems to their mutual satisfaction.
- (5) A utility shall make all reasonable efforts to seek methods to safely and reliably interconnect distributed generation facilities that will export power. This may include switching service to a radial feed if practical and if acceptable to the customer.

- (i) **Pre-Interconnection study fees for network interconnection of distributed generation.** Prior to charging a pre-interconnection study fee for a network

interconnection of distributed generation as permitted in subsection (g)(2) of this section, a utility shall first advise customer of the potential problems associated with interconnection of distributed generation with its network system. For potential interconnections to network systems there shall be no pre-interconnection study fee assessed for a facility with inverter systems under 20 kW. For all other facilities the utility may charge the customer a fee to offset its costs incurred in the conduct of the pre-interconnection study. In those instances where a utility conducts an interconnection study, the following shall apply:

- (1) The conduct of such pre-interconnection studies shall take no more than four weeks;
- (2) A utility shall prepare written reports of the study findings and make them available to the customer;
- (3) The studies shall consider both the costs incurred and the benefits realized as a result of the interconnection of distributed generation to the utility's system; and
- (4) The customer shall receive an estimate of the study cost before the utility initiates the study.

(j) **Communications concerning proposed distributed generation projects.** In the course of processing applications for interconnection and parallel operation and in the conduct of pre-interconnection studies, customers shall provide the utility detailed information concerning proposed distributed generation facilities. Such communications concerning the nature of proposed distributed generation facilities shall be made subject to the terms

of §25.84 of this title (Relating to Annual Reporting of Affiliate Transactions for Electric Utilities), §25.272 of this title (Relating to Code of Conduct for Electric Utilities and their Affiliates), and §25.273 (Relating to Contracts between Electric Utilities and their Competitive Affiliates). A utility and its affiliates shall not use such knowledge of proposed distributed generation projects submitted to it for interconnection or study to prepare competing proposals to the customer that offer either discounted rates in return for not installing the distributed generation, or offer competing distributed generation projects.

(k) **Equipment pre-certification.**

- (1) **Entities performing pre-certification.** The commission may approve one or more entities that shall pre-certify equipment as defined pursuant to this section.
- (2) **Standards for entities performing pre-certification.** Testing organizations and/or facilities capable of analyzing the function, control, and protective systems of distributed generation units may request to be certified as testing organizations.
- (3) **Effect of pre-certification.** Distributed generation units which are certified to be in compliance by an approved testing facility or organization as described in this subsection shall be installed on a company utility system in accordance with an approved interconnection control and protection scheme without further review of their design by the utility.

(l) **Designation of utility contact persons for matters relating to distributed generation interconnection.**

- (1) Each electric utility shall designate a person or persons who will serve as the utility's contact(s) for all matters related to distributed generation interconnection.
- (2) Each electric utility shall identify to the commission its distributed generation contact person(s).
- (3) Each electric utility shall provide convenient access through its internet web site to the names, telephone numbers, mailing addresses and electronic mail addresses for its distributed generation contact person(s).

(m) **Time periods for processing applications for interconnection with the utility system.**

In order to apply for interconnection the customer shall provide the utility a completed application for interconnection and parallel operation with the utility system. The interconnection of distributed generation to the utility system shall take place within the following schedule:

- (1) For a facility with pre-certified equipment, interconnection shall take place within four weeks of the utility's receipt of a completed interconnection application.
- (2) For other facilities, interconnection shall take place within six weeks of the utility's receipt of a completed application.
- (3) If interconnection of a particular facility will require substantial capital upgrades to the utility system, the company shall provide the customer an estimate of the schedule and customer's cost for the upgrade. If the customer desires to proceed

with the upgrade, the customer and the company will enter into a contract for the completion of the upgrade. The interconnection shall take place no later than two weeks following the completion of such upgrades. The utility shall employ best reasonable efforts to complete such system upgrades in the shortest time reasonably practical.

- (4) A utility shall use best reasonable efforts to interconnect facilities within the time frames described in this subsection. If in a particular instance, a utility determines that it can not interconnect a facility within the time frames stated in this subsection, it will notify the applicant in writing of that fact. The notification will identify the reason or reasons interconnection could not be performed in accordance with the schedule, and provide an estimated date for interconnection.
- (5) All applications for interconnection and parallel operation of distributed generation shall be processed by the utility in a non-discriminatory manner. Applications will be processed in the order that they are received. It is recognized that certain applications may require minor modifications while they are being reviewed by the utility. Such minor modifications to a pending application shall not require that it be considered incomplete and treated as a new or separate application.
- (n) **Reporting requirements.** Each electric utility shall maintain records concerning applications received for interconnection and parallel operation of distributed generation. Such records will include the date each application is received, documents generated in

the course of processing each application, correspondence regarding each application, and the final disposition of each application. By March 30 of each year, every electric utility shall file with the commission a distributed generation interconnection report for the preceding calendar year that identifies each distributed generation facility interconnected with the utility's distribution system. The report shall list the new distributed generation facilities interconnected with the system since the previous year's report, any distributed generation facilities no longer interconnected with the utility's system since the previous report, the capacity of each facility, and the feeder or other point on the company's utility system where the facility is connected. The annual report shall also identify all applications for interconnection received during the previous one-year period, and the disposition of such applications.

- (o) **Interconnection disputes.** Complaints relating to interconnection disputes under this section shall be handled in an expeditious manner.

§25.212. Technical Requirements for Interconnection and Parallel Operation of On-Site Distributed Generation.

(a) **Purpose.** The purpose of this section is to describe the requirements and procedures for safe and effective connection and operation of distributed generation.

- (1) A customer may operate 60 Hertz (Hz), three-phase or single-phase generating equipment, whether qualifying facility (QF) or non-QF, in parallel with the utility system pursuant to an interconnection agreement, provided that the equipment meets or exceeds the requirements of this section.
- (2) This section describes typical interconnection requirements. Certain specific interconnection locations and conditions may require the installation of more sophisticated protective settings or hardware, especially when the facility is exporting power to the utility system.
- (3) If the utility concludes that an application for parallel operation describes facilities that may require additional protective settings or hardware, the utility shall make those additional requirements known to the customer at the time the interconnection studies are completed.
- (4) Where the application of the technical requirements set forth in this section appears inappropriate for a specific facility, the customer and utility may agree to different requirements, or a party may petition the commission for a good cause exception.

(b) **General interconnection and protection requirements.**

- (1) The customer's generation and interconnection installation must meet all applicable national, state, and local construction and safety codes.
- (2) The customer's generator shall be equipped with protective hardware and software designed to prevent the generator from being connected to a de-energized circuit owned by the utility.
- (3) The customer's generator shall be equipped with the necessary protective hardware and software designed to prevent connection or parallel operation of the generating equipment with the utility system unless the utility system service voltage and frequency is of normal magnitude.
- (4) Pre-certified equipment may be installed on a company's utility systems in accordance with approved interconnection control and protection scheme without further review of their design by the utility. When the customer is exporting to the utility system using pre-certified equipment, the protective settings and operations shall be those specified by the utility.
- (5) The customer will be responsible for protecting its generating equipment in such a manner that utility system outages, short circuits or other disturbances including zero sequence currents and ferroresonant over-voltages do not damage the customer's generating equipment. The customer's protective equipment shall also prevent unnecessary tripping of the utility system breakers that would affect the utility system's capability of providing reliable service to other customers.

- (6) For facilities greater than two megawatts (MW), the utility may require that a communication channel be provided by the customer to provide communication between the utility and the customer's facility. The channel may be leased telephone circuit, power line carrier, pilot wire circuit, microwave, or other mutually agreed upon medium.
 - (7) Circuit breakers or other interrupting devices at the point of common coupling must be capable of interrupting maximum available fault current. Facilities larger than two MW and exporting to the utility system shall have a redundant circuit breaker unless a listed device suitable for the rated application is used.
 - (8) The customer will furnish and install a manual disconnect device that has a visual break that is appropriate to the voltage level (a disconnect switch, a draw-out breaker, or fuse block), and is accessible to the utility personnel, and capable of being locked in the open position. The customer shall follow the utility's switching, clearance, tagging, and locking procedures that the utility shall provide the customer.
- (c) **Prevention of interference.** To eliminate undesirable interference caused by operation of the customer's generating equipment, the customer's generator shall meet the following criteria:
- (1) **Voltage.** The customer will operate its generating equipment in such a manner that the voltage levels on the utility system are in the same range as if the generating equipment were not connected to the utility's system. The customer

shall provide an automatic method of disconnecting the generating equipment from the utility system should a sustained voltage deviation in excess of +5.0 % or -10% from nominal voltage occur for more than 30 seconds. Should a deviation in excess of +10% or -30% from nominal voltage occur, the customer shall automatically disconnect the equipment within ten cycles. The customer may reconnect when the utility system voltage and frequency return to normal range and the system is stabilized.

- (2) **Flicker.** The customer's equipment shall not cause excessive voltage flicker on the utility system. This flicker shall not exceed 3.0% voltage dip, in accordance with Institute of Electrical and Electronics Engineers (IEEE) 519 as measured at the point of common coupling.
- (3) **Frequency.** The operating frequency of the customer's generating equipment shall not deviate more than +0.5 Hertz (Hz) or -0.7 Hz on a 60 Hz base. The customer shall automatically disconnect the generating equipment from the utility system within 15 cycles if this frequency tolerance cannot be maintained. The customer may reconnect when the utility system voltage and frequency return to normal range and the system is stabilized.
- (4) **Harmonics.** In accordance with IEEE 519 the total harmonic distortion (THD) voltage shall not exceed 5.0% of the fundamental 60 Hz frequency nor 3.0% of the fundamental frequency for any individual harmonic when measured at the point of common coupling with the utility system. THD is also limited to 5.0% by §25.51(c) of this title (relating to Power Quality).

- (5) **Fault and line clearing.** The customer shall automatically disconnect from the utility system within ten cycles should the voltage on one or more phases fall below -30% of nominal voltage on the utility system serving the customer premises. This disconnect timing also ensures that the generator is disconnected from the utility system prior to automatic re-close of breakers. The customer may reconnect when the utility system voltage and frequency return to normal range and the system is stabilized. To enhance reliability and safety and with the utility's approval, the customer may employ a modified relay scheme with delayed tripping or blocking using communications equipment between customer and company.
- (d) **Control, protection and safety equipment requirements specific to single phase generators of 50 kilowatts (kW) or less connected to the utility's system.** Exporting to the utility system may require additional operational/protection devices and will require coordination of operations with the host utility. The necessary control, protection, and safety equipment specific to single-phase generators of 50 kW or less connected to secondary or primary systems must include an interconnect disconnect device, a generator disconnect device, an over-voltage trip, an under-voltage trip, an over/under frequency trip, and a synchronizing check for synchronous and other types of generators with stand-alone capability.

- (e) **Control, protection and safety equipment requirements specific to three-phase synchronous generators, induction generators, and inverter systems.** This subsection specifies the control, protection, and safety equipment requirements specific to three phase synchronous generators, induction generators, and inverter systems. Exporting to the utility system may require additional operational/protection devices and will require coordination of operations with the utility.
- (1) **Three phase synchronous generators.** The customer's generator circuit breakers shall be three-phase devices with electronic or electromechanical control. The customer is solely responsible for properly synchronizing its generator with the utility. The excitation system response ratio shall not be less than 0.5. The generator's excitation system(s) shall conform, as near as reasonably achievable, to the field voltage versus time criteria specified in American National Standards Institute Standard C50.13-1989 in order to permit adequate field forcing during transient conditions. For generating systems greater than two MW the customer shall maintain the automatic voltage regulator (AVR) of each generating unit in service and operable at all times. If the AVR is removed from service for maintenance or repair, the utility's dispatching office shall be notified.
- (2) **Three-phase induction generators and inverter systems.** 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 on the utility system side at the point of common coupling is within the visible flicker stated in subsection (c)(2) of this section. Otherwise, the customer may be required to

install hardware or employ other techniques to bring voltage fluctuations to acceptable levels. Line-commutated inverters do not require synchronizing equipment. Self-commutated inverters whether of the utility-interactive type or stand-alone type shall be used in parallel with the utility system only with synchronizing equipment. Direct-current generation shall not be operated in parallel with the utility system.

- (3) **Protective function requirements.** The protective function requirements for three phase facilities of different size and technology are listed below.
- (A) Facilities rated ten kilowatts (kW) or less must have an interconnect disconnect device, a generator disconnect device, an over-voltage trip, an under-voltage trip, an over/under frequency trip, and a manual or automatic synchronizing check (for facilities with stand alone capability).
 - (B) Facilities rated in excess of 10 kW but not more than 500 kW must have an interconnect disconnect device, a generator disconnect device, an over-voltage trip, an under-voltage trip, an over/under frequency trip, a manual or automatic synchronizing check (for facilities with stand alone capability), either a ground over-voltage trip or a ground over-current trip depending on the grounding system if required by the company, and reverse power sensing if the facility is not exporting (unless the generator is less than the minimum load of the customer.)
 - (C) Facilities rated more than 500 kW but not more than 2,000 kW must have an interconnect disconnect device, a generator disconnect device, an over-

voltage trip, an under-voltage trip, an over/under frequency trip, either a ground over-voltage trip or a ground over-current trip depending on the grounding system, if required by the company, an automatic synchronizing check (for facilities with stand alone capability) and reverse power sensing if the facility is not exporting (unless the facility is less than the minimum load of the customer.) If the facility is exporting power, the power direction protective function may be used to block or delay the under frequency trip with the agreement of the utility.

- (D) Facilities rated more than 2,000 kW but not more than 10,000 kW must have an interconnect disconnect device, a generator disconnect device, an over-voltage trip, an under-voltage trip, an over/under frequency trip, either a ground over-voltage trip or a ground over-current trip depending on the grounding system, if required by the company, an automatic synchronizing check and AVR for facilities with stand alone capability, and reverse power sensing if the facility is not exporting (unless the facility is less than the minimum load of the customer.) If the facility is exporting power, the power direction protective function may be used to block or delay the under frequency trip with the agreement of the utility. A telemetry/transfer trip may also be required by the company as part of a transfer tripping or blocking protective scheme.

- (f) **Facilities not identified.** In the event that standards for a specific unit or facility are not identified in this section, the company and customer may interconnect a facility using mutually agreed upon technical standards.

- (g) **Requirements specific to a facility paralleling for sixty cycles or less (closed transition switching).** The protective devices required for facilities ten MW or less which parallel with the utility system for 60 cycles or less are an interconnect disconnect device, a generator disconnect device, an automatic synchronizing check for generators with stand alone capability, an over-voltage trip, an under-voltage trip, an over/under frequency trip, and either a ground over-voltage trip or a ground over-current trip depending on the grounding system, if required by the utility.

- (h) **Inspection and start-up testing.** The customer shall provide the utility with notice at least two weeks before the initial energizing and start-up testing of the customer's generating equipment and the utility may witness the testing of any equipment and protective systems associated with the interconnection. The customer shall revise and re-submit the application information for any proposed modification that may affect the safe and reliable operation of the utility system.

- (i) **Site testing and commissioning.** Testing of protection systems shall include procedures to functionally test all protective elements of the system up to and including tripping of the generator and/or interconnection point. Testing will verify all protective set points

and relay/breaker trip timing. The utility may witness the testing of installed switchgear, protection systems, and generator. The customer is responsible for routine maintenance of the generator, control and protective equipment. The customer will maintain records of such maintenance activities which the utility may review at reasonable times. For generation systems greater than 500 kW, a log of generator operations shall be kept. At a minimum, the log shall include the date, generator time on, and generator time off, and megawatt and megavar output. The utility may review such logs at reasonable times.

- (j) **Metering.** Consistent with Chapter 25, Subchapter F of this title (relating to Metering), the utility may supply, own, and maintain all necessary meters and associated equipment to record energy purchases by the customer and/or energy sales/exports to the utility system. The customer shall supply at no cost to the utility a suitable location on its premises for the installation of the utility's meters and other equipment. If metering at the generator is required in such applications, metering that is part of the generator control package will be considered sufficient if it meets all the measurements criteria that would be required by a separate stand alone meter.

This agency hereby certifies that the proposal has been reviewed by legal counsel and found to be within the agency's authority to adopt.

**ISSUED IN AUSTIN, TEXAS ON THE 13TH DAY OF SEPTEMBER 1999 BY THE
PUBLIC UTILITY COMMISSION OF TEXAS
RHONDA G. DEMPSEY**