



Distributed Generation (DG) Manual

August 14, 2019 (6th Edition)
Revision 1.0



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DG Manual Editions:

- First Edition: November 1, 2011
- Second Edition: October 15, 2012
 - Revised: November 15, 2012
 - Revised: March 15, 2013
- Third Edition: October 15, 2013
- Fourth Edition: February 1, 2014
- Fifth Edition: June 6, 2014
 - Edited December 15, 2015
- Sixth Edition: January 15, 2016
 - Revised: August 14, 2019



DISTRIBUTED GENERATION MANUAL

1. Introduction

The primary purpose of this manual is to provide guidance for interconnect and operate Distributed Generation (DG) facility in parallel with the CPS Energy distribution system. This manual defines the minimum technical and financial requirements for safe integration of customer owned power production facilities of less than ten (10) MW. The DG manual is provided in an effort to maintain safe and reliable service to generating facilities and customers.

This manual covers most types of Distributed Generation in the CPS Energy service area:

- i. Inverter Based System – Solar PV and Energy Storage
- ii. Synchronous or Induction Motor System – Wind generation, standard fossil fuel based motor generators
- iii. Other Types – Will be reviewed as encountered

In general, the DG System and associated facilities must be designed in accordance with, but not limited to, Underwriters Laboratories (UL) Standards, Institute of Electrical and Electronics Engineers (IEEE) Standards, National Electrical Code (NEC), Public Utility Commission of Texas (PUCT), Electric Reliability Council of Texas (ERCOT) Operating Guides and Protocols, CPS Energy Electric Service Standards and Design Criteria, and any other applicable Local, State, or Federal code or standards. Particular attention should be paid to the requirements of the current versions of IEEE Standard 1547-2018 (Standard for Interconnecting Distributed Resources with Electric Power Systems).

1.1. Goals and Perspective

CPS Energy is committed to working with DG Owners to allow interconnection. Under our Flexible Path Plan, the majority of future power will come from more flexible sources such as renewables, battery storage, energy efficiency and demand-response programs.

CPS Energy has developed this Manual keeping in perspective the three main goals:

Safety First The first, most important goal for CPS Energy is safety—the safety of the general public and of the employees working on the electrical systems.

Reliability The second goal is reliability—the interconnection of the DG to CPS Energy’s distribution system must not compromise the reliability and/or the service quality of any of CPS Energy’s customers.



Economics The third goal is economics—the interconnection must be designed in a cost effective manner.

1.2. Business Purpose

Distributed Generation is normally installed for the following business purposes as Net-Metering, Grid-Tied or Micro-Grid as outlined below.

Net-Metering

DG System energy is provided to supply the DG Owner's premises and thus displaces the DG Owner's energy consumption from CPS Energy when installed behind the Point of Delivery (POD) on the DG Owner side.

Grid-Tied

The DG System is designed with the sole purpose to sell part or all of its generated power to CPS Energy under a power purchase agreement or tariff.

The DG System is connected to CPS Energy's distribution system at a location and in a manner approved by CPS Energy.

The DG System does not directly provide power to any other entity or customer.

Micro-Grid

Micro-grids are sections of electric power systems that contain distributed energy resources enabling them to disconnect from the grid and operate independently.

1.3. DG Manual

The DG System owner must conduct their own analysis and conform to CPS Energy interconnection requirements as directed in this manual.

CPS Energy reserves the right to amend this DG Manual at any time. Since these standards change regularly as a result of the latest practices, it is the user's responsibility to verify that the latest version of this DG Manual is being used. This DG Manual is located on the CPS Energy website at:

http://www.cpsenergy.com/Developers_Builders/Distributed_Generation/

- DG Section phone and fax number: 210-353-2700
- Email: DG@cpsenergy.com

2. DG Interconnection Process

All DG interconnection requests must undergo the following before permission to operate may be granted:



- Application Submittal
- Technical Review
- Conditional Approval
- Construction
- Inspection
- Testing
- Permission to Operate

2.1. *DG Application for Interconnection*

In advance of an interconnection, the DG Owner must complete an application. A separate form and application fee must be submitted for each DG Facility or facilities and each location.

An applicant shall submit a based on the capacity, location and configuration of their generating system. DG site plans and design drawings are required with the application to allow a technical review of the interaction of the DG with utility customers and the utility system.

2.2. *Preliminary Review and Feasibility Studies*

A Feasibility Study may be requested for specific DG sites. This study is performed on the CPS Energy Distribution system for the proposed site to determine high level costs and if the distribution grid will require upgrades to accommodate the proposed generation. Fees apply and are assessed based on the size of the proposed DG (Appendix B).

The feasibility request should be completed by the DG owner and submitted with general site plans, indicating size and type of proposed DG. Typical time required to complete a feasibility evaluation is 30 business days after the receipt of an approved “Application for Feasibility Study of Distributed Generation” (Appendix C) and payment of any required fee.

2.3. *Technical Review and Interconnection Studies*

CPS Energy’s technical review determines requirements for the interconnection of the proposed generation relative to the local electric distribution facilities and is not a design review of the generation system.

Upon completion of the submitted application and payment of associated fees, a review of each interconnection application is made to ensure that the operation of each proposed DG system is consistent with the technical requirements of the power delivery system and does not adversely impact other customers. The following requirements will be evaluated during the Technical Review Process:



<i>Type of analysis</i>	<i>Study considerations</i>
<i>Steady State</i>	<i>Capacity, voltage, power factor, reverse power flow, regulation tap movement</i>
<i>Voltage flicker</i>	<i>Intermittent sources and resonance</i>
<i>Short circuit and protection</i>	<i>Device ratings, effective grounding, coordination, equipment reclosing</i>
<i>Risk of islanding</i>	<i>DG to load ratio and sectionalizing, reactive power matching, load and generator type</i>
<i>Transients</i>	<i>Load rejection overvoltage, ground fault overvoltage, transformer inrush</i>
<i>Stability Studies</i>	<i>Disturbance can cause synchronous generator to lose synchronism with the power system</i>
<i>Telemetry Requirements</i>	<i>DG must provide ERCOT, DSP, and TSP with telemetry</i>
<i>Service and Metering Requirements</i>	<i>CPS Energy reference and guide</i>

Initial review of all interconnection requests is performed by the Electric Metering & Service Standards Department and distributed to other departments for review based on size, communication needed, protection requirements and metering class.

The standard review will require 30 days however this may be extended up to 60 days dependent on how well the submitted plan matches the existing utility capacity and should the interconnection be complex or the selected site require a more detailed system model. CPS Energy will provide estimated delivery dates should application processing require more time.

Conditions that will cause a detailed location study.

- System Load to Generation Ratio >5
- Fault Ratio Factor >20
- Ground Source Impedance >20
- Medium Voltage change of 4% (600 to 35kV)

CPS Energy will make written reports and study results available to the DG Owner for grid-tied systems. This report will contain:

- Expected owner costs
- Schedule of CPS Energy System modifications



- Date expected the utility interconnection may begin
- And any options that may influence interconnection

CPS Energy may reject applications for demonstrable reliability or safety issues however will inform the DG owner of the reason for the rejection and alternate options that may be available.

The DG Owner will be responsible for the expenses associated with Interconnection Facilities determined necessary or prudent in order to protect CPS Energy's System from disruption or damage caused by the DG System (See definitions of "Interconnection Facilities" and "Distributed Generation Facilities" in Appendix F).

2.4. Construction

The DG Owner is responsible for design and installation of the DG System up to the point of delivery (POD) as located and approved by CPS Energy (See definition of "Point of Delivery" in Appendix F).

CPS Energy is responsible for design and installation of CPS Energy's Distribution System up to the POD.

The interconnection of DG Systems may require construction of new facilities on CPS Energy's side of the POD or modifications to existing supply facilities in order to accommodate distributed generation. The determination of the need for system modifications is made by CPS Energy in the context of system studies conducted during the interconnection application and review process.

Cost of new construction or modifications on CPS Energy's distribution facilities associated with interconnection will be the responsibility for the DG Owner and must be paid before CPS Energy will begin construction of these distribution facilities. See DG System Owners Responsibilities.

2.5. Inspection

CPS Energy may, at its discretion, require a witness test of an installed DG facility before granting permission to operate the facility in parallel with the utility distribution system. CPS Energy will provide a list of specific required tests to be witnessed.

The DG Owner is responsible for ensuring that all circuit breakers, controls, relays and other protective devices are adjusted and functioning correctly. The DG Owner shall provide test equipment and qualified personnel to perform the required tests.

A general description of tests required is in Appendix D – Prevention of Interconnection for DG System.



2.6. Testing

CPS Energy will review and approve the general design of the protection scheme for a proposed DG interconnection. Review of the protective scheme will include all functions which directly affect protection of the utility system and all functions which, determined by CPS Energy, must operate to minimize the impact of customer faults on the system. The DG Owner is responsible for the facility protection design.

The designer must furnish, proposed settings for relays specified on the Relay Functional Requirement Specifications (RFRS) form. If requested, CPS Energy will provide system data needed to determine the relay settings.

A dated verifiable document must be provided for non-interference settings of DG greater than 300 kW capacity (typical is screenshot or printout).

For DG of 1 MW and greater, power quality will be monitored during ramp up and for up to 30 days after permission to operate.

2.7. Permission to Operate

Once CPS Energy determines that the DG facility is suitable to operate in parallel with the CPS Energy distribution System, both the DG Owner and the CPS Energy representative will sign and date the “Approval for Operation” document (Certificate of Completion). Once completed, the generation facility is authorized to operate in parallel with the CPS Energy System.

2.8. Disconnection of DG Facilities

The DG Owner may disconnect from CPS Energy's System by operation of its own switch, in accordance with Appendix A - “Interconnection Requirements for Distributed Generation” of this Manual.

The DG Owner shall have no right to operate CPS Energy's switch or any of CPS Energy’s Equipment located on the CPS Energy System side of the POD.

CPS Energy shall have the right to disconnect the DG Facility from the CPS Energy System where continuance of service to DG Owner or other Customers will, in CPS Energy’s reasonable determination, endanger persons or property. CPS Energy also reserves the right to disconnect for other cases as described in Appendix A.

3. DG Design Requirements

The detailed technical, operational, and maintenance requirements are found in Appendix A – “Interconnection Requirements for Distributed Generation”. This section of the Manual summarizes some of those key requirements.



3.1. DG Size and Limitations

Secondary Voltages Interconnection

DG Facilities connected at secondary voltages cannot have a maximum capacity rating that exceeds the size of the transformer serving the secondary. Service upgrades will be designed and installed by CPS Energy at the owner's expense.

Radial Distribution System

For aggregated small DG systems where the summation of the aggregated DG on a distribution circuit exceeds 20% of minimum circuit peak, will require a feasibility study before adding additional generation.

Combinations of Grid-Tied and small DG will be reviewed on a case by case basis.

Clustering of solar can create system issues and will be reviewed at the time application is submitted.

Downtown Network System

The Network Protector will prevent any excess DG power not consumed by the DG Owner from being exported into the CPS Energy network system power grid. In no case will the DG be allowed to feed power back through the CPS Energy network system power grid.

3.2. Prevention of Interference for DG Systems (IEEE Requirements)

The DG System operating requirements are described in Appendix A.

4. DG System Owner's Responsibilities

4.1. General

The DG Owner shall provide CPS Energy's Electric Metering & Service Standards with a fully completed DG Application (Appendix D) and all planning and support materials for CPS Energy to evaluate the interconnection requirements for the DG Facility.

- (1) The DG Owner shall have the Facility installed according to documented plans and shall allow CPS Energy to complete its commissioning testing and requirements as outlined in Appendix A. The DG Owner shall correct any shortcomings determined by CPS Energy before the DG Facility or Facilities are released for operation.



- (2) On an annual basis, CPS Energy shall have the right to review the operation of the DG Facility or Facilities at the site and conduct any tests it deems necessary to insure that the impact of the DG on the CPS Energy System results in safety and reliability for all parties involved and for all of CPS Energy Customers.

4.2. *Line Extension and Modifications to CPS Energy's Facilities Costs*

- (1) As a part of the interconnection analysis performed by CPS Energy, the DG Owner will be provided with an estimate of any line extension or other cost to be incurred in providing electric facilities to the DG Facility.
- (2) Notwithstanding CPS Energy's line extension policy, the DG Owner shall pay in advance the full cost of the construction of any transmission, substation, distribution, transformation, metering, protective, communication or other facilities or equipment which, at the sole discretion of CPS Energy, is required to serve the DG Facility or Facilities.
- (3) In the event it is necessary at the time of initial interconnection or at some future time for CPS Energy to modify its electric delivery systems in order to serve the DG Facilities and/or purchase or continue to purchase the output from the DG Facility or Facilities, or because the quality of the power provided by the DG Facility or Facilities adversely affects CPS Energy's delivery system, the DG Owner will be responsible to reimburse CPS Energy for all costs of modifications required for the interconnection of the DG Facility or Facilities.
- (4) In the event CPS Energy at any time in the future changes primary (or secondary) voltage of distribution facilities serving the DG installation or the DG Owner's premises or location such that metering equipment, transformers and/or any other DG Owner-owned equipment must be changed, the full cost of the change will be borne by the DG Owner.
- (5) In all cases, the DG Owner shall pay the full cost of the installation of a visible load break disconnect switch by and to the sole specification of CPS Energy. The switch will be readily accessible to CPS Energy personnel and of a type that can be secured in an open position by a CPS Energy padlock.
- (6) Appendices A and G of this Manual includes additional detail and operational and safety requirements. The DG Owner will follow all aspects of these requirements prior to and during operation of the DG Facility or Facilities.



4.3. Liability Insurance

For Facilities 50 kW and Smaller

For installations 50 kW and smaller the DG Owner is not required to provide a certificate of insurance coverage to CPS Energy. It is recommended, however, that the DG Owner carry liability insurance coverage which insures the DG Owner against all claims for property damage and for personal injury or death arising out of, resulting from or in any manner connected with the installation, operation and maintenance of the DG Owner's generating equipment.

For Facilities Larger than 50 kW

Prior to interconnection, the DG Owner must provide a certificate of insurance showing satisfactory liability insurance including contractual liability insurance covering indemnity obligations which insures the DG Owner against all claims for property damage and for personal injury or death arising out of, resulting from or in any manner connected with the installation, operation and maintenance of the DG Owner's DG Facility.

- (1) The amount of such insurance coverage shall be not less than \$2,000,000 per occurrence and name CPS Energy as an additional insured. This amount may be increased at the sole discretion of CPS Energy if the nature of the project so requires.
- (2) The certificate of insurance shall provide that the insurance policy will not be changed or canceled during its term without thirty days written notice to CPS Energy. The term of the insurance shall be coincident with the term of the interconnection contract or shall be specified to renew throughout the length of the Interconnection Contract.
- (3) The DG Owner shall provide proof of such insurance to CPS Energy at least annually and on request by CPS Energy.

4.4. Contracts (PPA)

A Purchase Power Agreement (where the DG Owner desires to deliver power and CPS Energy agrees to purchase power) may be required under the following instances:

- (1) ≤ 25 kW: As outlined in CPS Energy's tariffs if applicable.
- (2) ≥ 3 MW and < 10 MW: The DG Owner will execute a



Power Purchase Agreement with CPS Energy.

- (3) ≥ 10 MW: DG Facilities of this size are not covered by this Manual and will be considered by CPS Energy on a case-by-case basis.
- (4) An exception may be in the case of a special program offered by CPS Energy which may have its own Power Purchase Agreement.
- (5) The DG Owner may not assign any of the DG related contracts with CPS Energy to another entity without the written approval of CPS Energy.

4.5. *Initial Interconnection*

Upon satisfactory completion of the review process and approval of the Application as outlined in this Manual, CPS Energy will prepare the schedule for the interconnection of the DG Facilities.

- (1) The interconnection will be completed as soon as practical after completion of the review process and execution of the necessary contracts.
- (2) After completion of interconnection requirements and prior to initiation of service, CPS Energy will conduct a final inspection and commissioning of the facilities and interconnection to CPS Energy's system.
- (3) Upon satisfactory final inspection, CPS Energy will initiate service to the DG Facility or Facilities.

CPS Energy's review process and final inspection is intended as a means to safeguard CPS Energy's facilities and personnel. Any review by CPS Energy shall not impose any liability on CPS Energy and does not guarantee the adequacy of the DG Owner's equipment to perform its intended function. CPS Energy disclaims any expertise or special knowledge relating to the design or performance of generating installations and does not warrant the efficiency, cost-effectiveness, safety, durability, or reliability of such DG installations.



Appendix A

Interconnection Requirements for DISTRIBUTED GENERATION



Interconnection Requirements for DISTRIBUTED GENERATION

1. General Requirements

CPS Energy and the Distributed Generation Facility Owner (“DG Owner”) recognize the importance of having design, operational, and maintenance requirements to coordinate the interconnection of DG Owner's system with CPS Energy's system. This document addresses requirements for installing/interconnecting Distributed Generation (“DG”) Facilities to the CPS Energy system.

1.1. *Notice to All DG Owner’s Personnel*

The DG Owner’s contractors, agents, and operating/maintenance personnel shall be informed of and follow the requirements that are applicable to the specific DG Facility. Advanced notice of intent and verification of compliance is required before connecting to CPS Energy system.

1.2. *Notifying CPS Energy*

Unless otherwise stated in this document any required notification to CPS Energy shall be made to the CPS Energy DG Section.

1.3. *Display of Documents*

Copies of the Interconnection Agreement (IA) along with this document shall be posted in the DG Facility and all facilities associated with the operation of the DG Facility.

1.4. *Interconnect Study*

Specific locations and conditions may require the installation of more sophisticated protective devices and operating schemes. CPS Energy shall make any additional requirements known to the DG Owner at the time the interconnection studies are completed.

1.5. *Disconnect*

CPS Energy shall disconnect the DG Facility from the distribution system in an emergency, or should the DG Owner fail to install, operate, and maintain all wiring and equipment in such condition and/or manner that endangers persons or property, or may cause impairment of CPS Energy's interconnection and service to DG Owner.



2. Technical and Design Requirements

To help ensure the protection and safety of DG Owner's and CPS Energy's personnel and property, the continued provision of electric service to DG Owner, the continued maintenance of an interconnection between DG Owner and CPS Energy, and the reliable functioning of CPS Energy's overall system operations, the following requirements relevant to the type of DG Facility shall be observed.

2.1. Design Considerations

Standards

The DG Owner's equipment shall be designed in accordance with but not limited to UL (Underwriters Laboratories) Standards, IEEE (Institute of Electrical and Electronics Engineers) Standards, NEC (National Electrical Code), NESC (National Electrical Safety Code), PUCT (Public Utility Commission of Texas), ERCOT (Electric Reliability Council of Texas) Nodal Operating Guides, CPS Energy Electric Service Standards, IEEE Standard 1547, and any other applicable local, state or federal codes or standards.

Safety

2.1.1.1. *Visual Disconnect*

DG Owner shall 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 CPS Energy personnel, and capable of being locked in the open position. The DG Owner shall follow CPS Energy's switching, clearance, tagging, and locking procedures, which CPS Energy shall provide for the DG Owner.

2.1.1.2. *Reconnect Protection*

The DG Owner's DG shall be equipped with protective hardware and software designed to prevent the DG from being connected to CPS Energy's distribution system unless the CPS Energy voltage and frequency is within the accepted range on all phases.

Listed or Certified Equipment

For DG Systems up to 50 kW, certified equipment and equipment listed with an approved test label may be installed on CPS Energy's distribution system in accordance with CPS Energy approved interconnection control and protection scheme without further review of the DG Owner's design by CPS Energy. When the DG



Owner is exporting to CPS Energy using certified equipment, the protective settings and operations shall be those specified by CPS Energy. For a list of the certified equipment go to:

<http://www.gosolarcalifornia.ca.gov/equipment/inverters.php> or
http://www.gosolarcalifornia.ca.gov/equipment/pv_modules.php

Protection of DG Owner's Equipment

The DG Owner shall be responsible for protecting its DG equipment in such a manner that CPS Energy system outages, short circuits or other disturbances including zero sequence currents and Ferroresonant over-voltages do not damage the DG Owner's DG equipment. The DG Owner's protective equipment shall also prevent unnecessary tripping of CPS Energy breakers that would affect CPS Energy's capability of providing reliable service to other customers.

Remote Disconnect Control

If the DG is 2 MW or larger or as determines based on studies, CPS Energy requires a communication channel for transfer tripping of the DG Owner's main breaker or generator breaker for the purpose of separating the generation from the distribution grid. This equipment is to be installed at the Owner's expense. The channel shall be a part of the relay protection scheme and shall be from the Owner's site to the CPS Energy designated substation.

Bi-directional Disconnect Breaker

Circuit breakers or other interrupting devices at the Point of Interconnection must be capable of interrupting maximum available fault current from either direction. Facilities larger than 2 MW and exporting to CPS Energy shall have a redundant circuit breaker unless a listed device suitable for the rated application is used.

Exporting Power to CPS Energy

Exporting to CPS Energy may require additional operational or protection devices and will require coordination of operations with CPS Energy.



Power Purchase Agreements (PPA)

Exporting power to CPS Energy will require communication link to the inverters for remote disconnect and setting modification as directed by CPS Energy.

2.2. *Prevention of Interference*

Automatic Disconnect

The DG Owner shall provide an automatic method of disconnecting the DG equipment from CPS Energy if any of the parameters in the Interference Table below are violated. The DG Owner may reconnect with CPS Energy when the system voltage and frequency return normal range and is stabilized.

Interference Monitor

Interference is most often measured at the POI. The monitor may be placed at a practical location and best practices calculations may be utilized to determine expected level of interference for compliance. CPS Energy reserves the right to measure these parameters at the most practical point of connection, the POI, POCC, or POD.

Test Current Injection

Test method shall conform to current IEEE Anti-Islanding standards. Direct current (DC) pulse tests must be no greater than 0.5% of rated output current.

Interference Table

The following table lists the key electrical parameters and their acceptable limits in order to prevent interference on the CPS Energy System.

For less than 250 kW, refer to the IEEE 1547 - 2018 requirements column on Table 1.

For 250 kW and greater, refer to the CPS Energy requirements column on Table 1.



Table 1 Interference Limits for DG Systems Applied by Different Entities

Prevention of Interference Limits for CPS Energy, PUCT and IEEE 1547-2018 DG Requirements													
	CPS Energy					Public Utilities Commission of Texas					IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems		
	Single-Phase	Three-Phase				Single-Phase	Three-Phase				0 kW - 500 kW	500 kW-1500 kW	1500 kW - 10000 kW
	≤ 50 kW	<25 kW	25 kW - 500 kW	500 kW - 2000 kW	2000 kW - 10000 kW	≤ 50 kW	<25 kW	25 kW - 500 kW	500 kW - 2000 kW	2000 kW - 10000 kW			
Interconnection Requirements													
Interrupting Devices (capable of interrupting maximum available fault current)	x	x	x	x	x	x	x	x	x	4	x	x	x
Interconnect Disconnect Device at the POD	x	x	x	x	x	x	x	x	x	x	x	x	x
Interconnect Disconnect Device at the DG Facility	x	x	x	x	x	x	x	x	x	x	x	x	x
Over/Under Voltage Trip	x	x	x	x	x	x	x	x	x	x	x	x	x
Over/Under Frequency Trip	x	x	x	x	x	x	x	x	x	x	x	x	x
Ground over-voltage trip or ground over-current trip depending on the grounding system if required by CPS Energy			x	x	x			2	2	2	x	x	x
Reverse/under power sensing if the Facility is not exporting (the DG is less than the minimum load of the DG Owner's facilities)			x	x	x			3	3	3	x	x	x
Synchronizing Check (for facilities with standalone capability)	A/M ¹	A/M ¹	A/M ¹	A ¹	A ¹	A/M ¹	A/M ¹	A/M ¹	A ¹	A ¹	x	x	x
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 CPS Energy				x	x				x	x			
Telemetry/transfer trip is required by CPS Energy as part of a transfer tripping or blocking protective scheme.					x					x	x	x	x
Automatic Voltage Regulator					x					1	x	x	x
Three phase circuit breakers with electronic or electromechanical control for synchronous machines		x	x	x	x		x	x	x	x			
DG Owner solely responsible for proper synchronization for synchronous machines		x	x	x	x		x	x	x	x	Paralleling limits of 0.3 Hz Δf, 10% ΔV and 20° ΔΦ	Paralleling limits of 0.2 Hz Δf, 5% ΔV and 15° ΔΦ	Paralleling limits of 0.1 Hz Δf, 3% ΔV and 10° ΔΦ
Excitation response ratio shall not be less than 0.5 for synchronous machines		x	x	x	x		x	x	x	x	x	x	x
Excitation system shall conform with ANSI C50.13-1989 for synchronous machines		x	x	x	x		x	x	x	x			
May "motor" up to speed if initial voltage drop at the PCC is within the Flicker limits for induction machines		x	x	x	x		x	x	x	x			
Line-commutated inverters do not require synchronizing equipment		x	x	x	x		x	x	x	x	x	x	x
Self-commutated inverters require synchronizing equipment		x	x	x	x		x	x	x	x	x	x	x



Table 1 Interference Limits for DG Systems Applied by Different Entities (Cont'd)

Prevention of Interference Limits for CPS Energy, PUCT and IEEE 1547-2018 DG Requirements (Cont'd)						
Disturbance Delay and Trip Times						
	Trigger Point for Disconnect	Trip Time	Trigger Point for Disconnect	Trip Time	Trigger Point for Disconnect ⁵	Trip Time ⁵
Over Voltage Set Point 1	+ 5% of nominal voltage	2 s	+ 5% of nominal voltage	30 s delay; 0.167 s trip	+ 10% of nominal voltage	1 s
Over Voltage Set Point 2	+ 10% of nominal voltage	0.167 s	+ 10% of nominal voltage	0.167 s delay & trip	+ 20% of nominal voltage	0.16 s
Under Voltage Set Point 1	- 10% of nominal voltage	2 s	- 10% of nominal voltage	30 s delay; 0.167 s trip	- 12% of nominal voltage	2 s
Under Voltage Set Point 2	- 30% of nominal voltage	0.167 s	- 30% of nominal voltage	0.167 s delay & trip	- 50% of nominal voltage	0.16 s
Over Frequency Set Point	+ 0.5 Hz from base frequency	0.25 s	+ 0.5 Hz from base frequency	0.25 s	+ 0.5 Hz from base frequency	0.16 s
Under Frequency Set Point	- 0.7 Hz from base frequency	0.25 s	- 0.7 Hz from base frequency	0.25 s	- 0.7 Hz from base frequency for DG ≤ 30 kW	0.16 s
					-0.2 Hz to -3Hz (adjustable set point) for DG > 30kW	0.16 s to 300 s (adjustable)
					<-3 Hz from base frequency for DG > 30 kW	0.16 s
Flicker	Voltage at POI must be less than 3% voltage dip		Voltage at POI must be less than 3% voltage dip		DG shall not create objectionable flicker for other customers on the Area EPS	
Total Harmonic Distortion	< 5.0% of fundamental frequency		< 5.0% of fundamental frequency			
Individual Harmonic Distortion	< 3.0% of fundamental frequency		< 3.0% of fundamental frequency		< 11th order, 4%; between 11th and 17th, 2%; between 17th and 23rd, 1.5%; between 23rd and 35th, 0.6%; ≤35th, 0.3% (all based on % of current).	
Fault and Line Clearing for Loss of Voltage on any Phase of CPS Energy Circuit	- 30% of nominal voltage	0.167 s	- 30% of nominal voltage	0.167 s		
Direct Current Injection	< 0.5% of DG Facility rated output current				< 0.5% of DG Facility rated output current	

NOTES

M - Manual

A - Automatic

X - Required feature

¹ Required for facilities with stand-alone capability

² May be required by TDU; selection based on grounding system

³ Required, unless generator is less than DG Owner minimum load, to verify non-export

⁴ System exporting shall have either redundant or listed devices

⁵ DG ≤ 30 kW, Maximum clearing times; DG > 30 kW, Default clearing times



2.3. Emergency Power Systems Over 250 kW

Emergency electric generators (backup generators) or auxiliary power supplies owned by Customer shall serve the purpose of providing backup generation to the customer's load only. Customer's equipment must be wired to prevent the possibility of paralleling operation with CPS Energy's distribution system. Any parallel operation, including momentary paralleling, must be approved by the CPS Energy DG Section.

2.4. Non-Paralleling Emergency Electric Generators or Auxiliary Power Supplies

For non-paralleling emergency electric generators or auxiliary power supplies, the transfer scheme shall operate as a "break before make" during the transfer of the load from normal and emergency power and from emergency to normal power. The transfer scheme shall be interlocked to prevent paralleling during normal, test and maintenance conditions. Customer with non-paralleling emergency electric generators or auxiliary power supplies shall provide to the DG Section the following for review:

For systems with total capacity (including aggregate) less than 25 kW in a single parcel of property with single or multiple meters

- Detailed operational one-line diagram
- Site plan
- Meter loop drawing (elevation view)/ Proposed Equipment Layout
- "Visible" disconnect device or breaker and include the following ratings as applicable: Full Load Rating, Momentary Rating, Interrupting rating
- Show all protective devices and include as applicable size, rating, manufacturer, type, style, model, settings

For systems with total capacity (including aggregate) greater than or equals to 25 kW in a single parcel of property with single or multiple meters

- **Sealed and signed** (Texas P.E.) detailed operational one-line diagram
- **Sealed and signed** (Texas P.E.) site plan
- Meter loop drawing (elevation view) / Proposed Equipment Layout
- "Visible" disconnect device or breaker and include the following ratings as applicable: Full Load Rating, Momentary Rating, Interrupting rating



- Show all protective devices and include as applicable size, rating, manufacturer, type, style, model, settings

2.5. *Momentarily Paralleling*

Less than One Second

For paralleling electric generators or auxiliary power supplies, including customers with emergency electric generators or auxiliary power supplies of 250 kW the transfer scheme shall parallel no more than one (1) second with CPS Energy's distribution system during the transfer of the load from emergency power to normal power. Customers shall provide the DG Section the following for review:

- Transfer scheme control schematics
- Operating logic
- Relay one-line diagrams.
- Interconnect disconnect device
- DG disconnect device
- Synchronizing Check (for facilities with standalone capability)
- Over-voltage trip
- Under-voltage trip
- Over/under frequency trip
- Either a ground over-voltage trip or a ground over-current trip depending on the grounding system, if required by CPS Energy.

If customer's load is connected to CPS Energy's redundant service, customers shall determine the sequence of events between the normal circuit, redundant circuit, and backup generation as well as time delay for the backup generator. This information shall be included in the transfer scheme control schematic and operation logic.

Greater Than One Second

Customers paralleling longer than one (1) second but not continuously, in addition to the above, a reverse-power or under-power function is required. Customers shall be required to have a function to limit the amount of time to no more than 5 minutes the emergency electric generators or auxiliary power supplies can stay in parallel with CPS Energy.



2.6. *Single Phase DG Control, Protection and Safety Equipment*

Equipment required for control, protection and safety specific to single phase DG of 50 kW or less.

- interconnect disconnect device at the POD and at the DG Facility when required
- an over/under voltage trip
- an over/under frequency trip
- adjustable reactive output modification capability
- Synchronizing Check (for facilities with standalone capability)

2.7. *Three-Phase DG Control, Protection and Safety Equipment*

This section specifies the control, protection, and safety equipment requirements specific to these listed generation systems. Exporting to CPS Energy may require additional operational or protection devices and will require coordination of operations with CPS Energy.

Three-phase Synchronous Generators

- Breakers shall be 3-phase devices with electronic or electromechanical control.
- The DG Owner is solely responsible for properly synchronizing its generator with CPS Energy.
- 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 the appropriate American National Standards Institute Standard in order to permit adequate field forcing during transient conditions.
- For generating systems greater than 2 MW the DG Owner 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, CPS Energy's System Operator shall be notified at 210-353-4362.

Three-Phase 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 on CPS Energy side at the PCC is within the visible flicker stated in Section 3.3.2 of the DG Manual Overview or Table 1. Otherwise, the DG Owner may be



required to install hardware or employ other techniques to bring voltage fluctuations to acceptable levels.

Line-Commutated Inverters

Line-commutated inverters do not require synchronizing equipment.

Self-Commutated Inverters

Self-commutated inverters whether of interactive or stand-alone type shall be used in parallel with CPS Energy only with synchronizing equipment.

Protective Function Requirements

The protective function requirements for 3-phase facilities of different size and technology are listed below.

2.7.1.1. All DG Installations

All DG installations shall have:

- Interconnect disconnect device
- DG disconnect device
- Over-voltage trip
- Under-voltage trip
- Over/under frequency trip
- Synchronizing Check (for facilities with standalone capability)

2.7.1.2. For 25 kW but no more than 500 kW

The installation for these size generators, in addition to the above requirements, shall also have:

- Either a ground over-voltage trip or a ground over-current trip depending on the grounding system if required by CPS Energy;
- Reverse/under power sensing if the Facility is not exporting (the DG is less than the minimum load of the DG Owner's facilities).

2.7.1.3. For 500 kW but no more than 2,000 kW

The installation for these size generators, in addition to the above requirements, shall also have:

- Synchronizing Check (for facilities with standalone capability)

- 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 CPS Energy.

2.7.1.4. For 2,000 kW up to 10,000 kW

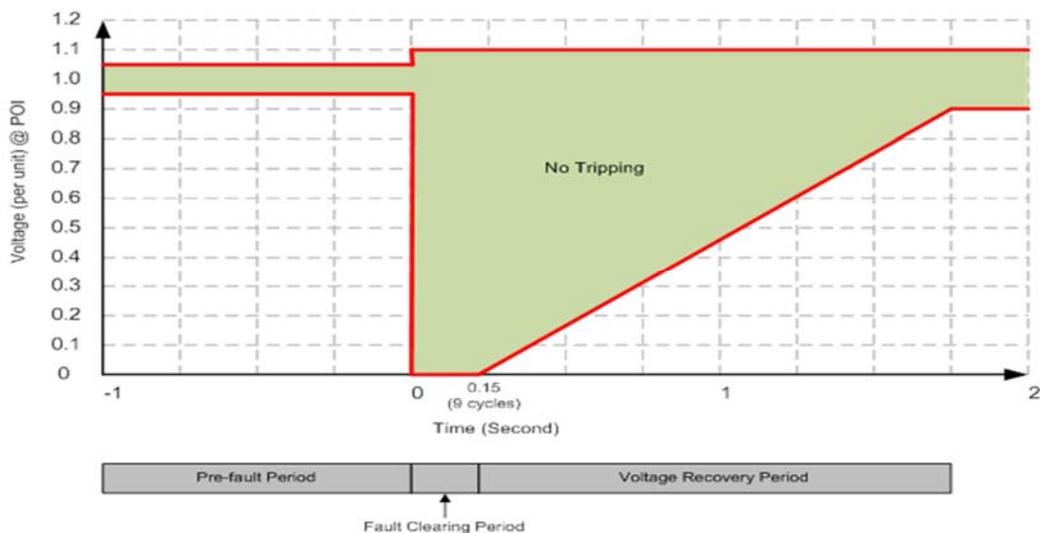
The installation for these size generators, in addition to the above requirements, shall also have:

- Telemetry/transfer trip required by CPS Energy as part of a transfer tripping or blocking protective scheme.

Exporting Power

If the three phase generator is greater than 50 kW and is exporting power to CPS Energy, the generator power factor shall be between 0.95 lagging to 0.95 leading at the generating facilities’ terminals at all time.

All generation resources shall meet the Electric Reliability Council of Texas (ERCOT) operating guide requirements with wind powered resources or Intermittent Renewable resources meeting the 9 cycle voltage ride through requirements as shown in the figure below:



2.8. System Acceptance and Commissioning

Inspection and Start-up Testing

2.8.1.1. Startup Notice

For those authorized and approved systems, the DG Owner shall provide CPS Energy with notice at least



two weeks before the initial energizing and start-up testing of the DG Owner's DG equipment and CPS Energy may witness the testing of any equipment and protective systems associated with the interconnection.

For all other unauthorized and unapproved systems, CPS Energy is not responsible for delays in startups or costs associated with denials of the system.

2.8.1.2. *For 500 kW and Greater, before Initial Paralleling Operations*

- Operability test of the isolation devices
- Unintentional-islanding functionality test (IEEE 5.4.1) and cease to energize functionality (IEEE 5.4.2) must be passed; open each phase at the POI and system should shut down.
- For design modifications that may affect the safe and reliable operation of the CPS Energy distribution system, the DG Owner shall revise and re-submit the Interconnection DG Application with information reflecting the modifications.

2.8.1.3. *For 500 kW and Greater, during Start-up Tests on All DGs*

Set AC Power Quality monitoring at the POI to verify conformance with the interference table.

2.8.1.4. *For 500 kW and Greater, Provide a Commissioning Report*

DG Owner shall submit a summary report containing the test procedures used and the results of the tests within thirty (30) days of testing. The report shall be submitted to the CPS Energy DG Section. Thereafter, DG Owner may be required to retest the system protection elements upon any reasonable request by CPS Energy.

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 DG and interconnection point disconnects. All wiring diagrams, material specifications, testing equipment list and setup diagrams, testing procedures, and all other pertinent information shall be submitted to CPS Energy DG Section for review and



approval. All certification verification results shall be provided to CPS Energy DG Section.

- Visual inspection shall be made to ensure grounding coordination requirement of IEEE 1547-2018 section 4.1.2 has been implemented.
- Testing will verify all protective and power quality set points and relay/breaker trip timing. CPS Energy may witness the testing of installed switchgear, protection systems, and DG controls.

Final Setup Information

For DG 500 kW and over, the DG Owner shall provide a list of set points for all protection equipment and regulation equipment to CPS Energy DG Section at the time of acceptance. This may be a picture, screen shot, printout or other form of verification acceptable to the CPS Energy DG Section.

2.9. Metering

General

Metering design shall be based on CPS Energy Tariff(s), ERCOT Protocol Section 10 (Metering), and any special requirements identified during project review. CPS Energy shall design, supply, own, and maintain all necessary meters and associated equipment. Metering design, equipment, and installation will be at the DG Owner's expense. ERCOT metered installations will require DG Owner registration as a Resource Entity (10 MW or more) with ERCOT, and will utilize CPS Energy as the "Qualifying Scheduling Entity" for scheduling the market resource. In general the metering requirements are as follows:

- For DG Facilities up to a 50 kW designed output, a CPS Energy revenue meter shall be installed at the inverter output, in addition to any premises metering. This is not an ERCOT meter point.
- For DG Facilities greater than 50 kW and up to 1 MW output, metering is required to capture the power delivered to the bulk CPS Energy distribution system for ERCOT reporting. Meter data for settlement is not required to be submitted to ERCOT.
- DG Facilities greater than 1 MW (the current registration threshold per ERCOT Nodal Protocols Section 15.5 (5)) and less than 10 MW output, will require a Transmission and/or Distribution Service Provider (TDSP) ERCOT meter to provide settlement meter data. DG must be registered with



ERCOT and CPS Energy must read, validate, edit, and submit meter data to ERCOT. This data must be validated and edited in accordance with the Texas Standard Electronic Transaction (SET) Protocols found on the ERCOT website. At CPS Energy's discretion, this meter point may be made an ERCOT Polled Settlement (EPS) meter point and ERCOT will directly poll the meter. CPS Energy will supply and maintain an uninterruptible power source (UPS). DG Owner will be responsible for the cost of the UPS.

- All DG Facilities 10 MW and greater will be EPS metered. Multiple DG Facilities connected at one meter point with a combined capability of 10 MW or greater may require gross real-time MW and MVAR telemetry from each DG Facility.

Meter Location

The DG Owner shall provide CPS Energy a suitable location on its premises for the installation of CPS Energy's meters and associated equipment. Metering shall be located at the POD or as determined in the Application approval process. Typical meter locations are as follows:

- Meter enclosure(s) or meter sockets shall be located adjacent to respective DG switchgear and not attached to or inside switchgear.
- CPS Energy metering instrument transformers located in the DG switchgear shall meet the requirements outlined in the CPS Energy Electric Service Standards. Instrument transformers shall meet CPS Energy requirements for potential and current transformers.
- Meter enclosures associated with Utility pole mounted instrument transformers shall be located adjacent to the Utility pole. Utility pole mounted instrument transformers will be provided and installed by CPS Energy.

Installation

CPS Energy shall supply, specify, own, and maintain all meters and associated equipment to measure energy flow of the DG. The DG Owner shall provide for material, installation and maintenance in accordance with NESC and CPS Energy specification as follows:

- The DG Owner shall install, own, and maintain all conduit raceway(s) required for site installation metering, relaying, and communications.
- The DG Owner shall provide support structure for meter socket or meter enclosure(s), and meter enclosure foundations. Details for these requirements will be on a



project by project basis, and will be provided to the DG Owner during the design phase of the project.

Meter Capability and Telemetry Requirements

In general all CPS Energy/DG Owner agreements as part of the Application approval process, CPS Energy Tariff(s), and ERCOT Protocol Section 10 shall govern the minimum meter requirements. Specific communication and telemetry requirements are as follows:

- Telemetry to the CPS Energy Generation Management System must be provided for DG Facilities greater than 1 MW. The DG must be registered with ERCOT.
- DG Facilities delivering 250 kW or more shall have a meter capable of monitoring, real power output, reactive power output and voltage at the POI, POD, or other reasonable location (see IEEE 1547-2018 4.1.6).

Metering Auxiliary Power and Communication Requirements

The DG Owner shall provide for communications and auxiliary power requirements identified during the design and review phase of the project. Meter points for DG Facilities 1 MW (or the DG registration threshold, as determined in ERCOT Protocol Section 16.5) and greater will require the following:

- Meter communications will be required at the meter point for remote meter access. An internet connection and dialup telephone service shall be provided at the DG Owner's expense with termination at the metering equipment metering enclosure. Please note internet access and telephone service may be available as part of CPS Energy's communication system.
- A single 120 V, 20 Amp circuit shall be provided for meter equipment from an uninterruptable power supply (UPS). CPS Energy to supply and maintain the UPS with DG Owner responsible for the cost.

2.10. SCADA

CPS Energy shall supply, own, and maintain all RTU (remote terminal unit) and associated equipment to remotely control and/or monitor status and analog data deemed necessary by CPS Energy. All serially connected devices providing these reads to the RTU must be capable of communicating DNP 3.0 protocol.

The DG Owner shall supply at no cost to CPS Energy the following:

- A mutually agreed upon location on its premises for the installation of CPS Energy's SCADA equipment. Communication equipment will reside with



the SCADA equipment and Power Quality equipment in the Cabinet co-located with metering.

- DG Owner to provide adequate general space for the metering, RTU, SCADA, and communications equipment.
- A 120 V, 20 Amp circuit shall be provided for SCADA equipment from an uninterruptable power supply by the DG Owner.
- An uninterruptible power source. (CPS energy to supply and maintain the UPS with DG Owner responsible for the cost.)
- All communication connections to meters, relays, and other Intelligent Electronic Devices (IEDs) interfacing with CPS Energy SCADA equipment. Any communication connections to SCADA in excess of 50 feet shall be fiber with a fiber to serial transceiver.
- Unrestricted access to all CPS Energy SCADA equipment.
- A drivable surface for accessing the SCADA equipment.

2.11. *Monitoring Power Quality*

CPS Energy may supply, own, and maintain a permanent power quality monitor on site if deemed necessary. The purpose of the monitor is to ensure compliance with interconnection parameters and to prevent interference with CPS Energy as described in Section 2.2.

- Permanent monitors are integral to the metering, therefore communications are provided by the CPS Energy Metering Department at the site.
- Temporary monitors may be installed at any time by CPS Energy.

CPS Energy shall have the right to disconnect its system from the DG Owner system. CPS Energy will determine the timing and duration of the interruption. CPS Energy will consider reconnecting its system to the DG Owner when CPS Energy has evidence that the electric energy of the DG Owner meets the Interconnection Terms and Interconnection Requirements. CPS Energy will determine the timing, conditions and details of the reconnection on a case-by-case basis.

2.12. *Communication*

CPS Energy shall supply, own, and maintain all necessary communication equipment and associated equipment for use of providing communication path to SCADA, Metering, System protection and Power Quality. Communication equipment will reside with the SCADA equipment and Power Quality equipment in the Cabinet co-located with metering. Cabinet will be provided by CPS Energy Communication Services with DG Owner responsible for the cost. Details for these requirements will be on a project by project basis, and will be provided to the DG Owner during the design phase of the project. CPS Energy Communication Services Department will provide the specification of the fiber optics cable and copper cable.



The DG Owner shall supply at no cost to CPS Energy the following:

- A conduit raceway, fiber optics and/or copper cable from the Data circuit demark to the Meter/Communication/SCADA Cabinet.
- A conduit raceway, fiber optics cable and/or copper cable for communication from the communication equipment to each metering enclosure (this includes CPS Energy meter and DG owned meter), relays, and other IED.
- A duplex 120 V circuit rated no less than 15 Amps for CPS Energy Communication equipment (Typical circuit load < 5 Amp).
- An uninterruptible power source. (CPS energy to supply and maintain the UPS with DG Owner responsible for the cost.)
- A leased Data circuit or other mutually agreed upon communication medium from the DG site to a determined CPS Energy Substation. Communication circuit requirements will be on a project by project basis, and will be provided to the DG Owner during the design phase of the project.
- Foundation/Concrete slab: Details for these requirements will be on a project by project basis, and will be provided to the DG Owner during the design phase of the project.
- A paved road or CPS Energy approved road for drive-up access to and around the Meter/SCADA/Communication Cabinet. Details for these requirements will be on a project by project basis, and will be provided to the DG Owner during the design phase of the project.
- Unrestricted access to all CPS Energy Communication equipment and path. If unrestricted access is not available, DG Owner shall provide contact information and escalation list for 24 hours a day, 7 days a week.

If CPS Energy determines that a leased circuit is required, DG Owner shall lease, at DG Owner's expense, the leased circuit with any available provider.

3. Operation and Maintenance

To help ensure the protection and safety of DG Owner's and CPS Energy's personnel and property, the continued provision of electric service to DG Owner, the continued maintenance of an interconnection between DG Owner and CPS Energy, and the reliable functioning of CPS Energy's overall system operations, the following operational and maintenance procedures shall be observed.

3.1. *Operating Authority and Personnel*

- CPS Energy System Operator (SO) will have the ultimate responsibility for carrying out the operating procedures described herein.



- CPS Energy maintains the Energy Management Center (EMC) on a 24-hour basis for the purpose of coordinating the operation of all Transmission, Distribution, and Generation facilities connected to CPS Energy.
- The DG Owner may be required to have an on-site or on-call person that will take operating instructions from the CPS Energy SO any time the DG is on line and generating energy or reactive power on the CPS Energy system.

3.2. *Voice Communication*

DG Owner will provide telephone numbers for normal and emergency situations. These should be listed on the DG application and CPS Energy shall be notified immediately of any changes. DG Owner shall provide and maintain a telephone in its Facility connected to an outside telephone line independent from DG Owner's internal telephone system (if there is one). This ensures telephone communications should DG Owner's internal switchboard become inoperable.

3.3. *Energizing the Connection between CPS Energy and the DG Facility*

Only authorized employees of CPS Energy are permitted to make and energize the connections between CPS Energy's system and the DG Owners facilities.

3.4. *Emergency Conditions*

CPS Energy Emergency

If in CPS Energy's sole judgment, an emergency poses a threat to the area power supply and service interruption and/or generation disconnect may prevent or alleviate the emergency condition, DG Owner may be called upon by CPS Energy's System Operator to operate necessary switches, breakers, reduce generation, change reactive output, etc. in order to prevent or alleviate an emergency condition.

ERCOT Emergency

CPS Energy is a member of ERCOT and operates its system in accordance with the operating criteria, guidelines, and protocols of ERCOT. As a result, CPS Energy may interrupt service to the DG in the event of an ERCOT declared emergency or as directed by ERCOT Operations.

3.5. *DG Owner Operating and Maintenance Responsibility*

Equipment Responsibility

DG Owner assumes all responsibility for the electrical system on the DG Owner's side of the Point of Delivery (POD).



- DG Owner will operate and maintain all wiring and apparatus in such condition and/or manner as not to endanger persons or property, or to cause impairment of CPS Energy's interconnection and service to DG Owner, or any of CPS Energy's customers.
- DG Owner shall inspect and maintain all Facility structures and equipment provided by DG Owner on an industry or manufacturer's recommended basis.

Control and Protective Equipment

The DG Owner is responsible for routine maintenance of any DG control and protective equipment at the POI not owned by CPS Energy. If CPS Energy does not do the periodic breaker trip testing by mutual agreement with the DG Owner, DG Owner will conduct periodic breaker trip testing and notify CPS Energy in advance of such testing so that CPS Energy may witness such tests.

Planned Maintenance

If DG Owner schedules a planned maintenance, CPS Energy requests that the DG Facility shall be taken off-line between the dates of March 1st to April 30th and October 1st to November 30th of each year unless otherwise agreed to in writing.

Maintenance and Operational Records

The DG Owner will maintain interconnection and service equipment records as follows:

- Log of maintenance activities for interconnect equipment.
- Protection functionality and associated battery maintenance logs must be maintained (IEEE 1547-2018 5.5).
- Operation log for DG systems greater than 500 kW. As a minimum the log shall include the date, DG time on, and DG time off, and MW and MVAR output.
- Facility one-line must be maintained and a correct one-line diagram of DG Owner's Facility must be provided to the CPS Energy EMC SO after any change.
- CPS Energy may review such documents at reasonable times.

DG Owner Switching Request

The DG Owner shall;

- Make a reasonable attempt to notify CPS Energy System Operations at least 48 hours in advance of any scheduled switching the DG Owner wishes CPS Energy to execute.



- Follow all switching instructions provided by CPS Energy's System Operator.
- Coordinate operation of its system with CPS Energy to ensure that the overall CPS Energy system operation will be consistent with the current ERCOT Nodal Operating Guides and Protocols.

Notification of Disruption

DG Owner shall promptly notify CPS Energy's System Operator of all internal system conditions that could affect CPS Energy's distribution system. All communications with the CPS Energy's SO shall reference the DG Owner's Facility two character mnemonic name (if applicable) and applicable equipment numbers as designated by CPS Energy on the approved one-line diagram.

Reasonable Access

- DG Owner shall provide CPS Energy's authorized representative access to DG Owner's premises at all reasonable hours for the purpose of inspecting CPS Energy's wiring and apparatus, erecting, removing or replacing CPS Energy's facilities at the POI, reading CPS Energy's meters and for all other purposes connected herewith.
- For ERCOT meter equipment failure, Communication equipment failure or SCADA equipment failure. CPS Energy authorized representatives shall have access 24 hours a day, 365 days a year.

Correction of Interference

DG Owner shall, repair, replace or disconnect equipment which violates the Prevention of Interference Section 2.2 in a reasonable time.

3.5.1.1. DG Owner Disclosure

If the DG Owner becomes aware of interference, DG Owner will notify CPS Energy as soon as practical and propose a schedule for correcting the interference.

3.5.1.2. CPS Energy Response

CPS Energy will investigate the interference effect on supply of electric service to other customers. Should the equipment interfere with CPS Energy's service to other customers, CPS Energy will notify the DG Owner of disconnect, unless an acceptable agreement is negotiated.



Equipment Compatibility

DG Owner is responsible for providing all Facility equipment in accordance with CPS Energy's applicable specifications, both initially and from time to time thereafter, whenever changes in the CPS Energy's distribution system (including the distribution system's monitoring and protection devices) requires such changes in the Facility in order to maintain its compatibility with the CPS Energy's distribution system. Prior to the replacement or modification of any equipment, DG Owner shall first notify CPS Energy of the replacement or modification, submit specifications to CPS Energy and obtain CPS Energy's approval of compatibility with CPS Energy's distribution system.

Batteries

DG Owner will visually inspect and conduct periodic maintenance on any Facility batteries as recommended by manufacturer. DG Owner will provide CPS Energy copies of test reports and any corrective action taken.

3.6. CPS Energy Operating and Maintenance Responsibility

CPS Energy SCADA

CPS Energy will operate and maintain any CPS Energy SCADA (Supervisory Control and Data Acquisition) equipment installed at the DG Owner's Facility to communicate with the CPS Energy's EMC and GENCO.

CPS Energy Disconnect Notice

CPS Energy will use reasonable efforts to provide DG Owner with seven calendar days advanced notice of any scheduled switching for distribution lines connecting the DG. CPS Energy shall have the right and authority to disconnect DG at CPS Energy's reasonable discretion if CPS Energy believes (in each case, as determined in a non-discriminatory manner) that:

- Continued interconnection of the DG Facility with CPS Energy's electric system creates or contributes (or will create or contribute) to a system emergency on CPS Energy's electric system.
- The DG Facility is not in compliance with the Interconnection Terms and Interconnection Requirements, and the non-compliance adversely affects the safety, reliability or power quality of CPS Energy's electric system.
- The DG Owner is in violation any of the DG Interconnection Terms and Interconnection Requirements.



In non-emergency situations, CPS Energy shall give DG Owner notice of noncompliance including a description of the specific noncompliance condition and allow DG Owner a 45 day cure period to correct the noncompliance prior to disconnecting the DG Facility.

CPS Energy Disconnect due to Interference

CPS Energy shall have the right to disconnect its system from the DG Owners system. CPS Energy will determine the timing and duration of the interruption. CPS Energy will consider reconnecting its power system to the DG Owner when CPS Energy has evidence that the electric energy of the DG Owner meets the Standards and Requirements of Section 2.2 - Prevention of Interference and Table 1 - Interference Limits for DG Systems Applied by Difference Entities. CPS Energy will determine the timing, conditions and details of the reconnection on a case-by-case basis.

Annual Maintenance Outage

CPS Energy performs periodic maintenance on its equipment. Such maintenance on CPS Energy equipment at the POD or any of the Interconnection Facilities may require scheduling approximately an eight hour outage annually during normal working hours. Such outage of DG Owner's equipment will typically be coordinated to coincide with DG Owner's annual maintenance schedule. The DG Owner's maintenance schedule shall be on file in the CPS Energy System Operator's office and must be updated at least annually. Any changes to such schedule shall be reviewed and approved by CPS Energy.

CPS Energy shall inspect the following devices, instruments, and systems:

- Revenue metering equipment owned by CPS Energy - This equipment shall be inspected on a reasonable basis, but not more often than every two months. CPS Energy will maintain and replace this equipment as necessary.
- CPS Energy owned metering instrument transformers and associated equipment - A power outage to DG Owner's equipment is required for the maintenance of the revenue metering or control instrument transformers at the POI.
- All SCADA and Communication equipment at the POI - CPS Energy will maintain this equipment as necessary and must have access to this equipment 24 hours a day 7 days a week.
- Protective relays as specified on CPS Energy's relay test sheets - CPS Energy will set and maintain these relays as necessary. This will include out-of-case testing. Breaker



trip testing will be performed at the same time if CPS Energy and the DG Owner agree. CPS Energy will provide DG Owner copies of the results of the annual relay tests upon request and notify DG Owner of any protective relay equipment requiring repair or replacement.

- All communication equipment used with distribution line protective relaying including periodic performance testing - DG Owner will be notified of any problems or irregularities found.

3.7. *Switching Guidelines*

Switching of CPS Energy equipment is required at times for equipment outages to allow both CPS Energy and DG Owner to perform maintenance and construction. CPS Energy and DG Owner activities should be coordinated whenever possible to reduce switching requirements. DG Owner and CPS Energy shall abide by each other's isolation procedures, including but not limited to abiding by the intent of isolation tags, locks or written notices of both parties. To facilitate this process, the following requirements have been included for guidance:

- **Planned Outages.** When switching CPS Energy equipment is desired for maintenance or operation of DG Owner's system, DG Owner shall contact CPS Energy's System Operator at (210) 353-4962 and selecting option 4 during CPS Energy's regular business hours at least 48 hours in advance, but not later than 2:00 P.M. Central Time on the day preceding such planned switching and explain the nature of the request. If CPS Energy's System Operator approves the switching, DG Owner must notify CPS Energy's System Operator at the scheduled time immediately prior to proceeding with the planned switching.
- **Equipment Failure.** In addition to outages for scheduled maintenance by DG Owner or CPS Energy, switching may be required at the POI or POD as a result of defective equipment being found, failed equipment and emergency situations. In these situations, both CPS Energy and DG Owner agree to provide any required switching as promptly as reasonably possible.
- To remove a transformer from service, all loads shall be removed first.
- To remove line equipment from service, switching at remote CPS Energy or other customer facilities is required. DG Owner must request an outage as previously described. CPS Energy will provide all switching on the CPS Energy side of the POD.

3.8. *Equipment Identification*

CPS Energy may display and mount signs, stickers, drawings, telephone numbers, and instructions pertaining to the scheduled maintenance or emergency operation of DG Owner's system on the outside and inside of the equipment.



3.9. Clearance Procedures

It is CPS Energy's practice that DG Owner must obtain clearance from CPS Energy SO for any maintenance activities requiring the outage of CPS Energy's distribution lines at the POI or POD in accordance with Section 3.7. When an outage of distribution line apparatus is desired, the following procedure for securing a clearance will apply:

- A clearance request is made to CPS Energy's System Operator in accordance with Section 3.7. CPS Energy's SO shall give switching instructions to CPS Energy personnel to accomplish switching at DG Owner's Facility and contact any other CPS Energy operators or crews necessary to accomplish switching at remote terminals.
- DG Owner and/or CPS Energy personnel shall place safety or "hold" tag on switches when they are opened. Tagging of equipment remote from DG Owner's system shall be done by CPS Energy personnel.
- CPS Energy's SO shall give the clearance in the name of the party requesting it. CPS Energy will use designated CPS Energy personnel to check that the procedures of the clearance are completed by the DG Owner prior to final approval. In the event more than one crew is working on a line, each crew shall secure clearance. CPS Energy is responsible for placing grounds on CPS Energy's equipment.
- When a switch in DG Owner's system is tagged mutually by DG Owner and CPS Energy personnel, the first operator desiring to remove his tag shall notify CPS Energy's SO that he is removing his tag and that there is still a tag on the switch. Neither CPS Energy nor DG Owner shall operate the switch until the operator whose tag is still on the switch has notified CPS Energy's SO that he is removing his tag.
- Release of all clearances and removal of all grounds are required before "hold" tags are removed and any switches closed. "Hold" tags are removed only after the clearance is released by the individual who secured the clearance and switching instructions are received from CPS Energy's SO.

3.10. Grounding Procedures

- CPS Energy shall place safety grounds on CPS Energy equipment when required for maintenance procedures.
- All grounding on the DG Owner's side will be performed by the DG Owner's personnel.
- The operator providing maintenance is responsible for placing safety grounds around the equipment to be maintained.
- No safety grounds should be placed where a switching device could be opened, removing the protection of a safety ground(s).
- The number and locations of all grounds should be provided to CPS Energy's SO.



- All grounds must be removed before "hold" tags are removed from switches.

3.11. *Fault Initiated Outages*

After automatic tripping of the DG due to an interruption of CPS Energy service at the POI or POD (due to a fault or other system disturbance);

- DG Owner shall notify CPS Energy's SO.
- Important to report as soon as possible;
 - Present position of circuit breakers or switches (open or closed)
 - Time of outage
 - Any information which might be helpful in determining the cause of the outage
- Report as soon as the information is available;
 - Indication flags of any relays which initiate trips to the CPS Energy circuit breaker at the POI or POD (if applicable). DG Owner shall make a notation of the relay flags and will not reset flags without permission from CPS Energy's SO. CPS Energy reserves the right to reset relay flags.
 - Circuit breaker operations counter reading on CPS Energy circuit breaker at the POI or POD (if applicable).

3.12. *DG Owner Operations*

Forced Outages

As soon as practical, DG Owner shall notify CPS Energy of any potential problems or of any forced outages and the expected duration thereof.

DG Owner Reconnect Notice

In the event DG system is isolated from the CPS Energy's system, DG Owner shall notify CPS Energy's SO before attempting to resynchronize with CPS Energy's system.

Operations Log Request Timing

Any records maintained or accessible to the DG Owner concerning an operating log with records of real and reactive power production, changes in operating status, scheduled and forced outages, and any unusual conditions found during any inspections shall be provided to CPS Energy upon request within thirty (30) days of CPS Energy's request.



Voltage Regulator Failure

In the event a generating unit's voltage regulator is out of service, DG Owner shall immediately notify CPS Energy's SO.

3.13. *DG Owner's Operational Reactive Support Responsibility*

If CPS Energy studies determine DG Owner should be operated to support the distribution system voltage by regulating volt-amps reactive output, this regulation shall be accomplished in accordance with the following:

- CPS Energy shall be responsible for monitoring overall system conditions and DG Owner shall take such corrective action as CPS Energy may require.
- DG Owner shall maintain the distribution voltage level provided by CPS Energy up to the reactive levels stated by the CPS Energy.
- If the DG Owner is categorized by ERCOT as subject to ERCOT reactive supply requirements, CPS Energy shall require the DG Owner to meet the minimum requirements for reactive VAR support as outlined in the ERCOT reactive support requirements for all connected generators.
- DG Owner must submit all reactive support tests as required by the ERCOT compliance templates to the CPS Energy EMC for submission to ERCOT.
- The DG Owner's voltage regulators must have characteristics acceptable to CPS Energy and must be in service at all times.

3.14. *Speed Governor Maintenance and Notification (if applicable)*

- DG Owner shall maintain its speed governor settings as required by CPS Energy.
- Yearly testing must be done and the test results submitted to the CPS Energy DG Section.
- DG Owner shall maintain its speed governor in service (if applicable) when operating synchronous to CPS Energy unless blocked due to a temporary operating problem.
- DG Owner shall immediately notify CPS Energy's System Operator when blocked.

3.15. *Amendments*

These Interconnection Requirements may be amended from time to time by CPS Energy to account for significant modifications in the manner in which DG Owner is connected to CPS Energy's system or to reflect subsequent changes in CPS Energy's Rate Structure for Electric Service approved by the San Antonio City Council. Notice of such amendment(s) will be communicated to DG Owner.



Appendix B

Feasibility Study Fees and Interconnection Study Fees



FEASIBILITY STUDY FEES AND INTERCONNECTION STUDY FEES

Feasibility Study Fees

Should a potential DG Owner desire a site feasibility study or studies from CPS Energy, the form in Appendix C (“Application for Feasibility Study for Distributed Generation”) must be filled out and returned with the non-refundable fee. An application and fee must be submitted for each site requested. (If the project progresses to the Interconnection Request below, this fee will be deducted from the fees below.) The current fees are as follows (Fees subject to change without notification):

DG Size Bracket	Fee
1 kW to less than 50 kW	\$0
50 kW to less than 1 MW	\$450
1 MW to less than 5 MW	\$750
5 MW to less than 10 MW	\$1,951

Interconnection Study Fees

In advance of an interconnection, the DG Owner must contact CPS Energy and complete the “Application for Interconnection of Distributed Generation” (see Appendix D). A separate form and application fee must be submitted for each DG Facility and each location. The current fees are as follows for a DG planned to be connected to the CPS Energy radial distribution system (Fees subject to change without notification):

DG Size Bracket	Fee
1 kW to less than 50 kW	\$0
50 kW to less than 500 kW	\$6,303
500 kW to less than 1 MW	\$19,059
1 MW to less than 5 MW	\$38,118
5 MW to less than 10 MW	\$63,480



Downtown Network Distribution System

In advance of an interconnection, the DG Owner must contact CPS Energy and complete the “Application for Interconnection of Distributed Generation” (see Appendix D). A separate form and application fee must be submitted for each DG Facility and each location. The current fees are as follows for a DG planned to be connected to the CPS Energy network distribution system (Fees subject to change without notification):

DG Size Bracket	Fee
1 kW to less than 25 kW	\$0
25 kW to less than 50 kW	\$600
50 kW to less than 500 kW	\$7,654
500 kW to less than 1 MW	\$20,410
1 MW to less than 5 MW	\$42,020
5 MW to less than 10 MW	\$69,933

Back-Up Generators (Commercial and Industrial Installations Only)

Should a potential DG Owner desire to install (a) back-up generator(s) at the site, fees must be submitted for back-up generators. Fees apply to total kW per site for commercial and industrial installations. The current fees are as follows (Fees subject to change without notification):

DG Size Bracket	Fee
1 kW to less than 50 kW	\$0
50 kW to less than 1 MW	\$300
1 MW to less than 5 MW	\$525
5 MW to less than 10 MW	\$1,275



Appendix C

Application for Feasibility Study of DG



**APPLICATION FOR FEASIBILITY STUDY OF
DISTRIBUTED GENERATION**

(One application per site)

DG OWNER

Name of Project: _____ Date: _____

DG Site Address (include zip code): _____

DG Owner’s Name: _____

DG Owner’s Address: _____

DG Owner’s Phone Number(s): _____

DG Owner’s Email: _____

DG Owner’s Signature (required): _____

DG

Size of proposed system (in ac power): _____

Type (Solar, Generator, Wind, etc.): _____

Do you plan to export power: Yes No

If yes, maximum amount expected (in AC power): _____

Expected Start-up Date: _____

Submit the following in PDF format only:

- Site Plan (with nearest adjacent intersecting streets) to DG@cpsenergy.com.

If additional information would be beneficial for this study, please attach on separate sheet(s). Please note there will be a **Non-Refundable** charge¹ for each application based on the size of the system as follows (Fees subject to change without notification).

Refer to Appendix B for Feasibility Study Fees - DG size bracket & fee.

Make checks payable to **CPS Energy** and send to:

CPS Energy
DISTRIBUTED GENERATION Section
10th Floor - Navarro MD#111007
145 Navarro St.
San Antonio, TX 78205

¹ If the project proceeds to our Interconnection Study phase, this fee will be deducted from construction costs.



Appendix D

Application for Interconnection of DG



APPLICATION FOR INTERCONNECTION OF DISTRIBUTED GENERATION (DG Application)

Must be completed for any size or type of DG

1. All DG Owners must complete this Section regardless of size or type

DG Owner's Name(s): _____

DG Owner's Mailing Address (including zip code): _____

DG Site Address (include zip code): _____

DG Owner's Email Address: _____

Account Number (if applicable): _____

Telephone (normal): _____ (emergency): _____

Information Prepared and Submitted By:

Name: _____

Address: _____

Contact Number (24hrs. / 7days a wk.): _____

Email: _____

Signature (required): _____ Date: _____

Name of DG Owner or DG Owner's designated representative who can be contacted by CPS Energy at any time throughout ownership of DG system in case of emergency or important issues concerning the DG System.

DG Owner or DG Owner's designated representative (if not same as above):
Contact Number (24hrs. / 7days a wk.):
Email:
Installer/Contractor (if not same as above):
Contact Number (24hrs. / 7days a wk.):
Email:



The following information shall be supplied by the DG Owner or DG Owner’s designated representative and/or contractor. All applicable items must be accurately completed in order that the DG Owner’s generating facilities may be effectively evaluated by CPS ENERGY for interconnection.

Is this DG System an upgrade to the existing DG System installed? Yes No

Number of units/Configuration of modules: _____

Module manufacturer: _____

Type (Synchronous, Induction, Backup or Inverter): _____

Fuel Source Type (Solar, Natural Gas, Wind, etc.): _____

Kilowatt rating for this installation (95° F): _____ kW

Kilowatt rating for existing installation (95° F) (if applicable): _____ kW

Total aggregated Kilowatt Rating for DG installation (95° F): _____ kW

Kilovolt-Ampere Rating (95° F): _____ kVA Power Factor: _____

Voltage Rating: _____ V Amperage Rating: _____ A

Frequency: _____ Hz Number of Phases: _____

If DG is a Grid-Tied system, amount expected to be exported to grid: _____ kW

Instructions:

For DG Systems with total capacity (including aggregate) less than 25 kW in a single parcel of property with single or multiple meters, complete section 2 and initial, sign, and date the last page of the application.

For DG Systems with total capacity (including aggregate) of 25 kW and greater in a single parcel of property with single or multiple meters, or DG Systems of any size within the Downtown Network Area, complete sections 3 to 6 and initial, sign, and date the last page of the application.

2. DG Systems with Total Capacity (Including Aggregate) Less Than 25 KW in a Single Parcel of Property with Single or Multiple Meters

- Submit the following information:
- Detailed operational one-line diagram
- Site plan



- Meter loop drawing (elevation view)/ Proposed Equipment Layout
- “Visible” disconnect device or breaker and include the following ratings as applicable: Full Load Rating, Momentary Rating, Interrupting rating
- Show all protective devices and include as applicable size, rating, manufacturer, type, style, model, settings

Note: All drawings to scale – email in PDF format to cpsesolar@cpsenergy.com

Expected Start-up Date: _____

Please describe the Normal Operation of Interconnection, provide operating procedure: (examples: provide power to meet base load, demand management, standby, back-up, other)
Also, will the DG parallel continuously with CPS Energy? If only paralleling momentarily, for how long?

If the type is not an Inverter, provide RMS Symmetrical Short Circuit Current and X/R Ratio at Rated Voltage at point of common coupling for:

Line-to Ground Fault: _____ X/R: _____

3-Phase Fault: _____ X/R: _____

Wiring Configuration

Single or 3-Phase Winding Configuration
(Choose One)

- 3 Wire Delta
- 3 Wire Wye
- 4 Wire Wye
- Single Phase 2 wire
- Single Phase 3 wire

Neutral Grounding System Used: (Choose One)

- Ungrounded
- Solidly Grounded
- Ground Resistor = _____ Ohms

Provide Grounding Transformer Data as well if applicable



STOP: For DG systems less than 25kW, proceed to Section 6 of the application. For all other systems equal to/greater than 25kW, proceed to Section 3.

3. DG Systems with Total Capacity (Including Aggregate) of 25 KW and Greater in a Single Parcel of Property with Single or Multiple Meters, or DG Systems of any Size within the Downtown Network Area.

Submit the following information:

- **Sealed and signed** (Texas P.E.) detailed operational one-line diagram
- **Sealed and signed** (Texas P.E.) site plan
- Meter loop drawing (elevation view) / Proposed Equipment Layout
- Provide a certificate of insurance showing satisfactory liability insurance including contractual liability insurance covering indemnity obligations for DG Systems greater than 50kW.
- For installations using discrete relays, provide a relay one-line diagram and indicate the location and ratings of all instrument transformers
- “Visible” disconnect device or breaker and include the following ratings as applicable: Full Load Rating, Momentary Rating, Interrupting rating
- Show all protective devices and include as applicable size, rating, manufacturer, type, style, model, settings

Note: All sheet drawings to scale – send in PDF format to DG@cpsenergy.com.

Expected Start-up Date: _____

Please describe the Normal Operation of Interconnection, provide operating procedure: (examples: provide power to meet base load, demand management, standby, back-up, other)

Also, will the DG parallel continuously with CPS Energy? If only paralleling momentarily, for how long?

4. Supplemental Information



For installations that connect through an inverter, please provide the following information:

Inverter Manufacturer (Name): _____

Inverter Model (Name/Number): _____

Inverter Software Version (Number): _____

If this System's control and/or protective functions are dependent on a "software" program supplied by the manufacturer of the equipment, please provide the version or release number for the software that will be used: _____

For non-inverter installations that plan to parallel continuously, please provide the following information for each generator:

Manufacturer: _____

Type: _____

Kilowatt Rating: _____ kW

Kilovolt-Ampere Rating: _____ kVA

Power Factor: _____

R.P.M.: _____

Operating Voltage: _____ V Output Ampere: _____ A

Frequency: _____ No. of Phases: _____

Field Amps: _____ Field Volts: _____

Motoring Power: _____

Serial Number: _____

Gross Nameplate Rating: _____ kVA

Gross Nameplate Rating: _____ kW

Net Nameplate Rating: _____ kW

Power Factor Rating: _____ %

PF Adjustment Range: _____ %



Provide RMS Symmetrical Short Circuit Current and X/R Ratio at Rated Voltage at point of common coupling for:

Line-to Ground Fault: _____ X/R: _____

3-Phase Fault: _____ X/R: _____

Wiring Configuration

Single or 3-Phase Winding Configuration (Choose One)

- 3 Wire Delta
- 3 Wire Wye
- 4 Wire Wye
- Single Phase 2 wire
- Single Phase 3 wire

Neutral Grounding System Used: (Choose One)

- Ungrounded
- Solidly Grounded
- Ground Resistor = _____ Ohms

Provide Grounding Transformer Data as well, if applicable

For Synchronous Generators Only:

Synchronous Reactance: _____ % on _____ base

Transient Reactance: _____ % on _____ base

Sub-transient Reactance: _____ % on _____ base

Negative Sequence Reactance: _____ % on _____ base

Zero Sequence Reactance: _____ % on _____ base

For Induction Generators Only:

Locked Rotor Current: _____ Amps

-OR-

Stator Resistance: _____ Amps

Stator Leakage Reactance: _____ %

Rotor Resistance: _____ %

Rotor Leakage Reactance: _____ %

Short Circuit Current Produced by Generator: _____ Amps



For Generators that are Started as a “Motor” Only:

In-Rush Current: _____ Amps

Host DG Owner’s Service Entrance Panel (Main Panel) Continuous Current Rating: _____ Amps

For DG Owners supplying an interconnecting transformer, please provide the following:

Transformer Connection and Grounding Information

Load Loss _____ W

Percent Impedance: _____ %

Base kVA: _____ kVA

Voltage Ratings: _____ V

Tap Ratings: _____

5. CPS Energy DG Interconnection Settings Form

Instructions to DG Owner: A list of CPS Energy interconnection protection requirements for voltage and frequency are given below. Please fill in the project name and requested information in Columns A and B, and the anti-islanding features in Section 3. **This form needs to be signed by the DG Owner.**

Note: If the DG system cannot be set to meet the listed requirement, fill in the closest available value (or fixed value) so that CPS Energy can evaluate the settings.

DG Project Name: _____

Refer to Interconnection Requirements Section 2.2.4 [Table 1](#) for the lists of key electrical parameters including voltage, frequency, flicker, harmonics, and their acceptable limits on the CPS Energy System.



Prevention of Interference for DG Systems Less than 250 kW			
Voltage			
CPS Energy Requirement Descriptor	CPS Energy Requirement	Column A: Setting Name	Column B: Setting Value
Over Voltage Regulation Set point #1	$\leq +10\%$		_____ %
Over Voltage Time Delay #1	$\leq 1 \text{ sec}$		_____ Sec
Under Voltage Regulation Set point #1	$\leq -12\%$		_____ %
Under Voltage Time Delay #1	$\leq 2 \text{ sec}$		_____ Sec
Over Voltage Regulation Set point #2	$\leq +20\%$		_____ %
Over Voltage Time Delay #2	$\leq 0.16 \text{ sec}$		_____ Sec
Under Voltage Regulation Set point #2	$\leq -50\%$		_____ %
Under Voltage Time Delay #2	$\leq 0.16 \text{ sec}$		_____ Sec
Frequency			
CPS Energy Requirement Descriptor	CPS Energy Requirement	Column A: Setting Name	Column B: Setting Value
Over Frequency Set point	$\leq +0.5 \text{ Hz}$		_____ Hz
Over Frequency Time Delay	$\leq 0.16 \text{ sec}$		_____ sec
Under Frequency Set point	$\leq -0.7 \text{ Hz}$ for DG $\leq 30 \text{ kW}$		_____ Hz
	-0.2 Hz to -3 Hz (adjustable) for DG $>30 \text{ kW}$		
	$<-3 \text{ Hz}$ for DG $>30 \text{ kW}$		
Under Frequency Time Delay	0.16 s for DG $\leq 30 \text{ kW}$		_____ sec
	0.16 s to 300 s (adjustable) for DG $>30 \text{ kW}$		
	0.16 s for DG $>30 \text{ kW}$		

Note: Above set points are based on a nominal frequency of 60 Hz.



Prevention of Interference for DG Systems 250 kW or Greater			
Voltage			
CPS Energy Requirement Descriptor	CPS Energy Requirement	Column A: Setting Name	Column B: Setting Value
Over Voltage Regulation Set point #1	$\leq +5\%$		_____ %
Over Voltage Time Delay #1	≤ 2 sec		_____ sec
Under Voltage Regulation Set point #1	$\leq -10\%$		_____ %
Under Voltage Time Delay #1	≤ 2 sec		_____ sec
Over Voltage Regulation Set point #2	$\leq +10\%$		_____ %
Over Voltage Time Delay #2	≤ 0.167 sec		_____ sec
Under Voltage Regulation Set point #2	$\leq -30\%$		_____ %
Under Voltage Time Delay #2	≤ 0.167 sec		_____ sec
Frequency			
CPS Energy Requirement Descriptor	CPS Energy Requirement	Column A: Setting Name	Column B: Setting Value
Over Frequency Set point	$\leq +0.5$ Hz		_____ Hz
Over Frequency Time Delay	≤ 0.25 sec		_____ sec
Under Frequency Set point	≤ -0.7 Hz		_____ Hz
Under Frequency Time Delay	≤ 0.25 sec		_____ sec

Note: Above set points are based on a nominal frequency of 60 Hz.



6. Anti-Islanding Protection

CPS Energy Instructions: Please describe **in detail** the anti-islanding protection scheme, as well as, the worst-case time delay for shutting down the DG system. Indicate how long it takes the DG system to disconnect from the grid. Anti-islanding sensing must meet the NEC, IEEE 1547-2018, and UL 1741.

DG Owner Response: _____

Specify the type of DG system you are applying for below:

_____ I am applying for a DG Systems with total capacity (including aggregate) of less than 25 kW in a single parcel of property with single or multiple meters

_____ I am applying for a DG Systems with total capacity (including aggregate) of 25 kW or greater in a single parcel of property with single or multiple meters

Is the DG system on the Downtown Distribution Network system? Yes No

CPS Energy internal use only

CPS Energy Reviewer Comments:

CPS Energy Reviewer Name (Print): _____

Signature: _____ Date: _____



By executing this Application, the DG Owner, or its authorized representative, certifies that the information in the Application is true and accurate and DG Owner certifies that they have read, understand and agree to comply with all CPS Energy terms and conditions as stated or incorporated in the current DG Manual, including the Interconnection Requirements and the Interconnection Terms, applicable CPS Energy Rates and Riders, Rules and Regulations and Service Standards, which shall prevail over any inconsistent provisions in any form or acknowledgement submitted by the DG Owner. Any additional terms or different terms proposed by DG Owner are rejected unless expressly agreed to in writing by CPS Energy.

DG Owner or authorized representative printed name, Title/Position:

Signature: _____

Date: _____



Appendix E

DISTRIBUTED GENERATION Interconnection Terms



DISTRIBUTED GENERATION **INTERCONNECTION TERMS**

1. **Scope of Terms.** These “Terms” set forth the conditions under which the DG Owner and CPS Energy agree that a DG Facility, eligible for interconnection to CPS Energy's System, may be installed/interconnected to CPS Energy’s System, in accordance with the “Terms” found herein and the Interconnection Requirements for Distributed Generation

(“Interconnection Requirements”) found on the www.cpsenergy.com website. Any energy supplied by CPS Energy and purchased by DG Owner shall be in accordance with the terms of CPS Energy’s Rules and Regulations for Electric and Gas Service (“Rules and Regulations”), CPS Energy's applicable Rate Schedules (“Rates”), the Interconnection Requirements and the Terms.

2. **Interconnection of DG Facility**

DG Owner or its contractor shall design and install the DG Facility, as necessary for the interconnection of DG Owner’s DG Facility to CPS Energy’s System at the Point of Interconnection as located and described in the Interconnection Requirements for Distributed Generation. The Point of Interconnection (POI) is defined as the point where the DG Facility is electrically connected, either directly to the CPS Energy System or directly to the load-side (metered) of DG Owner-owned equipment, for the applicable DG Facility. DG Owner will own, operate, maintain and be responsible for the DG Facility, and for the costs of any other protective facilities which, in CPS Energy’s commercially reasonable opinion, are required or prudent in order to protect CPS Energy’s System from disruption or damage caused by the DG Facility. The Interconnection Facilities shall measure both the energy produced by the DG Facility and any energy provided by CPS Energy for DG Owner’s use at the DG Site. The “Interconnection Facilities” are defined as all facilities required by CPS Energy as a result of interconnection to the DG to allow the safe, reliable interconnection and operation of the DG. CPS Energy will design the Interconnection Facilities such that the Interconnection Facilities are sufficient to enable DG Owner to supply electric energy across the Point of Interconnection and Point of Delivery to CPS Energy's System. The Point of Delivery/Point of Demarcation (POD) is defined as the point where the electric energy first leaves the conductors or devices owned by CPS Energy, and enters the service-entrance, other conductors or devices owned by the DG Owner. DG Owner agrees to promptly provide information and engineering drawings requested by CPS Energy to assist in the design and installation of the Interconnection Facilities. Any electrical energy to be supplied by CPS Energy shall be delivered to DG Owner at the Point of Delivery in the manner described within the Interconnection Requirements.

3. **Inspection of DG Facility**

Prior to connection of the DG Facility to the Interconnection Facilities, CPS Energy may send a representative to the DG Site to inspect and perform acceptance tests on the DG Facility to determine if the DG Facility complies with the Interconnection Requirements and that all metering, telemetry, communications equipment, etc., associated with the Point of Interconnection is



properly functioning and receiving and transmitting accurate information. DG Owner shall not commence operation of the DG Facility until written approval has been given by CPS Energy.

CPS Energy shall notify DG Owner as to whether or not approval is granted within ten (10) working days from CPS Energy's inspection of the DG Facility. In the event the DG Facility does not comply, CPS Energy shall promptly notify DG Owner in writing, specifying with reasonable specificity the reason(s) for rejection of approval, and shall provide DG Owner a reasonable period of time to bring the DG Facility into compliance. CPS Energy shall have reasonable access to the DG Site at all times and shall provide advance notice to DG Owner of the need for CPS Energy presence at the DG Site, except that no advance notice is necessary in the case of an emergency, or if necessary to meet CPS Energy's legal obligation to provide service to CPS Energy's Customers.

4. Charges for Interconnection Facilities

Following approval of the Application and prior to commencement of construction of the Interconnection Facilities, CPS Energy shall invoice DG Owner for the estimated cost, if any, for the work which is required to interconnect the DG Facility to CPS Energy's System in accordance with the Interconnection Requirements ("Interconnection Costs"). DG Owner shall pay CPS Energy the Interconnection Costs within thirty (30) days from the date of the postmark or electronic mail (e-mail) of such invoice, the Interconnection Costs. Any amount not paid within such time shall bear interest at the legal rate calculated from the due date. CPS Energy shall have the right to terminate this Agreement pursuant to Section 9 upon Notice to DG Owner if the Interconnections Costs remain unpaid by DG Owner 60 days from the date of the invoice postmark or email. In the event the actual cost of the work exceeds the initial estimated Interconnection Cost, invoiced by CPS Energy and paid by DG Owner, through no fault of CPS ENERGY, CPS Energy shall invoice DG Owner for the additional cost and DG Owner shall pay such additional cost to CPS Energy within thirty (30) days from the date of the postmark or email of the invoice. Within sixty (60) days following completion of the make-ready work, if the amount paid by DG Owner to CPS Energy exceeds the final actual cost of the construction, CPS Energy shall promptly reimburse DG Owner for the amount by which the amount that was paid by DG Owner exceeds the final actual cost of the construction.

5. Charges/Payment for Energy

If DG Owner is a net-metered Customer, DG Owner's monthly energy bill, and Net Electric Generation (NEG) credits to which DG Owner is entitled, will be calculated in accordance with the corresponding CPS Energy applicable Rate(s) and Rider under which the DG Owner is served less any NEG credit computed under CPS Energy applicable Rate(s) and Rider. NEG, in terms of kWh, is deemed to exist only if an amount equal to the difference between the current month's CPS Energy meter read less the previous month's CPS Energy meter read is negative. DG Owner agrees to pay its energy bill on or before the due date set forth on the bill in accordance with applicable provisions in the Rules and Regulations and Rider.

If DG Owner who is not a net-metered Customer shall pay for full service energy requirements provided by CPS Energy in accordance with applicable Rate(s) and Rider(s) for their installation in an approved location within the CPS Energy Service Area.



If DG Owner has a DG Facility installed outside the Downtown Network and has a Power Purchase Agreement (“PPA”) with CPS Energy to sell any excess energy produced by DG Facility, CPS Energy will buy excess energy and pay in accordance with the provisions of the PPA Agreement negotiated between DG Owner and CPS Energy. Also, DG Owner who is party to a PPA with CPS Energy shall pay for energy provided by CPS Energy. If DG Owner has a DG Facility installed inside the Downtown Network, CPS Energy shall not purchase any energy produced by DG Facility.

6. Operation of Interconnection

DG Owner will maintain and operate the DG Facility in strict accordance with these Terms and the Interconnection Requirements. CPS Energy’s operation and maintenance of the Interconnection Facilities shall be excused for the duration of any outage which materially prevents or impairs CPS Energy’s ability to operate and control the provision of energy through the Point of Interconnection. CPS Energy shall resume operation and maintenance as soon as possible after the outage.

Unless otherwise provided for in the Interconnection Requirements, each Party shall install, operate and maintain all apparatus and necessary protective devices on the Party’s respective side of the Point of Delivery which are reasonably necessary, or reasonably required by CPS Energy, to comply with good operating practices and applicable ERCOT Nodal Protocols and Operating Guides, at its own cost and expense. In nearly all cases this most nearly represents the point where the ownership changes between CPS Energy facilities and the DG Owner’s facilities.

CPS Energy and DG Owner shall each be responsible for the safe installation, maintenance, repair and condition of their respective lines and appurtenances on the Party’s respective side of the Point of Interconnection. For the mutual protection of DG Owner and CPS Energy, only with CPS Energy’s prior authorization and approval are the connections between the CPS Energy’s distribution service wires and DG Owner’s service entrance conductors to be energized.

7. Construction, Operation and Maintenance of DG Facility

DG Owner shall be responsible for the design, installation, operation, and maintenance of the DG Facility and shall obtain and maintain any required governmental authorizations and/or permits. DG Owner shall conduct operations of its DG Facility in compliance with all aspects of such authorizations or permits and shall construct the DG Facility in accordance with specifications equal to or greater than those provided by the National Electrical Safety Code, approved by the American National Standards Institute, and other applicable standards in effect at the time of construction. DG Owner shall perform maintenance of the DG Facility in accordance with the applicable manufacturer’s recommended maintenance schedule and shall provide CPS Energy with a copy upon request. If required, DG Owner shall schedule planned maintenance on the DG Facility to be taken between the dates of March 1st to April 30th and October 1st to November 30th of each year unless otherwise agreed to in writing. DG Owner has provided CPS Energy with two phone numbers for contact during “normal” business hours and for emergency events. These contact numbers are found in the DG Application and Provider is responsible for promptly monitoring and updating the contact information when it changes.



8. Disconnection at the Point of Interconnection

DG Owner shall be required to install their own switch on their side of the Point of Interconnection for their use in disconnecting the DG Facility. DG Owner may, at their option, disconnect from the Point of Interconnection by operation of their switch. No notice is required for DG Facility's less than 500 kW. **For DG systems 500 kW and larger, notice to CPS Energy is required as outlined in the Interconnection Requirements.** DG Owner shall have no right to operate any of CPS Energy's facilities. DG Owner's disconnection shall not constitute a reason for CPS Energy's termination of the Interconnection unless DG Owner exercises its rights under Section 9. Should CPS Energy schedule planned maintenance and repairs on CPS Energy's System requiring disconnection or other service interruption, CPS Energy will use reasonable efforts to provide DG Owner with seven calendar days advance notice of such disconnection.

CPS Energy shall have the right to disconnect its System from the DG Facility in cases where continuance of connection will, in CPS Energy's reasonable determination, i) endanger persons or the public with physical harm or pose potential damage to property of CPS Energy, its customers or members of the public or ii) if there is evidence that the DG Facility operation causes disruption or deterioration of service to other DG Owners or other customers served from the same grid; or (iii) where CPS Energy reasonably determines that DG Owner has failed to comply with the Terms or the Interconnection Requirements. During the forced outage of any portion of CPS Energy's System serving and/or receiving energy from DG Owner, CPS Energy shall have the right to suspend service to effect immediate repairs on CPS Energy's System, but CPS Energy shall use its reasonable efforts to provide DG Owner with prior notice.

9. Term and Termination Rights

The Terms found **herein** become effective when the Application is approved by CPS Energy, and shall continue in effect until terminated by either Party with sixty (60) days prior written notice to the other Party. CPS Energy may terminate if (i) CPS Energy reasonably determines that DG Owner has failed to comply with the Terms or upon CPS Energy's determination that the DG Facility does not comply with the Interconnection Requirements provided CPS Energy provides notice of default to the DG Owner and DG Owner is given a forty-five (45) day period in which to bring the DG Facility into compliance, which may be extended upon mutual agreement, and the DG Facility continues to be noncompliant after such cure period; (ii) upon failure by DG Owner to generate energy from the DG Facility within twelve months after completion of the Interconnection Facilities; (iii) if any representation made by DG Owner in the DG Application proves to be false or deliberately misleading in any material respect; or (iv) if CPS Energy costs of constructing the Interconnection Facilities, are not paid by DG Owner as provided for Section 4 of this Agreement, after notice and a reasonable opportunity for DG Owner to remedy such nonpayment. The Parties shall disconnect the DG Facility from the Point of Interconnection upon the effective date of any termination under this Section.

10. Limitation of Liability and Indemnification

Notwithstanding any other provision in these Terms, with respect to CPS Energy's provision of service to DG Owner, CPS Energy's liability to DG Owner shall be limited as set forth in the Rules and Regulations. **DG Owner shall assume all liability for and shall indemnify CPS Energy against any claims, losses, costs, penalties, and expenses of any kind or character made by any person to the extent caused by DG Owner's negligence or wrongful act in connection with the design, construction, or operation of the DG Facility.**



In no event shall CPS Energy be liable for consequential, special, or incidental damages, including, without limitation, loss of profits, loss of revenue or disruption of business, or loss of production by or on behalf of DG Owner. CPS Energy does not assume liability for any costs or damages arising from the disruption of the business or for DG Owner's costs and expenses of prosecuting or defending an action or claim against CPS Energy. The limitations of liability provided in this paragraph do not apply in actionable cases of gross negligence or intentional wrongdoing on the part of CPS Energy, if any.

11. **Insurance**

For facilities larger than 50 kW and prior to interconnection, the DG Owner must provide a certificate of insurance showing satisfactory liability insurance including contractual liability insurance covering indemnity obligations which insures the DG Owner against all claims for property damage and for personal injury or death arising out of, resulting from or in any manner connected with the installation, operation and maintenance of the DG Owner's DG Facility prior to CPS Energy's approval of the Application. The amount of such insurance coverage shall be not less than \$2,000,000 per occurrence and name CPS Energy as an additional insured. This amount may be increased at the sole discretion of CPS Energy if the nature of the project so requires. Insurance as specified hereunder shall be in conjunction with insurance obligations stipulated within the executed Power Purchase Agreement (PPA), if applicable. The certificate of insurance shall provide that the insurance policy will not be changed or canceled during its term without thirty days written notice to CPS Energy. The insurance coverage shall be in place for so long as the DG Facility is operational. The DG Owner shall provide proof of such insurance to CPS Energy at least annually and upon request by CPS Energy.

For installations 50 kW and smaller the DG Owner is not required to provide a certificate of insurance coverage to CPS Energy. It is recommended, however, that the DG Owner carry liability insurance coverage which insures the DG Owner against all claims for property damage and for personal injury or death arising out of, resulting from or in any manner connected with the installation, operation and maintenance of the DG Owner's generating equipment.

12. **Easements**

The DG Owner shall execute and deliver to CPS Energy one or more grants of easement or rights-of-way over, on, under and adjacent to the DG Facility Site, in form and content reasonably acceptable to CPS Energy, containing such commercially reasonable terms and conditions for the construction, operation, maintenance and/or relocation of CPS Energy's gas and electric facilities and the Interconnection Facilities. CPS Energy may locate its equipment or facilities within such easement or right-of-way in the location of its choosing, after obtaining the prior written consent for such location from DG Owner, which may not be unreasonably withheld, conditioned or delayed. The agreement, execution and delivery of such easements shall be a prerequisite to issuance of the approval provided for in Section 3. DG Owner agrees that CPS Energy's representatives, employees and assignee are hereby granted rights of ingress and egress to the DG Facility Site at all reasonable times for the purpose of inspection of equipment and facilities providing service and to determine compliance with the Terms.



13. Dispute Resolution

The Parties agree to make a good faith effort to resolve any disputes arising between them by non-binding mediation. The Parties hereby agree that, in the event that any dispute between them has not been resolved by non-binding mediation, a Party will have any and all remedies in any court of competent jurisdiction.

14. Governing Law and Regulatory Authority

The State of Texas will in all respects govern, interpret, construe, and enforce, in accordance with the laws of the State of Texas, the Terms and the relationship established between the parties.

15. Amendment and Changes

The Interconnection Requirements may be amended by CPS Energy at any time, in their sole discretion, and DG Owner will receive notice of such changes prior to the effective date of such changes. Failure by DG Owner to adhere to the revised Interconnection Requirements shall be deemed a breach of this Agreement and be subject to the termination remedies under Section 9.

DG Owner agrees that the Rates and the Rules and Regulations are expressly subject to change by the Board of Trustees of CPS Energy or any governmental body having jurisdiction over the provision of gas and electric service by CPS Energy. DG Owner agrees to be bound by the Rates and the Rules and Regulations as they may change from time to time. Any such change shall affect only that portion of this Agreement specifically changed and all other portions shall remain in full force and effect.

16. Prior Agreements Superseded

The Parties are not bound by or liable for any statement, representation, promise, inducement, understanding, or undertaking of any kind or nature (whether written or oral) with regard to the subject matter hereof not set forth or provided for in these terms.

17. Assignment

CPS Energy or DG Owner may assign their rights and obligations to an affiliated entity, or to a successor entity of either party that is owned, directly or indirectly, by a company or entity that is in the direct chain of corporate DG Ownership of such Party. DG Owner shall not assign the approved Application or any of its rights, duties or obligations arising there from unless and until the DG Owner obtains CPS Energy's consent in writing

18. No Third-Party Beneficiaries

These Terms are not intended to and do not create rights, remedies, or benefits of any character whatsoever in favor of any persons, corporations, associations, or entities other than the Parties, and the obligations assumed in this agreement are solely for the use and benefit of the DG Owner and CPS Energy, their successors in interest and, where permitted, their assigns.



19. Confidentiality Agreement

Should DG Owner request ERCOT Polled Settlement (EPS) meter information or the ability to retrieve meter data from the EPS, DG Owner shall be required to execute a Confidentiality Agreement.

20. No Waiver

The failure by CPS Energy to insist, on any occasion, upon strict performance of any term found in this Interconnection Term sheet will not be considered to waive the obligations, rights, or duties imposed upon the Parties.



Appendix F

Definitions



DEFINITIONS

The following words, terms and acronyms, when used in this Manual and its attachments shall have the following meanings, unless the context clearly indicates otherwise.

AC - Alternating current

Aggregate – Sum of all DG hosts by circuit or substation.

Application for Interconnection of Distributed Generation (DG Application) - The standard form of Application for Interconnection of Distributed Generation projects approved by CPS Energy as shown in Appendix D.

Cluster - A group of neighboring DG installations

Company - CPS Energy

CPS Energy System/CPS Energy Electric Distribution System - CPS Energy's distribution system 35kV and below to which the DG equipment may be interconnected.

DG Owner – Any entity that intends to apply or has applied to CPS Energy for interconnection of a Distributed Generation system or any entity interconnected to the CPS Energy's system for the purpose of receiving or exporting electric power from or to the CPS Energy's system.

DG Facilities/System - All facilities installed, including the DG itself, to connect the DG to the Point of Interconnection.

Distributed Generation (DG) - An electrical generating facility located within the CPS Energy service territory of less than 10 MW and connected at a voltage of 35kV and below, which may be connected in parallel operation to the CPS Energy system. The facility may include energy storage technologies as well as conventional generation technologies.

Distribution Feeder - An electric line operated at voltages 35 kV and below that serves to deliver power from a utility substation or other supply point to customers.

Electric Reliability Council of Texas (ERCOT) - The area in Texas served by electric utilities, municipally owned utilities, and electric cooperatives that are not synchronously connected with electric utilities outside the state. ERCOT manages the flow of electric power to the customers, schedules power on the grid that connects transmission lines and generation units, and manages financial settlement for the competitive wholesale bulk-power market.

EMC – Energy Management Center

Energy Supply & Market Operations - The department within CPS Energy that has the daily responsibility for generating unit commitments and operational load forecasting.



Grid Tied - A DG connected to the CPS Energy System that does not offset any DG Owner electrical requirements (other than consumed by the generation auxiliaries). CPS Energy purchases all the net generation produced by the DG. This arrangement requires the execution of a Power Purchase Agreement (PPA) between the DG Owner and CPS Energy.

IEEE - The Institute of Electrical and Electronics Engineers

Interconnection Terms (IT) - The standard form of terms which have been approved by CPS Energy. The Interconnection Terms set forth the contractual conditions under which CPS Energy and a DG Owner agree that one or more facilities may be interconnected with the CPS Energy distribution system.

Interconnection Facilities - All facilities required by CPS Energy as a result of the DG interconnection, to allow the safe and reliable interconnection and parallel operation of the DG.

Interconnection Study - A study or studies that may be undertaken by CPS Energy in response to its receipt of a completed application for interconnection and parallel operation with the utility system. Interconnection studies may include, but are not limited to, service studies, coordination studies and utility system impact studies.

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

Inverter-Based Protective Function - A function of an inverter system, carried out using hardware and software that is designed to prevent unsafe operating conditions from occurring before, during, and after the interconnection of an inverter-based static power converter unit with a utility system. For purposes of this definition, unsafe operating conditions are conditions that, if left uncorrected would result in harm to personnel, damage to equipment, unacceptable system instability or operation outside legally established parameters affecting the quality of service to other customers connected to the utility system.

KV - Kilovolt, an amount of voltage equal to one thousand volts.

KW - Kilowatt, an amount of power equal to one thousand watts.

MW - Megawatt, an amount of power equal to one million watts.

Net-Meter - Service to a DG Owner under which electric energy generated by that DG Owner's DG and delivered to the CPS Energy System may be used to offset electric energy provided by CPS Energy to the DG Owner during a specified billing period.

Network Service/Underground Network - 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. Network Service is designed to maintain service to the customers even after the loss of one of these primary distribution feeder sources.

Parallel Operation - The operation of Distributed Generation while the DG is connected to the CPS Energy distribution system.



Parcel – Any part or portion of land with legal description and has been surveyed and platted as a single piece of property, with boundaries on all sides, i.e. Lot, Block, New City Block Number; or Track of Land out of a Survey, Abstract and County Block Number.

Plain Old Telephone Service (POTS) – Land line telephone service per Newton’s Telecom Dictionary

Point of Common Coupling (POCC) - From the perspective of the DG, this is the nearest point on the CPS Energy System where other customers can be connected. This is generally the point where system voltages and harmonics are metered, as it best represents the DG’s impact on other customers connected to the CPS Energy System.

Point of Delivery/Point of Demarcation (POD) - The point where the electric energy first leaves the conductors or devices owned by CPS Energy and enters the DG Owner’s installation, unless otherwise specified in a separate CPS Energy agreement, such as the IT or the DG Owner’s Service Agreement. In nearly all cases this most nearly represents the point where the ownership changes between CPS Energy facilities and the Customer/DG Owner’s facilities.

Point of Interconnection (POI) - The point where the DG itself is electrically connected, either directly to the CPS Energy System or directly to the load-side (metered) of the DG Owner’s owned equipment for the applicable DG System.

Radial Distribution System - Radial service consisting of one primary distribution feeder source forming a single power source for one or more customers.

RTU – Remote Terminal Unit

SCADA – Supervisory Control and Data Acquisition

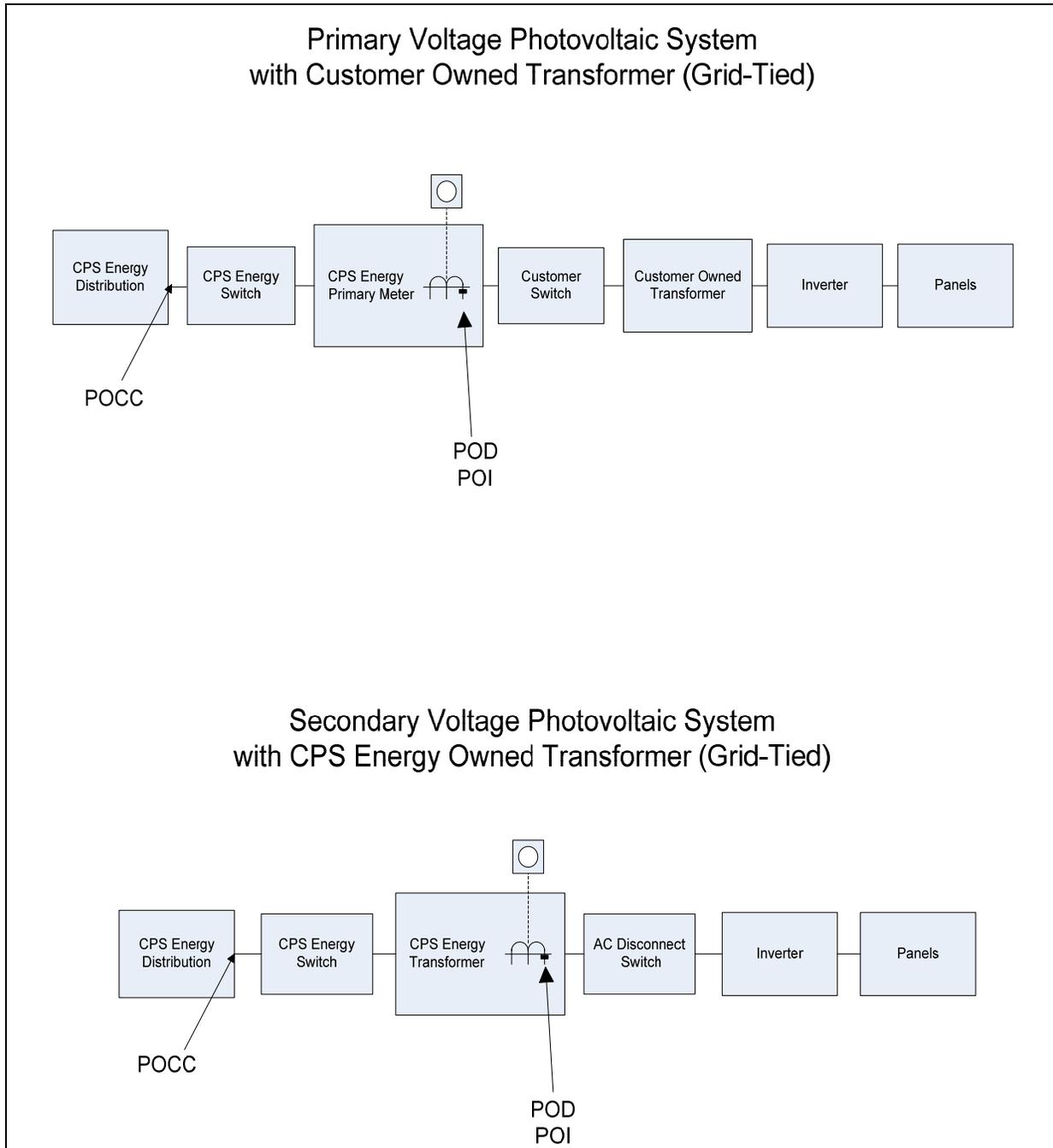
Site Feasibility Study - A site specific study that may be undertaken by CPS Energy in response to its receipt of a completed application from a potential DG Owner.

Stabilized - A 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 utility and DG Owner.

Switchgear - An enclosed metal assembly containing components for switching, protecting, monitoring and controlling electric power systems.

POCC, POD, & POI LOCATIONS ILLUSTRATION

Figure 1 POCC, POD, POI locations illustrations for grid-tied only^{2,3}



² For illustrative purposes only, NOT intended for design and/or construction

³ For additional examples refer to the CPS Energy Electric Service Standards, Section 2000



Appendix G

Additional Safety and Performance References



ADDITIONAL SAFETY AND PERFORMANCE REFERENCES

The following standards may be useful in the specification, design, and evaluation of a DG system. Many of these documents are the standards used by utilities to design and operate the distribution system. While most are not necessary for designing the typical DG interconnection, any of them may be relevant for a particular application. One or more of these documents will likely provide the basis of a utility's application rejection or claim for additional requirements. In such cases, specific sections of applicable documents should be referenced. Many of these documents have been updated and the updated version should be used.

Secondary Safety and Performance standards for DG:

ANSI/IEEE Std. 100-1996, IEEE Standard Dictionary of Electrical and Electronic Terms

ANSI/IEEE Std. 493-1900 IEEE Recommended Practice for Design of Reliable Industrial and Commercial Power Systems (IEEE Gold Book)

ANSI/IEEE Std. 1100-1992 IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (IEEE Emerald Book)

ANSI/IEEE Std. 1159-1995 IEEE Recommended Practice for Monitoring Electric Power Quality

ANSI/IEEE Std. 1250-1995 IEEE Guide for Service to Equipment Sensitive to Momentary Voltage Disturbances

ANSI/IEEE Std. C37.04 ANSI/IEEE Standard Rating Structure for AC High-voltage Circuit Breakers Rated on a Symmetrical Current Basis

ANSI/IEEE Std. C37.06 ANSI/IEEE Standard for AC High-voltage Circuit Breakers Rated on Symmetrical Current Basis – Preferred Ratings and Related Required Capabilities

ANSI/IEEE Std. C37.108-1989 IEEE Guide for the Protection of Network Transformers

ANSI/IEEE Std. C37.13 ANSI/IEEE Standard for Low-voltage AC Power Circuit Breakers Used in Enclosures

ANSI/IEEE Std. C37.14 ANSI/IEEE Standard for Low-voltage DC Power Circuit Breakers Used in Enclosures

ANSI/IEEE Std. C37.16 ANSI/IEEE Standard for Low-voltage Power Circuit Breakers and AC Power Circuit Protectors – Preferred Ratings, Related Requirements, and Application

ANSI/IEEE Std. C37.18 ANSI/IEEE Standard Enclosed Field Discharge Circuit Breakers for Rotating Electric Machinery

ANSI/IEEE Std. C37.2 IEEE Standard Electrical Power System Device Function Numbers

ANSI/IEEE Std. C37.27 ANSI/IEEE Standard Application Guide for Low-voltage AC Non-integrally Fused Power Circuit Breakers (Using Separately Mounted Current-Limiting Fuses)

ANSI/IEEE Std. C37.29 ANSI/IEEE Standard for Low-voltage AC Power Circuit Protectors Used in Enclosures

ANSI/IEEE Std. C37.50 ANSI Standard Test Procedures for Low-voltage AC Circuit Breakers Use in Enclosures



ANSI/IEEE Std. C37.51 ANSI Standard Conformance Test Procedure for Metal Enclosed Low-voltage AC Power Circuit-Breaker Switchgear Assemblies

ANSI/IEEE Std. C37.52 ANSI Standard Test Procedures for Low-voltage AC Power Circuit Protectors Used in Enclosures

ANSI/IEEE Std. C37.95 IEEE Guide for Protective Relaying of Utility Consumer Interconnections

ANSI/IEEE Std. C57.12 IEEE Standard General Requirements for Liquid Immersed Distribution, Power and Regulating Transformers

ANSI/IEEE Std. C57.12.13 Conformance Requirements for Liquid Filled Transformers Used in Unit Installations including Unit Substations

ANSI/IEEE Std. C57.12.40-1994 American National Standard for Secondary Network Transformers - Subway and Vault Types (Liquid Immersed) - Requirements

ANSI/IEEE Std. C57.12.44-1994 IEEE Standard Requirements for Secondary Network Protectors

ANSI/IEEE Std. C84.1-1995, Electric Power Systems and Equipment - Voltage Ratings (60Hertz)

IEC 1000-3-3 Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current less than 16A

IEC1000-3-5 Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current greater than 16A

UL 1008 Transfer Switch Equipment

Other UL standards apply to Distributed Generation systems but do not directly address interconnection safety. UL 2200 is the Standard for Safety for Stationary Engine Generator Assemblies. These requirements cover stationary engine generator assemblies rated 600 volts or less that are intended for installation and use in non-hazardous locations in accordance with NEC. These requirements do not cover generators for use in hazardous locations, which is covered by the Standard for Electric Motors and Generators for Hazardous (Classified) Locations, UL 674. These requirements also do not cover uninterruptible power system (UPS) equipment, which are covered by the Standard for Uninterruptible Power Supply Equipment, UL 1778.



Table 2 Standards Organizations

<p>National Fire Protection Association (NFPA)</p>	<p>1 Batterymarch Park Quincy, MA 02269-9101 Phone (617) 770-3000, Fax: (617) 770-0700 Web: http://www.nfpa.org</p>
<p>Underwriters Laboratories (UL)</p>	<p>333 Pfingsten Road Northbrook, IL 60062-2096 Phone: (847) 272-8800, Fax: (847) 272-8129 Web: http://www.ul.com/</p>
<p>Wyle Laboratories, Inc.</p>	<p>7800 Highway 20 West Huntsville, AL 35806 Phone: (256) 837-4411, Fax: (256) 721-0144 Web: http://www.wylelabs.com</p>
<p>Institute of Electrical and Electronics Engineers (IEEE)</p>	<p>445 Hoes Lane, PO Box 459 Piscataway, NJ 08855-0459 Phone: (800) 678-4333 Web: http://www.ieee.org</p>
<p>National Renewable Energy Laboratory</p>	<p>1617 Cole Boulevard Golden, CO 80401 Phone: (303) 275-3000, Fax: (303) 275-4053 Web: http://www.nrel.gov</p>
<p>Sandia National Laboratories, Photovoltaic Systems Assistance Center</p>	<p>P.O. Box 5800, Division 6218 Albuquerque, NM 87185 Phone: (505) 844-8161, Fax: (505) 844-6541 Web: http://www.sandia.gov/Renewable_Energy/photo_voltaic/pv.html</p>

Revisions to DG Manual

- November 15, 2012: DG – IA, Section 10; Added Indemnification clause (in bold)
- March 15, 2013: DG Manual Overview & DG Application; DG email updated
- March 15, 2013: DG Manual Overview, Section 4.3.4, Interconnection Requirements for DG, Section 2.4, & DG Application; Added aggregate and parcel requirements
- March 15, 2013: DG Manual Overview, Section 4.3.2; Added Feasibility Study Request information
- March 15, 2013: DG Manual Overview, Section 4.4.2; Added Interconnection Study Fees Refund information
- March 15, 2013: Interconnection Requirements for DG; Updated Feasibility & Interconnection Study Fees in Appendix B
- February 1, 2014: Interconnection Requirements for DG; Revised application and removed Exhibits. Application for Interconnection of DG; Updated agreement to reflect “Terms” in place of “Agreement”, revised signature page.
- January 15, 2016: DG Manual Overview, Section 3.1.2; Added solar penetration trigger which initiates a feasibility study requirement.
- January 15, 2016: DG Manual Overview, Section 3.2.2; Added clarification on flicker requirement.
- January 15, 2016: DG Manual Overview, Section 4.3.2; Added Feasibility Study requirement for solar installations approaching penetration limits, or create a cluster effect.
- January 15, 2016: Interconnection Requirements for DG; Section 2.6; Added adjustable reactive output capability
- January 15, 2016: Interconnection Requirements for DG; Section 2.7.6; Added ERCOT operating guide for voltage ride through and diagram.
- January 15, 2016: Interconnection Requirements for DG; Section 2.10; removed option to provide (4) 20mA input to the RTU.
- January 15, 2016: Interconnection Requirements for DG; Section 2.10; added language clarifying where communication equipment will reside.
- January 15, 2016: Interconnection Requirements for DG; Section 2.10; modified multimode fiber connection to a fiber to serial transceiver requirement.
- January 15, 2016: Interconnection Requirements for DG; Section 2.10; added drivable surface requirement for accessing SCADA equipment.
- January 15, 2016: Operation and Maintenance; Appendix F; Added definition for Aggregate and Cluster.