Control Number: 49421

Item Number: 380

Addendum StartPage: 0

SOAH DOCKET NO. 473-19-3864
PUC DOCKET NO. 49421

2019 JUN -3 PM 2:57

APPLICATION OF CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC FOR AUTHORITY TO CHANGE RATES	**§ § §**	**BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS**

June 3, 2019

Contact: Denise Hardcastle
CenterPoint Energy Houston Electric, LLC
1111 Louisiana Street
Houston, Texas 77002
Tel No: (713) 207-5767
Fax: (713) 207-9840
Denise.Hardcastle@CenterPointEnergy.com

TABLE OF CONTENTS

380

CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC
2019 CEHE RATE CASE
DOCKET 49421-SOAH DOCKET NO. 473-19-3864

SOLAR ENERGY INDUSTRIES ASSOCIATION
REQUEST NO.: SEIA01-01

QUESTION:

Please provide links the Company's publicly accessible interconnection documentation, including procedures, manuals, and other information that developers can access through the Company's website.

ANSWER:

Please see the link below provided to customers that supplies them with publicly accessible interconnection documentation, including procedures, manuals, and other information that developers can access.

The web address is: https://plus.anbetrack.com/cnp-dg .

SPONSOR (PREPARER):
Julienne Sugarek (Julienne Sugarek)

RESPONSIVE DOCUMENTS:
None

CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC
2019 CEHE RATE CASE
DOCKET 49421-SOAH DOCKET NO. 473-19-3864

SOLAR ENERGY INDUSTRIES ASSOCIATION
REQUEST NO.: SEIA01-02

QUESTION:

Please provide all materials related to the interconnection process that are not publicly posted but that may be sent to developers in the course of analyzing an interconnection request. These may include, for instance, letters indicating that additional studies or analyses are needed to analyze a particular request. Please note this request is not seeking personally identifiable or confidential information.

ANSWER:

Please reference PUC Substantive Rule Sections 25.211 and 25.212 along with the below attachments:

SEIA01-02 Attachment 1
SEIA01-02 Attachment 2
SEIA01-02 Attachment 3
SEIA01-02 Attachment 4
SEIA01-02 Attachment 5
SEIA01-02 Attachment 6

SPONSOR (PREPARER):
Julienne Sugarek (Julienne Sugarek)

RESPONSIVE DOCUMENTS:
SEIA01-02 Attachment 1.pdf
SEIA01-02 Attachment 2.pdf
SEIA01-02 Attachment 3.pdf
SEIA01-02 Attachment 4.pdf
SEIA01-02 Attachment 5.pdf
SEIA01-02 Attachment 6.pdf

CenterPoint Energy
P O Box 1700
Houston, TX 77251-1700

IF YOU ARE APPLYING FOR DISTRIBUTED GENERATION, PLEASE FOLLOW THE INSTRUCTIONS IN THE PARAGRAPHS BELOW. YOU WILL NEED TO COMPLETE AND SIGN AND THEN MAIL, FAX, OR EMAIL THE "APPLICATION FOR INTERCONNECTION AND PARALLEL OPERATION OF DISTRIBUTED GENERATION WITH THE UTILITY SYSTEM" AND "APPLICATION AND STUDY FEES ADDENDUM" TO THE ADDRESS, FAX NUMBER, OR EMAIL ADDRESS LISTED BELOW. DO NOT SEND IN THE "AGREEMENT FOR INTERCONNECTION AND PARALLEL OPERATION OF DISTRIBUTED GENERATION" AT THIS TIME.

IF YOU WERE REQUESTED TO COMPLETE AN "AGREEMENT FOR INTERCONNECTION AND PARALLEL OPERATION OF DISTRIBUTED GENERATION," PLEASE COMPLETE THE HIGHLIGHTED AREAS AND THEN PRINT AND SIGN IN THE TWO PLACES AND THEN MAIL, FAX, OR EMAIL THE "AGREEMENT FOR INTERCONNECTION AND PARALLEL OPERATION OF DISTRIBUTED GENERATION" TO THE ADDRESS, FAX NUMBER, OR EMAIL ADDRESS LISTED BELOW.

To run any distributed generation (DG) device that is connected to the CenterPoint Energy (CNP) system, you will first have to complete an application. You can go to our website at www.centerpointenergy.com, and do a search for distributed generation. There you will find helpful information. Send hard copies to me at: Bellaire Service Center, CenterPoint Energy, P.O. Box 1700, Houston, TX 77251-1700. The fax number is 713-945-9164. Anything that you have that is electronic can be emailed to me at Residential_DG@centerpointenergy.com or Commercial_DG@centerpointenergy.com

The application and addendum need to be filled out and returned to me. Two documents are part of the Public Utility Commission of Texas (PUCT) Substantive Rules. One document is an example of a one-line. Please let me know if there are any questions on your part.

Your supplier or contractor can be a source of information in filling out the application. Attached for your information are files for prospective customers who are considering installation of DG devices that would be operated directly with the CNP distribution grid. The PUCT has established state-wide rules for any such installation 0 - 10,000 kW and connected at a voltage up to 60,000 Volts. This would define a project under the PUCT rule requirements. Interconnection to the distribution grid will require review and compliance per the PUCT rules.

Basically, all DG projects must have design review prior to installation by CNP for compliance. Normally, there will be a study fee (established in the "CNP_Distributed_Generation_Application.pdf"). We will notify you after the initial review if this is applicable. We will coordinate the technical review of the interconnection equipment. The review package and application should be sent to the address shown in the application. Information should include a one-line diagram showing the relationship of the DG unit tied into a breaker or breakers in the electrical panel and the CNP meter location. The AC disconnect switch should be between the inverter and electrical panel and must be a lockable, external handle, visible and readily accessible disconnect switch and typically installed within 10 feet of the CNP meter. If the AC disconnect switch is installed more than 10 feet from the CNP meter, a weather-resistant, easily-read placard must be installed within 10 feet of the CNP meter, clearly identifying the location of the AC disconnect switch. Manufacturer specifics for the machine (or inverter) and disconnect switch are necessary in the review. Depending on actual conditions at the site, possible CNP system modifications may be required to accommodate the interconnection which would be at customer expense. The determination of any possible modification costs or study fees would be detailed in the report of our review.

Finally, once an application has been accepted as being in compliance, you will be notified of our approval of the connection design for construction. A field inspection will be required to demonstrate the installation is built as planned PRIOR TO ACTUAL SYNCHRONIZATION WITH THE CNP

GRID. An interconnection agreement will be prepared and must be signed by the customer prior to energization.

I hope this initial information will be useful in your further development of the project. Feel free to have your prospective equipment supplier or installer contact us for clarification of technical questions in this review. An internet search for distributed renewable generation or solar panels, suppliers, and contractors in the Houston area should help you locate installers.

If you have further questions, please contact me at 713-945-4155.

The address to the PUCT substantive rules web site is included below for your convenience. **https://www.puc.texas.gov/industry/electric/business/dg/Dg.aspx**

Robert Bridges
Supervising Engineer, DER Team
Power Quality & Solutions, DER Team
CenterPoint Energy

CenterPoint Energy Houston Electric, LLC
Applicable: Entire Service Area

CNP 8031

6.1.2.4 INTERCONNECTION AND PARALLEL OPERATION OF DISTRIBUTED GENERATION

6.1.2.4.1 DISTRIBUTED GENERATION SERVICE – RATE DGS

Company shall interconnect distributed generation pursuant to Public Utility Commission of Texas Substantive Rules 25.211 and 25.212.

A customer seeking interconnection and parallel operation of distributed generation with Company must complete and submit the Application for Interconnection and Parallel Operation of Distributed Generation with the Utility System.

PRE-INTERCONNECTION STUDY FEE SCHEDULE

Pre-certified distributed generation units that are up to 500 Kw that export not more than 15% of the total load on a single radial feeder and also contribute not more than 25% of the maximum potential short circuit current on a radial feeder are exempt from any pre-interconnection study fees. For all other DG applications, the study fees in the following table will apply.

Non-Exporting	0 to 10 kW	10+ to 500 kW	500+ to 2000kW	2000+ to 10,000 kW
1. Pre-certified, not on network	$0	$0	$650	$845
2. Non pre-certified, not on network	$312	$503	$1,210	$1,405
3. Pre-certified, on network	$272	$640	$1,680	$1,875
4. Not pre-certified, on network	$525	$1,150	$2,240	$2,435

Exporting	0 to 10 kW	10+ to 500 kW	500+ to 2000kW	2000+ to 10,000 kW
1. Pre-certified, not on network	$75	$220	$870	$1,065
2. Non pre-certified, not on network	$312	$769	$1,430	$1,625
3. Pre-certified, on network	$272	$860	$1,900	$2,095
4. Not pre-certified, on network	$495	$1,370	$2,460	$2,655

CenterPoint Energy Houston Electric, LLC
Applicable: Entire Service Area

CNP 8031

Prescribed Form for the Application for Interconnection and Parallel Operation of Distributed Generation

Customers seeking to interconnect distributed generation with the utility system will complete and file with the company the following Application for Parallel Operation:

APPLICATION FOR INTERCONNECTION AND PARALLEL OPERATION OF DISTRIBUTED GENERATION

Return Completed Application to:

CenterPoint Energy Houston Electric, LLC Attention: Robert Bridges
Power Quality & Solutions, DER Team
P.O. Box 1700
Houston, TX 77251

Customer's Name: _____

Address: _____TX.

Contact Person: _____

Email Address: _____

Telephone Number: _____

Service Point Address: _____

Information Prepared and Submitted By: _____

(Name and Address) _____

Signature _____

The following information shall be supplied by the Customer or Customer's designated representative. All applicable items must be accurately completed in order that the Customer's generating facilities may be effectively evaluated by CenterPoint Energy Houston Electric, LLC for interconnection with the utility system.

CenterPoint Energy Houston Electric, LLC
Applicable: Entire Service Area

CNP 8031

GENERATOR

Number of Units: _____

Manufacturer: _____

Type (Synchronous, Induction, or Inverter): Inverter

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

AC Kilowatt Rating (95° F at location) _____

AC Kilovolt-Ampere Rating (95° F at location): _____ Value Entered Does Not Align

Power Factor: _____ Value Entered Does Not Align

Voltage Rating: Other

Number of Phases: Single Phase

Frequency: _____

Do you plan to export power: ☐ Yes / ☐ NO

If Yes, maximum amount expected: _____

Do you wish CenterPoint Energy Houston Electric, LLC to report excess generation to your REP? ☐ Yes / ☐ No

Pre-Certification Label or Type Number (e.g., UL-1741 Utility Interactive or IEEE 1547.1):

_____

Expected Energization and Start-up Date: _____

Normal operation of interconnection: (examples: provide power to meet base load, demand management, standby, back-up, other (please describe))_____

One-line diagram attached: ☐ Yes

CenterPoint Energy Houston Electric, LLC
Applicable: Entire Service Area

CNP 8031

For systems not using pre-certified inverters (e.g., inverters certified to UL-1741 or IEEE 1547.1), does CenterPoint Energy Houston Electric, LLC have the dynamic modeling values from the generator manufacturer? ☐ Yes ☐ No

If not, please explain:_____

(Note: For pre-certified equipment the answer is Yes. Otherwise, applicant must provide the dynamic modeling values if they are available)

Layout sketch showing lockable, "visible" disconnect device is attached:: ☐ Yes

CenterPoint Energy Houston Electric, LLC
Applicable: Entire Service Area

CNP 8031

Authorized Release of Information List

By signing this Application in the space provided below, Customer authorizes CenterPoint Energy Houston Electric, LLC to release Customer's proprietary information to the extent necessary to process this Application to the following persons:

	Name	Phone Number	Email Address
Project Manager			
Electrical Contractor			
Consultant			
Other			

CenterPoint Energy Houston Electric, LLC

BY: _____

PRINTED NAME:

Robert Bridges

TITLE: Supervising Engineer, DER Team

DATE: _____

[CUSTOMER NAME]

BY: _____

PRINTED NAME:

_____

TITLE: _____

DATE: _____

Revision Number: 5th

Effective: 5/30/14

APPLICATION AND STUDY FEES ADDENDUM

Please provide the following information for the generating facility.

(For Solar (PV) Only)
Panel Wattage / Number of Panels: _____ *Watts/*_____

ESI ID (from electric bill):_____

Inverter Capacity:_____kW

Inverter peak efficiency rating:_____%

Generation capacity:_____ **DC** kW Rating

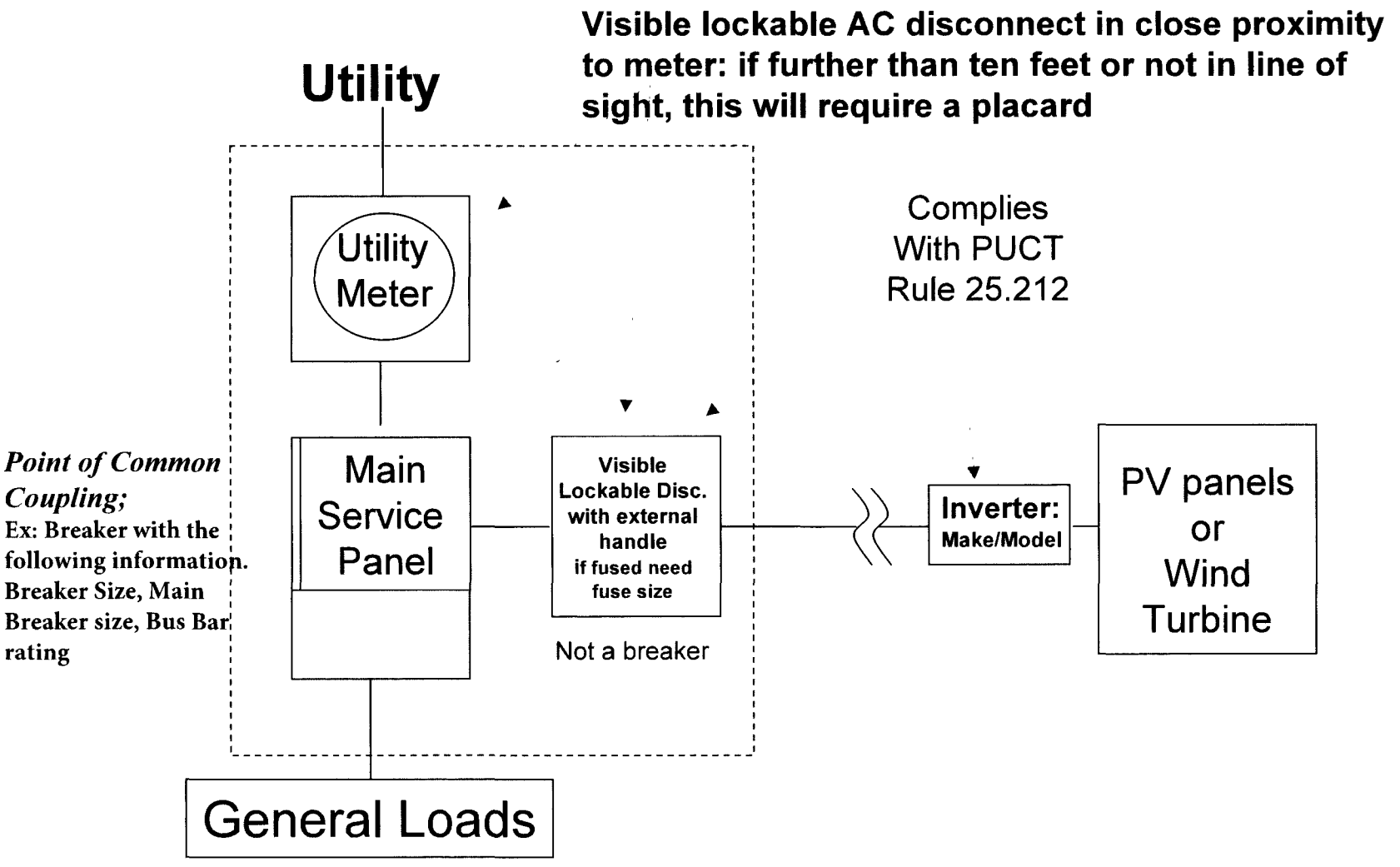
Generation maximum output:_____kW **AC**
(should equal **Kilowatt Rating** from pg. 5 of the application)

NOTE: The application review package shall include a electrical one-line diagram showing the relationship of the generation unit tied into a breaker or breakers in the electrical panel and the CenterPoint Energy (CNP) meter location. The Safety Disconnect switch shall be between the inverter and electrical panel and must be lockable with an external handle, visible and readily accessible, and within 10 feet of the CenterPoint Energy Meter. If Disconnection switch is installed more than 10 feet from the CenterPoint Energy meter, a weather-resistant, easily-read placard shall be install on the CenterPoint Energy meter, clearly identifying the location of the safety switch.

Manufacturer specifics for the inverter and the safety disconnect switch are necessary in the application review.

If there are any questions, please call us at 713-945-4155
To submit applications via email please use one of the email provided below.
Residential_DG@centerpointenergy.com
Commercial_DG@centerpointenergy.com

Example One-Line Diagram For Small Distributed Generation Installations



SPECIFICATION
FOR

CUSTOMER GENERATION
ON THE DISTRIBUTION SYSTEM

CenterPoint Energy Houston Electric, LLC
Electric Engineering
P.O. Box 1700
Houston, Texas 77251

REFERENCE DRAWINGS:

REFERENCE STANDARDS:

Public Utility Commission of Texas Substantive Rules §25.211 and §25.212
CenterPoint Energy Primary Service Specification 600-007-231-458
CNP Service Standards
IEEE 1547

NO.	DATE	ITEMS REVISED	BY	CH	APP
4	4-09-15	Updated	GBR/TRS	MDB	RKW
3	3-14-13	Completely Rewritten	GBR	MDB	RKW
2	7-26-88	Completely Rewritten	RWC		LGP
1	6-25-84	Completely Rewritten	LDG	JSH	JSH

RKW

CenterPoint Energy HOUSTON, TEXAS		
WRITTEN	2-20-81	R.H. Moffatt
CHECKED	2-23-81	J.M. Denison
APPROVED	2-24-81	F.J. Meyer
Sheet 1 of 15		

SPEC ID.	600	007	231	76

Table of Contents

1.0 SCOPE AND DEFINITIONS

1.1 This specification states the requirements and procedures for safe and effective connection and operation of customer-owned generating facilities on the CenterPoint Energy ("CNP") Electric Distribution System. It is emphasized that the requirements outlined in this specification are general and may not cover all details in specific cases. The customer shall discuss project plans with CNP, execute an Interconnection Agreement, and receive approvals before installing devices.

1.2 Pursuant to the Public Utility Commission of Texas ("PUCT") Substantive Rule §25.211(c)(3), the term "Customer" is "any entity interconnected to the company's utility system for the purpose of receiving or exporting electric power from or to the company's utility system."

1.3 The term "CNP System" is used in this specification to refer to the CNP Electric Distribution System. Pursuant to PUCT Substantive Rule §25.211(c)(5) and (10), if the installation's capacity is more than ten MW, CNP may require the installation be split into multiple points of interconnection, or recommend connection to the Transmission System.

1.4 Pursuant to PUCT Substantive Rule §25.211(c)(7), the term "Interconnection Agreement" is "the standard form of agreement, which has been approved by the commission. The interconnection agreement sets forth the contractual conditions under which a company and a customer agree that one or more facilities may be interconnected with the company's utility system."

1.5 The term "installed electric generating facilities kW rated capacity" is the electric generator(s) kVA or kW on the generator nameplate calculated at 100% power factor irrespective of any kW limit imposed by the prime mover rating, control system setting or protection setting. For example, 1600 kW @ 80% PF (2000 kVA) rated capacity on the generator nameplate is calculated at 100 % power factor to be 2000 kW.

1.6 Pursuant to PUCT Substantive Rule §25.212(g), closed-transition switching has specific requirements. CNP defines closed-transition switching as operation of generation that is paralleled with the CNP system for a period of time and is operated separately from the CNP system either before or after such period of parallel operation.

2.0 POLICY ON CUSTOMER GENERATION

2.1 It is the policy of CNP to permit any Customer to operate their generating facilities in parallel with the CNP System, provided that the Customer's generating facilities meet the requirements of this specification.

2.1.1 Customers operating generating facilities in parallel with CNP shall meet the operation requirements of PUCT Substantive Rules §25.211 and §25.212.

2.1.2 Any Customer desiring to operate their facility in parallel with the CNP System must do so without adversely affecting other customers, utilities, or CNP devices or personnel.

2.1.3 Certain protective devices, such as circuit breakers, reclosers, and relays, specified by CNP shall be installed by the Customer at the location where the Customer desires to operate generating facilities in parallel with the CNP System.

2.1.4 Customers receiving primary metered service at 12 kV or 35 kV (phase-to-phase) shall also meet the requirements of the latest version of the Primary Service Specification 600-007-231-458.

2.1.5 Pursuant to PUCT Substantive Rule §25.212(f), in the event that standards for a specific unit or facility are not set out in the rule, CNP and the Customer may interconnect a facility using mutually agreed upon technical standards.

2.2 Three-phase and single-phase Customer generating facilities may be connected in parallel with the CNP System, if the requirements of this specification are met and the appropriate approvals are obtained as outlined under "Approval" (Article 3.0) of this specification.

2.2.1 Where multiple generating facilities are connected to the CNP System through a single point of common coupling, the sum of the nameplate ratings of the generating facilities will be used.

2.2.2 Any Customer found operating unapproved generating facilities in parallel with the CNP System, or operating approved generating facilities with required protective devices disconnected or bypassed will be required to immediately disconnect their generating facilities from the CNP System. The Customer will not be allowed to reconnect the generating facilities, until the appropriate review and approval from CNP has been obtained and a signed Interconnection Agreement executed.

2.3 CNP will not assume any responsibility for the protection of the Customer's electrical system.

2.4 Any Customer desiring parallel operation with CNP shall sign an Interconnection Agreement with CNP, prior to parallel operation, specifying the terms and conditions under which the interconnection shall take place.

2.5 According to PUCT Substantive Rule §25.211(h), certain aspects of secondary network systems create technical difficulties that may make interconnection more costly to implement. In instances where Customers request interconnection to a secondary network system, CNP and the Customer shall use best reasonable efforts to complete the interconnection, in accordance with the PUCT rule and IEEE 1547. More details are provided in the PUCT's rule.

2.6 Pursuant to PUCT Substantive Rule §25.211(n), the owner of a distributed generating facility that is interconnected shall report to CNP any change in ownership of the facility and the cessation of operations of a facility within 14 days of such change.

3.0 APPROVAL

3.1 The Customer shall complete, sign, and submit the standard form approved by the PUCT for an application for interconnection and parallel operation ("the Application") with the CNP System to the CNP-designated distributed generation contact person. CNP will use this data to simulate and evaluate the impact of the Customer generating facilities on the CNP System during normal operating conditions and in the event of a disturbance on the CNP System. Any situations that do not meet required system operating conditions shall be corrected by the Customer before interconnection will be approved. If there are changes to the project, an application revision will be required. An additional study fee may also be required.

3.2 In addition to the information requested in the Application, the Customer shall submit the following.

3.2.1 The data listed in the Application and study fees addendum.

3.2.2 A detailed electrical system one-line diagram showing the generating facilities, transformers, circuit breakers, disconnect switches and protective relays with respect to the CNP meter.

3.2.3 A detailed site plan showing the locations of the generating facilities disconnect device and interconnect disconnect device with respect to the point of common coupling.

3.2.4 Outline drawings and instruction books, if applicable, of the disconnect switch that isolates the generating facilities from the CNP System.

3.2.5 Manufacturer's operating data, such as time-current and time-voltage curves, on the protection relays.

3.2.6 Generating facilities' electrical parameters, to include the installed electric generating facilities kW or MW rated capacity.

3.2.7 Manufacturer/technical information for any equipment necessary for the interconnection study.

3.3 Prior to interconnection of the Customer's generating facilities, CNP shall inspect the Customer's facility and witness the Customer's testing of the protective devices associated with the interconnection.

3.3.1 The information on the installed nameplate(s) of the electric generating facilities must match the information provided in the Application.

3.4 The Customer shall not commence parallel operation of their generating facilities with the CNP System until final written approval has been given by CNP.

3.5 Any modifications made by the Customer to their facility that may affect the CNP System must be approved by CNP prior to implementation.

4.0 GENERAL OPERATING REQUIREMENTS

4.1 CNP's System primary voltages are 12.47 kV and 34.5 kV depending on the geographic location of the Customer's facility. The Customer shall contact the CNP-designated distributed generation contact person for information on the specific circuit that will serve their generating facility.

4.1.1 CNP may change the primary voltage of the circuit serving a Customer generating facility. Customers interconnected directly to the CNP System at primary voltage shall make modifications to their facilities to be able to reconnect to the CNP System. The Customer shall be responsible for all costs associated with this reconnection.

4.1.2 Customers interconnected to the CNP System secondary voltages, which is 4 kV and below, may also be subjected to reconnection costs, depending on the service voltage and the generating facility size.

4.2 The interconnection of the Customer's generating facilities with the CNP System shall not cause any reduction in the quality of service being provided to other customers. In order to eliminate undesirable interference due to the Customer's parallel generating facilities with the CNP System, the following criteria shall be met by the Customer's generating devices:

4.2.1 Pursuant to PUCT Substantive Rule §25.212(c)(1), the Customer shall operate its generating facilities in such a manner that the voltage levels on the CNP System are in the same range as if the generating facilities were not connected to the CNP System. The Customer shall provide an automatic method of disconnecting the generating facilities from the CNP System if a sustained voltage deviation in excess of +5.0% or –10 % from nominal voltage persists for more than 30 seconds, or a deviation in excess of +10% or 30% from nominal voltage persists for more than ten cycles. The interrupting device's auxiliary contacts shall change state in the required time after the voltage deviation is initiated. The Customer may reconnect when the CNP System voltage and frequency return to normal range and the CNP System is stabilized.

4.2.2 The Customer shall not cause voltage fluctuations on the CNP System in excess of plus or minus 3% as measured at the point of common coupling with the CNP System.

4.2.3 The total distortion factor of CNP's sinusoidal voltage wave as a result of harmonics introduced by the Customer's generating facilities shall not exceed 5% of the fundamental 60 Hz frequency nor 3% of the fundamental for any individual harmonic when measured at the point of common coupling with the CNP System. The total distortion factor is the square root of the sum of the squares of all harmonics to the square of the fundamental.

4.2.4 After its initial cut-in, CNP may periodically monitor the point of common coupling with the CNP System. If the distortion factor measured exceeds the limits specified above, the Customer shall take corrective measures to reduce the impact of harmonics onto the CNP System. If the Customer fails to do so, the Customer shall disconnect the generating facilities from the CNP System.

4.2.5 Pursuant to PUCT Substantive Rule §25.212(c)(3), the operating frequency of the Customer's generating facilities shall not deviate more than +0.5 Hertz (Hz) or –0.7 Hz from a 60 Hz base, measured at the point of common coupling. The Customer shall automatically disconnect the generating facilities from the CNP System within 15 cycles if this frequency tolerance cannot be maintained. The interrupting device's auxiliary contacts shall change state in the required time after the frequency deviation is initiated. The Customer may reconnect when the CNP system voltage and frequency return to normal range and the system is stabilized.

4.2.6 The power factor of the Customer's generating facilities shall be between 0.90 lagging to 0.90 leading at the generating facilities' terminals at all times. The Customer shall correct the generating facilities' power factor to meet this criterion.

4.2.7 The Customer shall be responsible for disconnecting the generating facilities from the CNP facilities due to an outage caused by short circuits or grounds on the CNP circuit serving the Customer's generating facilities, pursuant to PUCT Substantive Rule §25.212(c).

4.2.8 The Customer shall provide negative and zero sequence current protections of their generating facilities.

4.3 The Customer shall properly synchronize their generating facilities with the CNP System, as per IEEE 1547.

4.4 CNP shall approve all protective devices the Customer installs for distributed generation to prevent the energization of a de-energized CNP circuit.

4.5 For generation that is paralleled with the grid for 100 milliseconds or less (closed-transition switching), CNP does not require a communication channel for transfer tripping of the Customer's main breaker, provided that the Customer complies with the following:

4.5.1 Disable any mode in the automatic transfer switch (ATS) that would allow paralleling for more than 100 milliseconds.

4.5.2 Provide a test report completed by a relay testing agent that confirms that closed-transition is limited to 100 milliseconds and a failure scheme is in place and was tested.

4.5.3 In the supplemental terms and conditions that are attached to the Interconnection Agreement, describe the 100 milliseconds closed-transition operation and failure scheme.

4.5.4 Provide control wiring drawings that document the closed-transition and failure scheme.

4.5.5 Demonstrate the above requirements during the on-site distributed generation (DG) inspection by CNP.

4.5.6 Submit a commissioning test report that documents the on-site testing.

4.6 For generation that is paralleled with the grid for more than 100 milliseconds and when the Customer's installed electric generating facilities kW or MW rated capacity is in excess of 2 MW or as determined to be necessary by CNP's DG study for facilities under 2 MW, CNP requires a communication channel for transfer tripping of the Customer's main breaker or generator breaker for the purpose of separating the generation from the grid. This equipment is to be installed at the Customer's expense when determined to be necessary by CNP's DG interconnection study. The channel shall be a part of the relay protection scheme and shall be from the Customer's site to the CNP-designated substation.

4.6.1 CNP will design and specify the necessary relay devices. The components to be installed at the CNP-designated substation will be installed by CNP. The components to be installed at the Customer's site shall be installed and maintained by the Customer.

4.7 For generation that is paralleled with the grid for more than 100 milliseconds and when the Customer's installed electric generating facilities kW or MW rated capacity is in excess of 2 MW or as determined to be necessary by CNP's DG study for facilities under 2 MW, CNP requires:

4.7.1 Voltage transformers and a relaying scheme at the CNP-designated substation to be installed by CNP at the Customer's expense to protect against the Customer's generating facilities feeding a transmission fault.

4.7.2 A communication channel for transfer tripping of the Customer's main breaker, as specified in Article 4.6 of this specification will be required at the Customer's expense.

4.7.3 Communication options will be evaluated on a case by case basis.

4.8 CNP reserves the right to disconnect the Customer at their point of service from the CNP System for any of the following reasons:

4.8.1 During system emergencies.

4.8.2 To facilitate maintenance, test, or repair of CNP facilities. When there is a planned outage, CNP will give the Customer seven business days prior written notice of the service interruption, due to routine maintenance, repairs, or modifications.

4.8.3 The Customer's generating facilities interfere with operation of other customers' facilities or with the operation of the CNP System.

4.8.4 Inspection of the Customer's generating facilities or protective devices reveals a hazardous condition.

4.8.5 A lack of scheduled maintenance or maintenance records for the Customer's generating facilities and protective devices, as referenced in the Interconnection Agreement and specified in Article 4.12 of this specification.

4.8.6 The Customer's protective devices do not comply with this specification.

4.8.7 The Customer modifies the generating facilities or protective devices without receiving CNP approval for the modification.

4.8.8 A valid Agreement is required by PUCT Substantive Rules §25.211(e)(1) and §25.211(e)(5). Pursuant to PUCT Substantive Rule §25.211(c)(1), upon expiration or termination of the Agreement with the Customer, in accordance with the terms of the Agreement, CNP may disconnect the Customer's generating facilities. Pursuant to PUCT Substantive Rule §25.211(e)(5), the Customer must execute an Agreement on the forms prescribed by the PUCT. CNP may disconnect the Customer's generating facility if the Agreement has not been received and executed.

4.8.9 The communications channel or the protective relay for transfer trip is not functional.

4.9 In the event of an outage to the affected CNP circuit serving the Customer, immediate restoration may not be possible from an adjacent circuit.

4.9.1 Per the Application, the Customer shall inform CNP, if they are participating in ERCOT's Emergency Response Service ("ERS") program.

4.10 CNP reserves the right to de-energize and block the Customer's breaker from closing if a section of the circuit connected to the Customer's generation facility is field switched to another circuit that has no operable transfer trip protection.

4.11 All costs resulting from future additional protective relaying requirements shall be borne by the Customer.

4.12 To ensure safe and reliable operation when operating in parallel with the CNP system, the Customer has the sole responsibility for the routine maintenance of their protective devices and generating facilities.

4.12.1 CNP reserves the right to verify the calibration and operation of the Customer's protective devices. Verification shall include the tripping of the circuit breakers by manually closing the protective relay contacts.

4.12.2 The Customer must maintain their equipment upon initial commissioning and each year thereafter.

4.12.3 The Customer must maintain complete test and maintenance records for each location and provide test and maintenance records to CNP upon request.

4.12.4 Failure of the Customer to provide proper routine maintenance or maintenance records shall result in the Customer being disconnected, as specified in Article 4.8 of this specification.

5.0 SPECIFIC REQUIREMENTS - THREE-PHASE GENERATORS

5.1 Customers who desire to install and operate three-phase generating facilities in parallel with the CNP System are required to install certain protective devices. The purpose of these devices is to promptly remove the Customer's generating facilities from the CNP System whenever a fault or abnormal event occurs, so as to protect the general public and CNP personnel and facilities from injury or damage due to fault or load currents produced.

5.2 Protective devices at the Customer's location shall be owned, operated, and maintained by the Customer.

5.2.1 The installation, inspection, and testing of protective devices shall be approved by CNP.

5.2.2 The set points of all relays used to isolate the Customer's generating facilities from the CNP System in the event of a system disturbance shall be approved by CNP.

5.2.3 The Customer has the sole responsibility for the routine maintenance of their protective devices and generating facilities, as specified in Article 4.12 of this specification.

5.3 The Customer's generating facilities shall not be connected in parallel with the CNP System through the customer-owned transformers protected by high side fuses for installed electric generating facilities kW or MW rated capacity over 2 MW.

5.4 It is CNP's practice to automatically reclose the substation circuit breakers instantaneously, which is 10 to 15 cycles, after they have tripped. Instantaneous reclosing of three-phase line reclosers located between the CNP substation and the Customer's generating facilities is also practiced. The Customer shall ensure that their generating facilities are automatically disconnected from the CNP System prior to the CNP substation breaker or line reclosers automatic reclose.

5.4.1 The Customer's breakers or reclosers shall not automatically reclose after tripping. The Customer may reconnect when the utility system voltage and frequency return to normal range and the system is stabilized, as specified in Articles 4.2.1 and 4.2.5 of this specification.

5.5 The Customer's main and generating facilities' circuit breakers and reclosers shall be three-phase devices with electronic or electromechanical control. Hydraulically controlled breakers and reclosers shall not be used.

5.5.1 The symmetrical current interrupting capability shall be greater than the maximum future system fault duty as specified by CNP.

5.5.2 The Customer's generating facilities' breakers shall be equipped with a breaker failure relay scheme that will trip their main breaker in the event the generating facilities' breaker fails to trip within ten (10) cycles after receiving an initial trip signal from the appropriate relays.

5.6 The Customer's generating facilities shall be separable from the CNP System by a visible break disconnecting device.

5.6.1 If the Customer is interconnected directly to the primary distribution system, which is 12.47 kV or 34.5 kV primary metered customers, CNP will install a three-phase gang-operated load break disconnecting device or three single-phase blade disconnects to separate the Customer's generating facilities from the CNP System.

5.6.2 If the Customer is interconnected to the secondary distribution system, which is 4kV and below, the Customer shall install a visible break, blade disconnecting device either at the point of service or the generating facilities to separate the Customer's generating facilities from the CNP System. This disconnecting device shall be readily accessible to CNP personnel at all times. The disconnecting device shall be capable of being locked by CNP to keep the switch in the open position.

6.0 SPECIFIC REQUIREMENTS - SINGLE-PHASE GENERATORS

6.1 The Customer will be allowed to install and operate single-phase generating facilities that are 50 kW or less in parallel with the CNP System at most locations on the radial distribution system if they meet the requirements of this specification. Depending on the point of connection to the CNP System, single-phase generating facilities larger than 50 kW may be allowed.

6.2 The Customer shall install a manual disconnecting visible blade safety switch device that will provide a visible opening between the CNP System and the Customer's generating facilities. The visible blade safety switch device shall be readily accessible to CNP personnel at all times. The disconnecting device shall be capable of being locked by CNP to keep the switch in the open position.

6.3 It is CNP's practice to automatically reclose the substation circuit breakers instantaneously, which is 10 to 15 cycles, after they have tripped. Instantaneous reclosing of three-phase line reclosers located between the CNP substation and the customer's generating facilities is also practiced. The Customer shall ensure that their generating facilities are automatically disconnected from the CNP System prior to the CNP substation breaker or line reclosers automatic reclose.

6.4 The Customer's generating facilities' controls shall be equipped with a line voltage sensing relay or contactor that will prevent the generating facilities from being connected to a de-energized CNP circuit.

7.0 INDUCTION GENERATORS AND INVERTER SYSTEMS

7.1 The power factor correction devices for induction generating facilities or power inverters shall be approved by CNP.

7.2 The step-switched capacitors for induction generating facilities or the other techniques to bring voltage fluctuations to acceptable levels for induction generating facilities shall be approved by CNP.

7.3 For inverter systems, the Customer shall provide a one-line diagram showing the relationship of the generating facilities tied into a breaker or breakers in the electrical panel and the CNP meter location. The AC disconnect switch shall be between the inverter and electrical panel and must be a lockable, external handle, visible and readily accessible disconnect switch and typically installed within ten feet of the CNP meter. If the AC disconnect switch is installed more than ten feet of the CNP meter, a weather-resistant, easily read placard must be installed within ten feet from the CNP meter, clearly identifying the location of the AC disconnect switch.

7.4 The Customer shall provide manufacturer specifics for the inverter and disconnect switch. The inverter specification sheet shall show that the anti-islanding protection has been certified by IEEE 1547 or UL 1741. Otherwise, the Customer shall test the inverter pursuant to PUCT requirements, as specified in Articles 4.2.1 and 4.2.5 of this specification. CNP shall receive notice and be present for the inverter testing.

7.5 If the Customer using an inverter for parallel generating facilities causes any reduction in the quality of service provided to other utility customers due to harmonics, the Customer shall install filtering devices to cause the harmonic output of the Customer's inverter to an acceptable level.

8.0 REVENUE METERING

8.1 The revenue metering for the Customer's generating facility shall be as determined by CNP.

8.2 Actual metering arrangements must conform with PUCT-approved tariff requirements, which are subject to revision.

8.3 The revenue meter shall be installed by CNP after all documentation and inspections are completed and approved.

8.4 The Customer is responsible for resolving billing issues with their retail electric provider.

8.4.1 Commercial meters establish a demand based on import of kW and kVAr.

CNP - Basic DG Process

Installations Larger than 50kW

1. **Application:**
    a. CNP receives completed application with one-line.
    b. Application is reviewed, and CNP determines if a study fee will be required.

2. **Study:**
    a. If a study is required, the customer is informed of the study fee cost, and additional information that will required for the study.
    b. The study begins once CNP receives payment and all requested information.
    c. The interconnection study takes approximately 4 weeks.
    d. Upon completion of the study, CNP will inform the customer of the outcome, including an estimate of any required modifications.
    e. Following the study, (if required) an estimated cost for transfer trip will be provided.
        i. NOTE: CNP will provide the estimated cost for equipment to be purchased and installed by CNP, however there will be additional equipment that the customer will need to procure and install at their site.

3. **Construction**
    a. CNP received an upfront payment for the installation of transfer trip and/or any other required system modifications.
    b. If Transfer Trip is required, CNP Telecom performs a path loss study to determine the communication options. CNP begins the equipment procurement process, and construction is scheduled.
        i. NOTE: The lead time for transfer trip is approximately 8 months.
    c. Customer procures necessary equipment and installs it.
    d. Construction is completed.

4. **Inspections:**
    a. Customer relay testing & site inspection:
        i. PRIOR TO ACTUAL SYNCRONIZATION WITH THE CNP GRID, a field inspection will be conducted to witness relay testing and confirm that it meets PUC & CNP requirements.
        ii. CNP will also verify that the installed equipment matches the information provided in the application and study documentation.
        iii. The customer provides CNP with test report documenting the results of the test.
    b. Transfer Trip:
        i. CNP will test the transfer trip scheme.

5. **Interconnection Agreement**
    a. Following a successful inspection, an interconnection agreement will be prepared and must be signed by the customer.

6. **Approval to Run**
    a. Upon completion of these steps, CNP will notify provide the customer with:
        i. A copy of the fully executed interconnection agreement.
        ii. A letter stating that the DG is officially granted permission to operate.

CenterPoint Energy

CenterPoint Energy Distributed Generation Interconnection Customer Information for Battery Energy Storage System

Facility Name: _____

Customer's Name: _____

Contact Person: _____

Mailing Address: _____

City: _____ State: _____ Zip: _____

Telephone:_____Fax:_____E-Mail: _____

Requested In-service Date: _____

Facility Location (if different from above)

Address: _____

City: _____ State: _____ Zip: _____

Application is for:

New Generating Facility _____ Existing Facility_____ Capacity Increase: _____

A) If capacity addition to existing facility, please describe (close transition, parallel operation, ERS, or others)_____

B) Provide existing account number (ESI ID or PMI #): _____

Maximum Export Capability Requested: _____ (kW/PF)

Maximum Load shifting, smoothing, peak shaving in kW: _____ (kW/PF)

Will the CNP distribution grid be used to charge the storage device? _____ (Yes/No)

What is the maximum charging demand from CNP distribution grid? _____(kW/PF)

When will the storage devices discharge to CNP distribution grid? _____

Battery Energy Storage System (BESS) Information

Manufacturer: _____Model: _____Rating Voltage: _____

Rated Storage Power in kW: _____ Rated Storage Energy in kWh _____

Quantity of BESS: _____ Single or Three Phase: _____

Rated kW discharge: _____ Rated kW Charge: _____

Energy Throughput (kWh): _____ Cycle Life (Cycles): _____

Charge Efficiency in percent (%): _____Depth of Discharge (in percent): ____

Discharge Efficiency in percent (%): _____ End of Life (EOL in percent): _____

BESS Data Sheet parameters:

Idling Active Losses in Watt (W): _____

Idling Reactive Losses in VAR: _____

Customer to provide data sheets: _____(Yes/No)

Short-Circuit Fault Contribution: _____ in % of rated current or _____in Amperes

BESS Settings Information

Maximum State of Charge in Percent (%): _____

Minimum State of Charge in Percent (%): _____

Rise Limitation: _____(%/min)

Fall Limitation: _____(%/min)

Time Charge Delay: _____(seconds)

Time Discharge Delay: _____(seconds)

Type of Control Settings: _____ (Volt-VAR, Volt-Watt, no monitoring, power monitoring, etc.)

Customer to provide Control Settings Information: _____(Yes/No)

AC/DC Converter Technical Specifications of BESS

DC Side

Rated DC Voltage (Vdc): _____(kV) Converter Efficiency: _____ (%)

DC Capacitor (Cdc): _____ (Micro Farad Converter Internal Losses: _____(W)

AC Side

Converter Rating: _____(kVA) Active Power Rating: _____(kW)

Reactive Power Rating: _____(kVAR)

Min Power Factor: +/- _____ (%)

Internal Coupling Element: _____(Yes/No)

Coupling Resistance (R): _____(Ohms)

Coupling Inductance (L): _____(H)

Protective Device Information

Interconnecting Circuit Breaker:

Manufacturer: _____Type:_____

Load Rating (Amps):_____Interrupting Rating (Amps):_____Trip Speed in Cycles:_____ (Cycles)

Interconnection Protective Relays:

For each protective device, provide the followings:

Manufacturer of Interrupting Device: _____ Catalog number: _____

Rating: _____ (A) Voltage: _____ (V)

Manufacturer of Relay: _____Model: _____

CT ratio: _____ PT ratio _____

Attached Settings &Setting file: ____ (Yes/No) Pickups: _____(Amps)

Conductor Data

Please include the following conductor data information in the electrical one-line diagram:

Conductor manufacturer: _____

Conductor size: _____ Numbers of conductors in parallel: _____

Conductor Material: _____ (Al/Copper)

Insulation material: _____

Sheath: ____ (Yes / No)

Concentric neutrals :_____(Yes / No)

Rated Voltage _____ (V) Withstand Rating: _____ (A)

Nominal ampacity in Amps _____ (A) Temperature: _____

Length: _____ (ft.)

Equivalent impedances of conductor

Positive Sequence Impedance: R: _____Ohms/mile X: _____Ohms/mile

Zero Sequence Impedance: R: _____Ohms/mile X: _____Ohms/mile

For CenterPoint Energy Use ONLY

DG ID: _____

Circuit IDs: _____ Work Center #: _____

Section IDs: _____ Switch/Fuse IDs _____

CNP's Contact Person: _____ Tel: _____

Service Consultant: _____ Tel: _____

CenterPoint Energy

CenterPoint Energy Distributed Generation Interconnection Customer Information for Large PV System (≥ 500 kW)

Facility Name: _____

Customer's Name: _____

Contact Person: _____

Mailing Address: _____

City: _____ State: _____ Zip: _____

Telephone:_____Fax:_____E-Mail: _____

Requested In-service Date: _____

Facility Location (if different from above)

Address:_____

City: _____ State: _____ Zip: _____

Application is for:

New Generating Facility _____ Existing Facility_____ Capacity Increase: _____

A) If capacity addition to existing facility, please describe (close transition, parallel operation, ERS, or others)_____

B) Provide existing account number (ESI ID or PMI #)
_____

C) Customer existing site Load: _____(kW/PF)

Maximum Export Capability Requested: _____ (kW/PF)

Maximum Active Generation in kW: _____ (kW/PF)

Maximum Active Standby in kW/PF: _____ (kW/PF)

Electrical One-line/Drawings/Data Sheets/ Specifications: _____ (Yes/No)

Inverters Information

DC Side

Inverter rated DC Voltage: _____ (kV)

Inverter Efficiency: _____ (%)

DC Capacitor (Cdc) in uF: _____ (uF)

Inverter Internal Losses in Watts: _____ (W)

AC Side

Inverter Manufacturer: _____

Inverter Model Number: _____

Pre-Certification Inverter Codes & Standards (e.g. UL-1741): _____

Number of Inverters: _____

Inverter Phasing: Single Phase: _____ or Three Phase: _____

Inverter Rating in kVA: _____ (kVA)

Inverter Active Power Rating in kW: _____ (kW)

Inverter Reactive Power Rating in kVAR: _____ (kVAR)

Inverter Power Factor Range in Percent: +/-_____ (%)

Inverter Internal Coupling Resistance R in Ohms: ___

Inverter Coupling Inductance L in Henry: _____ (H)

Inverter Control Settings

Adjust Power Factor in Percent: _____ (%)

In Volt-Var: _____

In Volt-Watts: _____

In Watts-Power Factor: _____

In Maximum Generation Level: _____

Insolation Model

Provide 8760 Insolation Model (W/m^2)/Time (s) in Excel or Text format: _____ (Yes/No)

PV Panel Information

Panel Manufacturer: _____

Panel Model Number: _____

Provide PV Panel Data Sheet Information in Standard Test Condition: ___ (Yes)

Panel Rating in Watts: _____ (W)

PV Panel Active Generation in kW: _____ (kW)

PV Panel DC Voltage: _____ (V)

Number of PV panels in series (Ns): _____

Number of PV panels in parallel (Np): _____

Short-Circuit Fault Contribution in Percentage: _____ (%) of Rated Current or

Short-Circuit Fault Contribution in Percentage: _____ (%) of Active Generation

Customer-owned Transformer Information

Transformer Data

Transformer Size: _____(kVA)

Transformer Impedance (%Z) :_____(%) on _____kVA Base

Transformer X/R ratio: _____ Picture of Transformer Name Plate: _____(Yes/No)

Transformer Primary: _____(V)_____Delta_____Wye_____Grounded Wye

Transformer Secondary: _____(V)_____Delta_____Wye_____Grounded Wye

Transformer Tertiary: _____(V)_____Delta_____Wye_____Grounded Wye

Transformer Tap Settings

Transformer Primary Tap Settings: _____(%) _____(Voltage in kVLL)

Transformer Secondary Tap Settings: _____(%) _____(Voltage in kVLL)

Transformer Tertiary Tap Settings: _____(%) _____(Voltage in kVLL)

Transformer Fuse Data

Fuse Manufacturer: _____Model _____Rating _____(Amps)

Fuse Rated Voltage: _____Speed: _____

Fuse Interrupting Rating :_____(Amps)

Transformer Grounding Impedance (Rg) if Applicable

Transformer Grounding Impedances on Primary: Rg: _____(Ohms) Xg: _____(Ohms)

Transformer Grounding Impedances on Secondary: Rg: _____(Ohms) Xg: _____(Ohms)

Transformer Grounding Impedances on Tertiary: Rg: _____(Ohms) Xg: _____(Ohms)

Protective Device Information

Interconnecting Circuit Breaker:

Manufacturer: _____Type:_____

Load Rating (Amps):_____Interrupting Rating (Amps):_____Trip Speed in Cycles:_____ (Cycles)

Interconnection Protective Relays:

For each protective device, provide the followings:

Manufacturer of Interrupting Device: _____ Catalog number: _____

Rating: _____ (A) Voltage: _____ (V)

Manufacturer of Relay: _____Model: _____CT ratio: _____PT ratio _____

Attached Settings &Setting file: ____ (Yes/No) Pickups: _____(Amps)

Power Factor Correction Capacitor (PFCC) Bank (If Applicable)

Manufacturer: _____

Size per phase: _____ (kVAR) Single or Three-phase: _____

Quantity: _____ Voltage: _____

Type: _____ Interrupting Rating: _____

Corrected Power Factors Range: _____ Location: _____

Selected Power Factor at Full Load in Percent: _____%

Sequence of Operations

Please provide brief generator and switchgears system description and sequence of operations operated at the site for different modes of operations (parallel, island, black start, zero power transfer, ERS etc.). What types of methods are used to synchronize the generators?

Conductor Data

Please include the following conductor data information in the electrical one-line diagram:

Conductor manufacturer: _____

Conductor type: _____ Numbers of conductors in parallel: _____

Conductor Material: _____ (Al/Copper)

Insulation material: _____

Sheath: ____ (Yes / No)

Concentric neutrals :_____(Yes / No)

Rated Voltage _____ (V) Withstand Rating: _____ (A)

Nominal ampacity in Amps _____ (A) Temperature: _____

Length: _____ (ft.)

Equivalent impedances of conductor

Positive Sequence Impedance: R: _____Ohms/mile X: _____Ohms/mile

Zero Sequence Impedance: R: _____Ohms/mile X: _____Ohms/mile

Motor Information

All motors over 250 HP will need to be reviewed. Please fill out this section below if applicable:

- Number of motors starting simultaneously: _____

Motor Data Table

	Example	**Group 1**	**Group 2**	**Group 3**	**Group 4**
Number of Motors	**2**				
Horsepower	**100**				
Phase	**3**				
Rated Voltage	**480**				
Full Load Amps	**120**				
Locked Rotor Amps	**673**				
Power Factor in percent	**40 %**				
Efficiency in 50%, 75%, 100%	**87%**				
ANSI Group	**2**				
*Code Letter	**G**				
Required Starting Frequency	**2/day**				
Start under Load Y/N	**Y**				
**Starting Method	**FVS**				

*Locked Rotor kVA per HP Code Letter, this is not the Design Letter.

**Starting Methods:

FVS	Full voltage start (same as across the line)
ATRF	Auto-transformer (reduced voltage start)
CAPS	Capacitor Start

SSDR	Star-Start, Delta-Run
OTHR	Other (please include a description)

For CenterPoint Energy Use ONLY

DG ID: _____

Circuit IDs: _____ Work Center #: _____

Section IDs: _____ Switch/Fuse IDs _____

CNP's Contact Person: _____ Tel: _____

Service Consultant: _____ Tel: _____

CenterPoint Energy

CenterPoint Energy Distributed Energy Resources Interconnection Customer Information for Synchronous/Induction Generator

Facility Name: _____

Customer's Name: _____

Contact Person: _____

Mailing Address: _____

City: _____ State: _____ Zip: _____

Telephone:_____Fax:_____E-Mail: _____

Requested In-service Date: _____

Facility Location (if different from above)

Address: _____

City: _____ State: _____ Zip: _____

Application is for:

New Generating Facility _____ Existing Facility_____ Capacity Increase: _____

A) If capacity addition to existing facility, please describe (close transition, parallel operation, ERS, or others)_____

B) Provide existing account number (ESI ID or PMI #): _____

Maximum Export Capability Requested: _____ (kW/PF)

Maximum Active Generation in kW: _____ (kW/PF)

Maximum Active Standby in kW/PF: _____ (kW/PF)

Submit Electrical One-line/Drawings/Data Sheets/ Specifications: _____ (Yes/No)

Distributed Generation Facility Information

Technology Type: _____ Renewable: _____Non-renewable: ____

Fuel Type: Diesel_____ Natural Gas_____ Fuel Oil_____

_____Other (state Type)_____

Generator Type: Synchronous: _____Induction: _____

Synchronous Generator Information

Generator kVA Base: _____

Generator kV Base: _____

Generator Rated Voltage: _____

Power Factor: _____

Generator Configuration (Y, Grounded Y, Delta): _____

Number of Units: _____

Number of Poles: _____

Salient Poles or Round Poles: _____

Direct Axis Saturated Synchronous Reactance (Xd): _____in Per Unit (PU)

Direct Axis Saturated Transient Reactance (X'd): _____ in Per Unit (PU)

Direct Axis Saturated Sub-transient Reactance (X"d): _____ in Per Unit (PU)

Quadrature Axis Saturated Synchronous Reactance (Xq): _____in Per Unit (PU)

Quadrature Axis Saturated Transient Reactance (X'q): _____in Per Unit (PU)

Quadrature Axis Saturated Sub-transient Reactance (X"q): _____in Per Unit (PU)

Zero Sequence Reactance (X_0): _____ in Per Unit (PU)

Negative Sequence Reactance (X_2): _____ in Per Unit (PU)

Leakage Reactance (X_l): _____ in Per Unit (PU)

H, inertia of all rotating mass in MW-s/MVA: _____

Damping constant Kd: _____ in Per Unit (PU)

Neutral Grounding Resistor if applicable: _____(Ohms)

T 'do, d-axis transient open circuit time constant: _____(s)

T "do, d-axis subtransient open circuit time constant: _____(s)

T 'qo, Q-axis transient open circuit time constant: _____(s)

T"qo, Q-axis subtransient open circuit time constant: _____(s)

Reactive Power Capability Curve: _____(Yes/No)

Loading Information

Minimum Estimated Existing Load in kVA and power factor: _____(kVA/PF)

Maximum Estimated Existing Load in kVA and power factor: _____(kVA/PF)

Maximum Estimated New load in kVA and power factor: _____(kVA/PF)

Added Capacity in kVA and power factor: _____(kVA/PF)

Synchronous Generator Control Settings

For Fixed Generation Controlled:

Power Factor in Percent: _____(%) Max Reactive Power: _____(kVAR)

Minimum Reactive Power: _____(kVAR)

Customer's Notes:

For Voltage Controlled:

Desired Voltage: _____(kVLL) Max Reactive Power: _____(kVAR)

Minimum Reactive Power: _____(kVAR)

Customer's Notes:

Others (Please specify): _____

Excitation and Governor System Data

Individual Generator Power Factor: _____(%)

Rated Power Factor: Leading: _____ (%) Lagging: _____(%)

IEEE Model ID Number: _____Others: _____

Stabilizer type and Model: _____

Automated Voltage Regulator

Manufacturer: _____Size: _____(kVA)

Voltage: _____(V) Number of Phase: _____

Input Voltage Range: _____ Output Voltage Range: _____

Proposed Settings: _____

Induction Generator Information

Generator kVA Base: _____ Motoring Power in kW: _____(kW)

Generator kV Base: _____Active Generation in kW: _____(kW)

Generator Rated Voltage: _____ Efficiency: _____Power Factor: _____(%)

Rated Speed in RPM: _____(RPM) ANSI Motor Group: _____

Rotor Type: Single Circuit: _____Double Circuit: _____Deep Bar: _____

Locked Rotor Current: _____(Amps)

Rotor Resistance, Rr : _____in Per Unit

Stator Resistance, Rs: _____ in Per Unit

Stator Reactance, Xs: _____ in Per Unit

Rotor Reactance, Xr: _____ in Per Unit

Magnetizing Reactance, Xm: _____ in Per Unit

Short Circuit Reactance, Xd": _____ in Per Unit

Cage Factor: CFr: _____CFx: _____

Exciting Current : _____(Amps) Temperature Rise: _____

Frame Size: _____ Design Letter: _____

Reactive Power Required at No Load: _____(kVAR)

Reactive Power Required at Full Load: _____(kVAR)

Total Rotating Inertia, H: _____MW.s/MVA per Unit on kVA Base

Subtransient Impedance: R":_____X":_____(in Per Unit)

NEMA Code: _____

Induction Generator Settings: Power Factor: _____(+/- %)

Customer-owned Transformer Information

Transformer Data

Transformer Size: _____(kVA)

Transformer Impedance (%Z) :_____(%) on _____kVA Base

Transformer X/R ratio: _____ Picture of Transformer Name Plate: _____(Yes/No)

Transformer Primary: _____(V)_____Delta_____Wye_____Grounded Wye

Transformer Secondary: _____(V)_____Delta_____Wye_____Grounded Wye

Transformer Tertiary: _____(V)_____Delta_____Wye_____Grounded Wye

Transformer Positive Sequence Impedance (Z1)

Primary-Secondary: _____% Primary-Tertiary: ____% Secondary-Tertiary: ____%

Transformer X1/R1 ratio

Primary-Secondary: _____ Primary-Tertiary: ____ Secondary-Tertiary: ____

Transformer Tap Settings

Transformer Primary Tap Settings: _____(%) _____(Voltage in kVLL)

Transformer Secondary Tap Settings: _____(%) _____(Voltage in kVLL)

Transformer Tertiary Tap Settings: _____(%) _____(Voltage in kVLL)

Transformer Fuse Data

Fuse Manufacturer: _____Model _____Rating _____(Amps)

Fuse Rated Voltage: _____Speed: _____

Fuse Interrupting Rating :_____(Amps)

Transformer Grounding Impedance (Rg) if Applicable

Transformer Grounding Impedances on Primary: Rg: _____(Ohms) Xg: _____(Ohms)

Transformer Grounding Impedances on Secondary: Rg: _____(Ohms) Xg: _____(Ohms)
Transformer Grounding Impedances on Tertiary: Rg: _____(Ohms) Xg: _____(Ohms)

Protective Device Information

Interconnecting Circuit Breaker:

Manufacturer: _____Type:_____

Load Rating (Amps):_____Interrupting Rating (Amps):_____Trip Speed in Cycles:_____ (Cycles)

Interconnection Protective Relays:

For each protective device, provide the followings:

Manufacturer of Interrupting Device: _____ Catalog number: _____

Rating: _____ (A) Voltage: _____ (V)

Manufacturer of Relay: _____Model: _____CT ratio: _____PT ratio _____

Attached Settings &Setting file: ____ (Yes/No) Pickups: _____(Amps)

Power Factor Correction Capacitor (PFCC) Bank (If Applicable)

Manufacturer: _____

Size per phase: _____ (kVAR) Single or Three-phase: _____

Quantity: _____ Voltage: _____

Type: _____ Interrupting Rating: _____

Corrected Power Factors Range: _____ Location: _____

Selected Power Factor at Full Load in Percent: _____%

Sequence of Operations

Please provide brief generator and switchgears system description and sequence of operations operated at the site for different modes of operations (parallel, island, black start, zero power transfer, ERS etc.). What types of methods are used to synchronize the generators?

Conductor Data

Please include the following conductor data information in the electrical one-line diagram:

Conductor manufacturer: _____

Conductor size: _____ Numbers of conductors in parallel: _____

Conductor Material: _____ (Al/Copper)

Insulation material: _____

Sheath: ____ (Yes / No)

Concentric neutrals :_____(Yes / No)

Rated Voltage _____ (V) Withstand Rating: _____ (A)

Nominal ampacity in Amps _____ (A) Temperature: _____

Length: _____ (ft.)

Equivalent impedances of conductor

Positive Sequence Impedance: R: _____Ohms/mile X: _____Ohms/mile

Zero Sequence Impedance: R: _____Ohms/mile X: _____Ohms/mile

Motor Information

All motors over 250 HP will need to be reviewed. Please fill out this section below if applicable:

- Number of motors starting simultaneously: _____

Motor Data Table

	Example	Group 1	Group 2	Group 3	Group 4
Number of Motors	**2**				
Horsepower	**100**				
Phase	**3**				
Rated Voltage	**480**				
Full Load Amps	**120**				
Locked Rotor Amps	**673**				
Power Factor in percent	**40 %**				
Efficiency in 50%, 75%, 100%	**87%**				
ANSI Group	**2**				
*Code Letter	**G**				
Required Starting Frequency	**2/day**				
Start under Load Y/N	**Y**				
**Starting Method	**FVS**				

*Locked Rotor kVA per HP Code Letter, this is not the Design Letter.

**Starting Methods:

FVS	Full voltage start (same as across the line)
ATRF	Auto-transformer (reduced voltage start)
CAPS	Capacitor Start

SSDR	Star-Start, Delta-Run
OTHR	Other (please include a description)

Facility with Close Transition for No More than 100 milliseconds

Manufacturer name of the high speed automated transfer switch (ATS):

ATS Model number: _____Quantity: _____

Ratings: _____(Amps) Speed: _____(Cycles) Voltage: _____(V)

Number of poles: _____Interrupting Rating: _____(Amps) Control model number: _____

Technology utilized for switching: _____

Pre-certified and/or Approved Standards: _____

Installation of Shunt trip circuit (please specify): _____

Additional Requirements

Provide control wiring drawings for the closed-transition: _____(Yes/No)

Provide breaker failure scheme: _____(Yes/No)

Submit a test report completed by a relay testing agent that confirms that closed-transition is limited to 100 milliseconds: _____ (Yes/No)

Provide a breaker-failure scheme and a test report to indicate an automatic opening of breaker when transition time exceeds 100 milliseconds: _____ (Yes/No)

Describe the 100 milliseconds closed-transition operation and failure scheme in the supplemental terms and conditions: _____ (Yes/No)

Disable any mode that would allow paralleling for more than 100 milliseconds: _____ (Yes/No)

Demonstrate the above requirements during the on-site DG inspection by CNP: _____ (Yes/No)

Submit a commissioning test report that documents the on-site testing of closed transition scheme: _____ (Yes/No)

Agree to a testing and yearly preventative maintenance reporting schedule: _____ (Yes/No)

Notes: CenterPoint Energy (CNP) does not require the customer with closed transition switching to install a transfer trip device at this time. CNP reserves the rights to modify the above requirements at any time.

For CenterPoint Energy Use ONLY

DG ID: _____

Circuit IDs: _____ Work Center #: _____

Section IDs: _____ Switch/Fuse IDs _____

CNP's Contact Person: _____ Tel: _____

Service Consultant: _____ Tel: _____

CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC
2019 CEHE RATE CASE
DOCKET 49421-SOAH DOCKET NO. 473-19-3864

SOLAR ENERGY INDUSTRIES ASSOCIATION
REQUEST NO.: SEIA01-07

QUESTION:

Please identify the testimony CenterPoint filed in its application to support the proposed changes to its pre-interconnection study fee schedule.

ANSWER:

The proposed pre-interconnection study fee is part of the cost associated with Distributed Generation Meter Installation Charge; which is Discretionary Service DC.18 the charge is "as calculated" (please see Exhibit MAT - 8 at 216 and at 232).

Troxle's testimony at 47 lines 5-6, and 10 -13 addresses the proposed changes for discretionary charges.

The pre-interconnection study is a required task associated with the Distribution Generation meter installation, and specific labor skills and materials are required to perform this service. (please see Exhibit MAT - 8 at 297).

SPONSOR (PREPARER):
Matthew Troxle (Matthew Troxle)

RESPONSIVE DOCUMENTS:
None

CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC
2019 CEHE RATE CASE
DOCKET 49421-SOAH DOCKET NO. 473-19-3864

SOLAR ENERGY INDUSTRIES ASSOCIATION
REQUEST NO.: SEIA01-08

QUESTION:

Please provide all studies or other information the Company relies on to support the changes to its pre-interconnection study fee schedule.

ANSWER:

CEHE estimated the number of hours needed to perform pre-interconnection studies and manager reviews, based on studies performed in 2018. See attachment SEIA01-08 Support for Study Fee Schedule Attachment 1.xlsx for the information supporting the hours and costs for the different categories of DGs as shown in study fee schedule. The estimated hours for the studies and the manager review were multiplied by the total burdened salary of the individuals and the manager to obtain the new proposed tariff.

SPONSOR (PREPARER):
Matthew Troxle/Dale Bodden (Matthew Troxle/Dale Bodden)

RESPONSIVE DOCUMENTS:
SEIA01-08 Support for Study Fee Schedule Attachment 1.xlsx

SEIA 1-8 Support for Study Fee Schedule Attachment1.xlsx

	Size Category	Estimated Individual Hours	Individual $'s	Estimated Manager Hours	Manager $'s	CEHE Proposed Tariff $'s	CEHE Existing Tarriff $'s
	10+ to 500kW						
Not Exporting	Pre-certified - not on network	3.3	$0	0		$0	$0
Not Exporting	Non pre-certified - not on network	4.95	$408	1.32	$173	$581	$503
Not Exporting	Pre-certified - on network	9.9	$815	1.98	$260	$1,075	$640
Not Exporting	Not pre-certified - on network	13.2	$1,087	2.64	$346	$1,433	$1,150
Exporting	Pre-certified - not on network	4.29	$353	1.65	$216	$570	$220
Exporting	Non pre-certified - not on network	5.94	$489	2.31	$303	$792	$769
Exporting	Pre-certified - on network	10.89	$897	2.97	$389	$1,286	$860
Exporting	Not pre-certified - on network	14.19	$1,169	3.63	$476	$1,645	$1,370
	500+ to 2000kW						
Not Exporting	Pre-certified - not on network	27	$2,224	8	$1,049	$3,273	$650
Not Exporting	Non pre-certified - not on network	32	$2,636	10	$1,311	$3,947	$1,210
Not Exporting	Pre-certified - on network	57	$4,695	12	$1,574	$6,269	$1,680
Not Exporting	Not pre-certified - on network	62	$5,107	14	$1,836	$6,943	$2,240
Exporting	Pre-certified - not on network	30	$2,471	8	$1,049	$3,520	$870
Exporting	Non pre-certified - not on network	35	$2,883	10	$1,311	$4,194	$1,430
Exporting	Pre-certified - on network	68	$5,601	12	$1,574	$7,175	$1,900
Exporting	Not pre-certified - on network	73	$6,013	14	$1,836	$7,849	$2,460
	2000+ to 10,000kW	120		16			
Not Exporting	Pre-certified - not on network	30	$2,471	8	$1,049	$3,520	$845
Not Exporting	Non pre-certified - not on network	35	$2,883	10	$1,311	$4,194	$1,405
Not Exporting	Pre-certified - on network	60	$4,942	12	$1,574	$6,516	$1,875
Not Exporting	Not pre-certified - on network	65	$5,354	14	$1,836	$7,190	$2,435
Exporting	Pre-certified - not on network	33	$2,718	8	$1,049	$3,767	$1,065
Exporting	Non pre-certified - not on network	38	$3,130	10	$1,311	$4,441	$1,625
Exporting	Pre-certified - on network	71	$5,848	12	$1,574	$7,422	$2,095
Exporting	Not pre-certified - on network	76	$6,260	14	$1,836	$8,096	$2,655

CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC
2019 CEHE RATE CASE
DOCKET 49421-SOAH DOCKET NO. 473-19-3864

SOLAR ENERGY INDUSTRIES ASSOCIATION
REQUEST NO.: SEIA01-09

QUESTION:

Refer to Exhibit MAT-8 page 232-233.

a. The value for the pre-interconnection study fee for the 10+ to 500 kW, non-exporting, not pre-certified on network value ($1,4331,150) appears to contain a typographical error. Please confirm the correct value for this entry.
b. Please explain in detail what analyses are required for the analysis of exporting systems that are not required for the analysis of non-exporting systems.
c. Provide by year the total number of interconnection requests that the Company received in 2016, 2017, and 2018 based on the export / non-export and size categories listed in this table
d. For systems identified in c above, provide how many systems were exempt from pre-interconnection study fees based on the export or potential short circuit current exemption criteria.

ANSWER:

In reference to Exhibit MAT-8 page 232-233.

a) The value shown as $1,4331,150 on the pre-interconnection fee chart should be $1,443.

b) The pre-interconnection studies that are required for non-exporting and exporting DG systems are similar, except that exporting DG systems require additional analyses to check for Transfer Trip protection or the Reverse Power Trip protection. Transfer Trip or Reverse Power Trip is needed when there is a potential for islanding on the distribution system, which is true for exporting DG systems. The studies that are normally performed for both exporting and non-exporting DER systems are listed below;

- Load Flow to ensure DG will not cause issues with thermal limit and voltage imbalance criteria
- Voltage drop report according to ANSI Standards C84.1, Range A
- Fault current limitation
- Grounding check
- Equipment rating analysis
- Harmonic study when needed
- Flickering for PV only
- Sensitivity study when needed
- Transfer trip criteria*
- Reverse Power trip when needed*
- 3V0 protection scheme requirement
- Interface transformer configuration when needed

Exporting DG systems require studies to determine transfer trip or reverse power trip.

c) The total number of interconnection requests that the Company received in 2016, 2017, and 2018 based on the export / non-export and size categories are provided in the attachment SEIA01-09c Interconnection Requests Attachment 1.xlsx.

d) For systems identified in c above, the number of systems that were exempt from a pre-interconnection study fee based on the export or potential short circuit current exemption criteria was 4,445.

SPONSOR (PREPARER):
Matthew Troxle/Julienne Sugarek (Matthew Troxle/Julienne Sugarek)

RESPONSIVE DOCUMENTS:
SEIA01-09c Interconnection Requests Attachment 1.xlsx

SEIA 1-9c Interconnection Requests Attachment 1.xlsx.

	0-10 kW	10-500 kW	500-2000 kW	2000+-10000 kW
2016				
Exporting	499	67	22	2
Non-Exporting	79	10	12	2
2017				
Exporting	825	190	17	8
Non-Exporting	54	19	20	6
2018				
Exporting	1967	525	6	3
Non-Exporting	155	12	3	2

CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC
2019 CEHE RATE CASE
DOCKET 49421-SOAH DOCKET NO. 473-19-3864

SOLAR ENERGY INDUSTRIES ASSOCIATION
REQUEST NO.: SEIA01-10

QUESTION:

Refer to Troxle Direct at 47. Does the Company consider analyses associated with the interconnection of distributed generation systems as a "discretionary service"?

ANSWER:

Yes.

SPONSOR (PREPARER):
Matthew Troxle (Matthew Troxle)

RESPONSIVE DOCUMENTS:
None

CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC
2019 CEHE RATE CASE
DOCKET 49421-SOAH DOCKET NO. 473-19-3864

SOLAR ENERGY INDUSTRIES ASSOCIATION
REQUEST NO.: SEIA01-11

QUESTION:

Please provide a definition of "exporting" and "non-exporting" systems and what system and customer load characteristics are used to determine the type of system.

ANSWER:

The definition of "exporting" is the capability of injecting energy to the utility's distribution grid. This is commonly termed as "extended paralleling" with the utility's distribution grid.

The definition of "non-exporting" is the capability of generating energy for a customer load without injecting energy to the utility's distribution grid. This is commonly termed as "high speed closed transition" where the customer is paralleled with the utility's distribution grid for 100 milliseconds or less.

Whether a customer is considered an exporting or non-exporting system is determined by a question shown in the Customer application in Attachment SEIA01-02 Attachment 1.

SPONSOR (PREPARER):
Julienne Sugarek (Julienne Sugarek)

RESPONSIVE DOCUMENTS:
None

CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC
2019 CEHE RATE CASE
DOCKET 49421-SOAH DOCKET NO. 473-19-3864

SOLAR ENERGY INDUSTRIES ASSOCIATION
REQUEST NO.: SEIA01-12

QUESTION:

Please explain in detail what impacts and costs a non-exporting distributed generation system can impose on CenterPoint's distribution grid.

ANSWER:

For non-exporting DGs, the generation is still connected in parallel with the grid. As such, it will have an impact on: 1) system voltage, frequency and load reduction, 2) thermal loading, 3) protection and available fault current, and 4) transient over-voltage. Thus, depending on the system design, sizing, location, and customer loads, parallel non-export DG's will have similar impacts as exporting DGs to the utility.

1. Impact on system voltage, frequency and load reduction

Non-exporting DGs typically reduce the load profile of a distribution circuit and will cause system level operational impacts as the ratio of generation to load approaches 1. This effect is exacerbated on circuits with existing exporting DGs. Circuit level transient effects can also become a concern on circuits with multiple DGs due to increase in net generation. The majority of existing DGs lack fast-trip capability to mitigate transient-overvoltage.
Fluctuations between load and generation can impact system voltage and power quality, especially for inverter-based DGs since they do not have automatic voltage regulators. These are not always visible due to the lack of status/ telemetry from DGs. Consequently, the system may require upgrades for estimating/monitoring DG status. Voltage or frequency controllers (automated voltage regulators and load frequency controller) may also need to be installed to stabilize the system voltage and frequency which can result in increased operating cost for CEHE.

2. Impact on thermal loading

Due to load reduction, non-exporting DGs will increase circuit-level reverse-power flow on circuits with existing exporting DGs. This can require upgrades to equipment, such as wires, transformers, voltage regulators, protective devices, etc., on the impacted areas.

3. Impact on protection and available fault current

Non-exporting synchronous DGs are still connected to the grid and contribute to distribution grid fault current. This requires ratings of protective equipment, such as breakers and fuses, to be re-evaluated. Upgrades will be necessary when fault currents exceed equipment ratings. Additional upgrades, such as installation of neutral reactors to substation transformers, may be required to ensure that maximum fault currents at the substation do not exceed the planning design criteria.
The protection system is typically designed with conventional technique assuming a radial power flow. Depending on location and the type of DGs, the protection system may lose coordination on circuits having multiple DGs. To maintain safety and reliability of the utility system, protection scheme coordination should be re-evaluated, re-designed and upgraded when necessary. These can result in an increase in material cost, operating cost, maintenance costs and labor costs.

4. Impact on transient over-voltage

Transient over-voltage can occur when a portion of a distribution feeder containing generation and some equal or smaller amount of load becomes disconnected from the grid resulting in a high generation to load ratio. This transient over-voltage is of concern because of the potential to cause damage to nearby equipment and load. Although non-exporting DGs do not contribute to the excess generation, but the reduction in load from non-exporting DGs can increase the potential for transient over-voltage on circuits with high existing exporting DGs. To minimize this impact, protection

schemes and equipment ratings need to be re-evaluated and upgraded when necessary.

SPONSOR (PREPARER):
Dale Bodden (Dale Bodden)

RESPONSIVE DOCUMENTS:
None

CERTIFICATE OF SERVICE

I hereby certify that on this 3rd day of June 2019, a true and correct copy of the foregoing document was served on all parties of record in accordance with 16 Tex. Admin. Code § 22.74.