DER Interconnection Guidelines for Customers

Interconnection for Parallel Generation

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Introduction

Intent, Purpose and Scope

The DER Interconnection Guidelines for Customers (“the Guidelines”) provide guidance applicable to Interconnection Customers (“IC”) planning to interconnect and operate distributed energy resources (“DER”), including generators, in parallel with the ComEd distribution system. The Guidelines are intended to provide standards that apply to various aspects of Generating Interconnection Customers’ interfacing with ComEd.

This document addresses the IC’s responsibilities within the DER interconnection process, regulatory and general system requirements, including relay and protection, SCADA, metering, and telemetry, as well as an overview of the process itself.


The electric interconnection of distributed generation facilities is governed by the Illinois Administrative Code in Title 83, Part 466, “Electric Interconnection of Distributed Generation Facilities” (“Part 466”) (equal to or less than 10 MVA); and Part 467, “Electric Interconnection of Large Distributed Generation Facilities” (“Part 467”) (greater than 10 MVA).

Responsibilities of the Interconnection Customer

Adherence to Contracts and Agreements

ICs must adhere to all contracts and agreements throughout the ComEd System DER Interconnection Process. Standards of conduct can be found within the contract sections of Part 466, Appendix D and Part 467, Appendix C.

Private Equipment

The IC is responsible for designing, installing, operating, and maintaining its’ own equipment in accordance with IEEE Standard 1547, Good Utility Practice(s), the National Electrical Code, the National Electrical Safety Code, North America Electric Reliability Council, any applicable independent system operator, ComEd planning criteria and guidelines, and all applicable laws, statutes, guidelines and regulations, including those specified in the attached appendices. This includes installing, setting, and maintaining all protective devices necessary to protect the IC’s facilities. The requirements specified in the Guidelines are designed to protect ComEd facilities and to maintain system reliability, not to protect IC facilities.
System Upgrade Costs
The IC is responsible for direct connect cost as well as other costs associated with interconnection to ComEd’s facilities, which may include system upgrades required to accommodate applicant requests. The Engineering Review Process will reveal specific requirements explicit to the IC’s submitted design. The following list is a general summary of potential additional costs, which is subject to change at any time.

- Relay Protection to ComEd system
- Telemetry
- Accelerated upgrades to ComEd's system, outside of ComEd's planned work
- Associated setting changes
- Metering upgrades
- Relocation, upgrades or installation of ComEd's facilities
- All upgrades or modifications for wholesale generators

Protection Requirements Related to Ongoing Utility Upgrades
The ComEd system is constantly changing due to shifts in loading and the addition or removal of generation. The possibility exists that a change in the ComEd system may cause a change in the protection requirements at the generation interconnection. It would then be the responsibility of the generator owner to make the necessary changes to meet ComEd requirements.

Types of Generation
There are three categories of non-utility generation that operate in parallel with the ComEd System:

Qualifying Facility (QF) is a generation facility that meets requirements specified by federal law under the Public Utility Regulatory Policy Act of 1978 (PURPA). There are two general classifications that meet these requirements:

- Co-generation facilities which sequentially produce electric energy and another form of energy, such as heat or steam, using the same fuel source.
- Small Power Production facilities which use biomass, waste, renewable resources (water, wind or solar), or geothermal as a primary energy source.

Certification requirements for both classifications cover various facility aspects including generation technology, fuel sources, operating efficiency, and ownership, and are established by FERC under CFR, Title 18, Part 292, “Regulations under sections 201 and 210 of PURPA with regard to small power production and co-generation.”

A Non-Qualifying Facility is a generation facility that does not qualify under the provisions of PURPA, such as the typical merchant power plants that sell their output on the wholesale
market or enter into Power Purchase Agreements with a local utility or industrial customer. This generation type constitutes most of the Independent Power Producers.

A Qualified Solid Waste Energy Facility is the third category, specified by Illinois Law (220 Illinois Compiled Statutes, 5/8-403.1). This is a “facility determined by the Illinois Commerce Commission to qualify as such under the local Solid Waste Disposal Act, to use methane gas generated from landfills as its primary fuel, and to possess characteristics that would enable it to qualify as a co-generation or small power production facility under federal law.” These also include the Small Power Production facilities which use biomass, waste, renewable resources (water, wind or solar), or geothermal as a primary energy source.

Options for DER Interconnection

The DER interconnection process is designated into the following categories:

- **DER less than 10MVA**
- **DER greater than 10MVA**

PJM Wholesale Market Participation

IC’s that are looking to participate in the PJM wholesale market should contact: PJM Customer Relations and Training at 610-666-8980 for more information. The PJM Tariff (Manual 14A) can be obtained at: [http://www.pjm.com/](http://www.pjm.com/).

Please visit [Requirements for Transmission Interconnection](#) for more information.

ComEd System DER Interconnection Process

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

1. **Application Submittal**
2. **Technical Review**
3. **Conditional Approval**
4. **Construction**
5. **Inspection**
6. **Testing**
7. **Permission to Operate**

The Interconnection Process is illustration in Appendix 9 of this document. Additional information regarding Customer Generated Power can be found online.

Requirements for Interconnection

Regulatory Requirements
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For information regarding regulatory requirements, please refer to Part 466 or Part 467.

Interconnection Process Overview

For a workflow view of ComEd’s Interconnection process and a duration timeline by Level Type, please refer to Appendix 9.

Application Submittal

IC are strongly encouraged to apply online for DER interconnection by visiting ComEd’s interconnection portal at: https://interconnect.comed.com. Online submittal enables applicants to pay fees and submit forms electronically, as well as track the progress of their interconnection applications throughout the process.

Alternatively, an interconnection application may be submitted via printable, mailable forms available at the following links:

For customers wanting to connect generators of equal to or Less than 10 MVA in parallel to ComEd’s distribution system, please visit the following for additional information: https://www.comed.com/MyAccount/MyService/Pages/DistributionLess10k.com

For customers wanting to connect generators of 10 MVA or greater in parallel to ComEd’s distribution system, please visit the following for additional information: https://www.comed.com/MyAccount/MyService/Pages/DistributionGreater10k.com

Payment of the appropriate application fees must be successfully processed for the interconnection application to be considered complete. An electronic payment option is provided when submitting an electronic application at https://interconnect.comed.com. If mailing your application form, please send the completed application and associated fees (in the form of a check or money order, only; do not send cash) to the following address:

ComEd
Attn: Interconnection Services Department
2 Lincoln Center, 9th Floor
Oakbrook Terrace, IL 60181

Pre-Application Form

Prior to applying for interconnection, a potential IC may submit a formal written request form, along with a non-refundable $300 fee, for a pre-application report on a proposed project at a specific site. ComEd will provide the pre-application data to the potential application within 20 business days after receipt of the completed pre-application report request form and fee. The pre-application report produced by ComEd is non-binding and does not confer any rights. In addition, the IC must submit an interconnection application before it can interconnect with the ComEd system.

Obtain the Pre-Application request form here.
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Distributed Generation Applications

An applicant will enter the Interconnection application process based on the capacity, location and configuration of their generating system.

We strongly recommend completing the application process online, as ComEd is trying to reduce paper use and streamline the application process. The electronic application may be found at https://interconnect.comed.com.

Explanation of Fees

<table>
<thead>
<tr>
<th>Application</th>
<th>Generation</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Application</td>
<td>Variable – Designate online</td>
<td>Variable – Payment online</td>
</tr>
<tr>
<td>Pre-Application</td>
<td>ComEd produced report providing readily available data for the requested point of interconnection</td>
<td>$300</td>
</tr>
<tr>
<td>Level 1</td>
<td>25kW or less, lab certified inverter-based DG facility</td>
<td>$50</td>
</tr>
<tr>
<td>Level 2</td>
<td>5MW or less, lab certified DG facility</td>
<td>$100.00 plus $1.00/kVA</td>
</tr>
<tr>
<td>Level 3</td>
<td>10MVA or less, the DG facility does not export power</td>
<td>$500.00 plus $2.00/kVA</td>
</tr>
<tr>
<td>Level 4</td>
<td>10MVA or less that do not qualify for Levels 1-3</td>
<td>$1,000.00 plus $2.00/kVA</td>
</tr>
<tr>
<td>All Large Distributed Generation Facilities</td>
<td>Generating Facilities greater than 10MVA</td>
<td>$15,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$ 5,000 non-refundable</td>
</tr>
</tbody>
</table>

Technical Review

Tiered Evaluation Approach

The technical review process for DER interconnection is prescribed by Parts 466 and 467 of the Illinois Administrative Code, and is primarily based on the size of the proposed DER and configuration of the local electric distribution facilities. Appendix 9 illustrates the various levels of review and timelines.

Upon completion of the submitted application and payment, a review of each interconnection application is made to ensure that the operation of the proposed DER 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:
Testing

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

The IC must furnish, for ComEd’s approval, proposed settings for relays specified on the RFRS. If requested, ComEd will provide system data needed to determine the relay settings. See Appendix 4 for more information.

Inspection

ComEd may, at its discretion, require a witness test of an installed DER facility before granting permission to operate the facility in parallel with the ComEd distribution system. Witness testing is required for any DER facility using equipment that is not lab-certified (ref. Part 466, Section 466.70), and is generally required for larger DER facilities. The IC is responsible for providing qualified personnel who will complete all required tests.

The IC is responsible for ensuring that all circuit breakers, controls, relays and other protective devices are adjusted and functioning correctly. The IC shall provide test equipment and qualified personnel to perform the required tests. ComEd will provide a list of specific required tests to be witnessed (also see Appendix 7).

A general description of tests required is in Appendix 7 — Pre-Interconnect Inspection Standards. If a witness test is required for a DER facility, ComEd will develop a list of specific tests to be performed, which will serve as the ultimate governing document.

Permission to Operate

Once ComEd determines that the DER facility is suitable to operate in parallel with the ComEd Distribution System, both the IC and the ComEd representative will sign and date the “Approval for Operation of Generating Facility in Parallel with the ComEd System” document (Certificate of Completion). Once completed, the generation facility is authorized to operate in parallel with the ComEd System.

Warning: Livening equipment without required permission to operate will result in disconnection from the ComEd system.
Criteria for ComEd DER Interconnection

All DER interconnections will be evaluated for the following:

- Safety of the general public or ComEd personnel
- Risk of degradation to services for customers due to interruptions or power quality events
- Compromise of security or reliability of ComEd electrical systems

All owners of approved DER interconnections participants are required to be responsive to ComEd direction and instructions during emergency conditions or to remove the DER from service when ComEd is performing work on the circuit to which the DER is connected.

The following is intended to help guide the IC in designing a configuration that best supports the criteria for ComEd DER interconnection.

Overview

This section describes the most commonly used interconnection. Here you will find general guidelines for protection schemes. Final requirements are established during the technical review process. The protection schemes in this section are intended to be cumulative, in that concepts and requirements described for Level 1 are carried forward to subsequent Levels. For example, information discussed in Level 1 applies to Level 2 and so forth.

Protection requirements for individual projects may be greater than those listed in the Guidelines, based on existing system conditions (e.g., other existing or previously-queued DER on the same circuit), and are considered on a case by case basis. Under certain circumstances, an interconnection classified under one Level, may require protection typically associated with a higher Level. Adding DER to a circuit with existing DER may require additional protection at the existing DER facility. Generally, the protection at the ComEd source station is determined by the total DER on the line.

Stability Studies

Severe disturbances on the power system can potentially cause a synchronous generator to lose synchronism with the power system. A large generator operating in this unstable manner can create large power and voltage fluctuations and can severely stress the generator and power system equipment.

Damage could result to customer equipment and the ComEd System. The resulting disturbances may affect other customers as well. Based on accepted industry protection guidelines, out-of-step protection is required to address stability concerns.

The following procedures will be used to ensure that the interconnection design provides for an adequate stability margin.
The IC shall provide with the Letter of Intent (LOI), data pertaining to the generator and related control systems that are required for the stability analysis. The IC should obtain the version of this form to be filled-out from their Project Manager.

For All interconnection configurations, ComEd will review the generator data and preliminary design and determine if any special stability studies are required.

If stability studies are required, ComEd will perform analysis to verify that the generator installation meets the ComEd criteria. In this criterion, the most severe fault that could credibly occur near the generator will be analyzed. Typically, this will be a three-phase fault followed by a circuit breaker failure, although this scenario may vary depending on specific details of the installation. If the generator loses synchronism for this scenario, special generator protection will be required in addition to out-of-step protection of the generator. If the generator does not lose synchronism for this scenario, then generator out-of-step protection will be sufficient.

ComEd will complete the initial stability analysis of the interconnection and will identify any special stability protection schemes (in addition to out-of-step protection) which are required for the interconnection design. These may include such schemes as high speed stability trip schemes on the transmission lines and special communication channels from remote terminals indicating circuit breaker and disconnect switch status. For more information see Interconnection Protection Scheme Configurations and Telemetry.

The following information will be identified by these stability studies:

- The critical clearing time for 3-phase faults on each line connected to the generator.
- The critical clearing time for the most severe 3-phase fault/Circuit Breaker failure combination related to the interconnection.
- A summary of special stability protection schemes, in addition to out-of-step protection, which are required for the interconnection.

Stability analysis performed by ComEd will not evaluate the risk to the IC’s equipment due to unstable operation of its own generator. It is the responsibility of the IC to assess these risks and protect their equipment accordingly.

If subsequent generation is added to the ComEd system near the IC’s interconnection, it is the IC’s responsibility to assess the risks of these changes. If necessary, ComEd will re-verify that the generator installation meets ComEd requirements. It may be determined at this point that additional protection will be required at the IC’s expense.

**Interconnection Protection Scheme Configurations**

ComEd will determine the bus and line configurations and protection requirements that are necessary to connect the DER proposed in the IC’s application. To perform such an analysis, ComEd will require technical information on the IC’s generator(s) proposed DER, as well as the and proposed point of interconnection (“POI”) to the ComEd System.
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Interconnection configurations are site-dependent. The following section provides protection scheme guidelines on the most commonly used configurations for interconnection by ComEd. Specifications may be found in Appendix 4.

General Overview of Protection Scheme Requirements

Direct Transfer Trip (DTT) to either ComEd or customer equipment may be required for the following conditions:

- An island condition exists with a mix of rotating-machine generation and inverter-based generation
- Generation capacity greater than or equal 10MVA
- Capacity of rotating generation is greater than 1/3 of minimum line load
- Generation has the potential to back-feed onto the transmission system

Transformer Configurations

- ComEd requires all interconnection transformers to have a Delta High-Side connection

Transient Overvoltage (TOV) Limits

- IC’s inverters shall not, by their design or application while interconnected to the ComEd system, cause transient overvoltage (TOV) which exceed ComEd line or equipment ratings during fault or switching operations. If the IC’s inverters cause objectionable overvoltages which exceed the ratings of the ComEd lines and equipment, then ComEd may require that the IC, at its expense, mitigate these issues to a level below the equipment design ratings.

Short-Circuit Current Ratings

- IC equipment shall be rated for ultimate system fault current levels.

Protective Relay

- All ComEd required protective functions must be implemented in a ComEd-approved utility grade protective relay.

Basic Insulation Levels (BIL) Rating

- The legacy design standard for the ComEd 34.5kV system is 200kV BIL. The current design standard for new 34kV lines is 150kV BIL. All customer equipment should be designed to the BIL rating of the ComEd line to which it is being interconnected.

Design and Operating Requirements for Customer Equipment

Interconnecting Customer Engineering Design

The customer is responsible for designing its own generator step-up electrical facility that corresponds to ComEd standards. [Appendix 4 provides Relay Requirements.]
During the Technical Review, Engineering Review process ComEd's functional relay requirements specific to the proposed DER facility will be given to the IC, using the Relay Functional Requirements Specifications (RFRS) form. This form will be generated based on the initial information provided in the submitted application.

The RFRS form is project-specific and shows the protective functions for which the IC is to provide relays and related equipment. The IC must indicate on the RFRS form the specific relay type and range proposed for each function. The IC must also provide proposed current and potential transformer ratios, connections, and locations as related to the electrical one-line diagram. The completed RFRS forms and related information, including the corresponding one-line diagrams, are to be returned to ComEd.

Before proceeding with construction, the IC must furnish six (6) sets of final design documents to ComEd for review and approval. IC design documents (electrical prints, relay settings, etc) will be reviewed by ComEd within a 2-week period upon receipt of documents from the IC. Project delays due to untimely submittal of complete design documents are the responsibility of the IC. Design documents must be of good engineering quality and include the following:

- One-line diagram showing the connections between the generator(s) and the ComEd System
- Three-line diagrams showing current and potential circuits for protective relays
- Relay tripping and control schematic diagram
- Instruction books for relays on the RFRS forms

Additional engineering meetings may be necessary to discuss the design documents. If changes are necessary, the IC must incorporate all changes and corrections and submit six (6) sets of corrected prints to ComEd before proceeding with construction.

**Warning:** Customers that fail to comply with ComEd required designs will not be allowed to connect to the ComEd system.

**Equipment Requirements**

ComEd requires smart inverters be used in inverter based distributed generation.

*This section will be developed in future revisions of this document.*

**Protection Requirements**

**General Need for System Protection in the Presence of Parallel Generation**

The components of the ComEd transmission and distribution (T&D) systems are subject to a variety of natural and man-made hazards, among these are lightning, wind, wildlife, and vandalism. Damaged or short-circuited equipment should be switched out of service as soon as possible to minimize safety hazards and to avoid additional equipment damage. DER operated in parallel with the T&D system provides an additional source of energy that must also be disconnected in case of an emergency. Because interconnected DER facilities may interfere with the operation of protective devices normally used on the T&D system, it is essential that a
suitable system of protection be used to minimize hazards and to prevent the reduction of quality of service to other ComEd customers.

**General Effects of Parallel Generation on System Protection Requirements**

The interconnection of DER shall not introduce a hazard or adversely affect the quality of service to ComEd customers. Protective equipment must be added to standard ComEd facilities to provide adequate protection of the T&D system. Requirements for additional protective equipment due to parallel operation of DER will vary depending on the capacity (MW) of the DER facility and on the configuration of the local ComEd system.

The ComEd System Protection Department will specify all necessary protective relaying, communication and SCADA requirements for DER interconnection. Communication may include, but are not limited to, microwave communication systems, single mode fiber optic systems, and power line carrier communications systems. For information on Telemetry see Appendix 3.

Examples of general relay requirements for various types of installations are discussed in Appendix 4.

**Reclosing of ComEd Supply Lines**

Most faults that occur on overhead lines are transient. That is, if the line is de-energized promptly, it can often be reclosed and returned to service. Examples of such transient faults include momentary tree contact due to wind, and insulator flashover due to lightning. Automatic reclosing of overhead lines is standard industry practice to improve system reliability. In many cases, an overhead line can be de-energized and reclosed within one second, with minimum disruption of service to the customers connected to the line.

**Effects of Parallel Generation on Automatic Reclosing**

Automatic reclosing on ComEd's lines can potentially damage generating equipment operated in parallel with the T&D system. Severe mechanical stress on the generating equipment may occur if the line is reclosed while the generator is still connected to the ComEd system. This applies to both synchronous and induction generators. With synchronous generators, damage may occur when they are out of synchronism when the supply is restored; with induction generators, damage may occur if they are operating at a speed higher or lower than normal when reclosed to the system. As a general policy, ComEd does not eliminate automatic reclosing of overhead supply lines to interconnect DER, because that would risk reducing the reliability of service to other customers. Addition of DER to a line shall not alter standard auto-restoration schemes at transmission substations, distribution centers, or other distribution loads. Some configurations may require direct tripping of connected DER for line faults.

**Possible Reclosing Scenarios and IC Responsibilities**

The IC is responsible for protecting the DER facility's equipment so that automatic or manual reclosing, faults, or other disturbances on the ComEd System do not cause damage to the equipment.
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When automatic reclosing may result in equipment damage or a safety hazard, either to the ComEd system or customer facilities, ComEd will require that additional protective equipment be installed. This will usually consist of communication and/or control equipment to disconnect the customer-owned DER (or to confirm that it is disconnected) before the ComEd supply line is reclosed.

**Requirement to Maintain Existing Levels of Reliability**

Often when parallel generation is brought online, existing utility-owned protection devices on the circuit will need to be changed out or removed to allow continued operation of the protection elements of the circuit. If this is the case, it is required that any protection device being removed or reconfigured must be replaced with a device or logic that will maintain existing levels of reliability. This may be in the form of new advanced device(s) being installed, existing devices being upgraded, or a simple reprogramming of existing devices.

The following design requirements shall apply where DA schemes (FLISR- fault location, isolation, and service restoration) exist where DERs are being reviewed:

- DERs applying within Distribution Automation zones shall not interfere with the proper operation of the scheme.
- If existing levels of reliability cannot be maintained, mitigation shall be required at customer expense.
- DERs proposed within existing protection and automation schemes must be integrated to maintain existing levels of reliability.

**Telemetry**

**Inverter Based Generation**

Any inverter based generation projects that meet the following criteria will be required to install communications to ensure real-time SCADA telemetry. These include:

Any project 1MW to 5MW:
- Installation of a Distribution Automation (DA) device or equivalent approved system
- All SCADA points - except relay failure status
- Polling Rate of 5-minute maximum

Any project that is greater than 5MW
- Installation of communication equipment to support required polling rate
- All SCADA points listed below
- Polling Rates of 30 seconds (analog) and 2-4 seconds (status)

Any project that is participating in the PJM Wholesale Market
- Installation of communication equipment to support required polling rate
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- All SCADA points listed below
- Polling Rates of 10 seconds (analog) and 2-4 seconds (status)

Net-metered C&I projects are not required to provide SCADA information.

Basis for Real-time SCADA requirements:
- Monitor impact of larger installations on ComEd system
- Monitor performance during transmission and distribution faults
- Monitor feeder loading and performance (voltage and frequency)
- Verify islanding performance

Inverter Communication Specifications to be determined based on approved tariff requirements.

The following is a preliminary list of SCADA points required. This represents the minimum list of data points required.

- 3 Phase kV (Voltage)
- 3 Phase Amps
- 3 Phase MVA
- 3 Phase MW
- 3 Phase MVAR
- 3 Phase MWh
- Relay Failure Status
- Communication Failures

Other Information:
- Each project is evaluated on a case-by-case basis and may result in additional SCADA communication requirements.

- For T1 (TDM) connections - There are a limited number of ports capable of a T1 (TDM) connections within the Exelon environment. For this type of connection, the preferred method would be an AT&T MPLS connection. AT&T would then connect this circuit to our AT&T privet MPLS cloud to provide to provide a redundant path to the substation. These types of connections normal are assessed a monthly cost range between $2,000 and $3,000 which the IC is responsible for. The developers / installers need to be coordinated with Exelon to provide the proper information with AT&T.

- Points of demarcation may be difficult to obtain. For service requests, ComEd would have to call AT&T to report a trouble on the monitoring circuits. ComEd would have to provide escort to the AT&T technician if substation access is required. For copper connection, an isolation transformer would need to be placed within the substation which represents another potential single point of failure.

- ICs can design and install communications equipment and facilities, if the following conditions are met:
  - Only allowed at greenfield projects sites. ComEd must design and install any equipment at existing ComEd facilities (e.g., ComEd substation).
If the communication equipment and facilities are to be conveyed to ComEd at the end of construction, an approved ComEd contractor of choice (COC) must be used to design and install the communications equipment and facilities.

Any projects that meet the following criteria will be required to install communications to ensure real-time SCADA telemetry.

### Installed Communications for Real-time SCADA Telemetry:

<table>
<thead>
<tr>
<th>Generation Size</th>
<th>Real-time SCADA Communications Required</th>
<th>Note:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any project 1MW to 5MW</td>
<td>Yes</td>
<td>Installation of a Distribution Automation (DA) device or equivalent approved system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All SCADA points - except relay failure status</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polling Rate of 5-minute maximum</td>
</tr>
<tr>
<td>Any project that is greater than 5MW</td>
<td>Yes</td>
<td>Installation of communication equipment to support required polling rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All SCADA points listed below</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polling Rates of 30 seconds (analog) and 2-4 seconds (status)</td>
</tr>
<tr>
<td>Any project that is participating in the PJM Wholesale Market</td>
<td>Yes</td>
<td>Installation of communication equipment to support required polling rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All SCADA points listed below</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polling Rates of 10 seconds (analog) and 2-4 seconds (status)</td>
</tr>
<tr>
<td>Net-metered C&amp;I projects</td>
<td>No</td>
<td>not required to provide SCADA information.</td>
</tr>
</tbody>
</table>

See Appendix 3 for options regarding Projects <5MW.

### Machine Generation

Some generators will require continuous telemetry to ComEd’s operation facilities. These will typically be large generators, generators involved in wholesale transactions, or generators which are dispatchable by ComEd. Telemetry may be required for one or more of the following reasons:

- **System Control.** ComEd has an obligation to maintain frequency and generation/load balance within its service territory. Changes in the status of large amounts of generation, without real-time telemetry, are detrimental to system control.
- **Monitor Wholesale Power Transaction.** ComEd must be able to monitor wholesale power transactions taking place between generators and third parties through the ComEd System.
- **Transmission and Distribution System Operation.** The status of large generators significantly impacts operating decisions. Operators need to know the status of these large generators before performing routine or emergency switching.
- **Public Safety.** Generators can potentially keep a portion of the electrical grid energized while isolated from the ComEd System. It is critical to detect these situations as soon as
they occur so that corrective action can be taken, since the safety of the public and of ComEd workers is at stake.

Generators that meet the following criteria require implementing telemetry to ComEd’s control center and dial-up telephone communication to the revenue meter. Required telemetry is listed below each criterion. If more than one criterion applies to a generator, the telemetry requirements of each criterion must be met. If PJM’s metering requirements are stricter than ComEd’s, than PJM’s metering requirements take precedence.

1. If the aggregate generation at a site is greater than 10 MW and greater than 50% of the peak load at the site.
   - Continuous telemetry required.
   - Instantaneous MW and MVAR of each generator.
   - Instantaneous revenue grade MW and MVAR; and cumulative revenue grade MWhr and MVARhr at all points of interconnection with ComEd.
   - Status of all circuit breaker(s) which can disconnect a generator from the ComEd System.
   - Status of bus tie circuit breaker(s).
   - At least one bus kV measurement.

2. If the generation is involved in sales transactions through the ComEd System.
   - Continuous telemetry required.
   - Instantaneous revenue grade MW and MVAR; and cumulative revenue grade MWhr and MVARhr at all points of service from ComEd.
   - Aggregate instantaneous MW and cumulative MWhr of all third-party loads inside ComEd’s control area.

3. If the generation is involved in a Power Purchase Agreement (PPA) or participating in the PJM capacity markets which contains unit specific performance or a unit specific payment structure.
   - Continuous telemetry required.
   - Instantaneous revenue grade MW and MVAR; and cumulative revenue grade MWhr and MVARhr at the generator’s step-up transformer high side (or equivalent net output) for each unit.
   - Instantaneous revenue grade MW and MVAR; and cumulative revenue grade MWhr and MVARhr at all points of interconnection with ComEd all points of service from ComEd.

4. If the generation will be remotely turned on/off by ComEd.
   - Continuous telemetry required.
   - Instantaneous revenue grade MW and MVAR; and cumulative revenue grade MWhr and MVARhr at all points of service from ComEd.
   - Supervisory control for generator’s (or generators’) on/off from ComEd.
5. If multiple generators over a large area with an aggregate generation greater than 40 MW are being centrally controlled.
   • Continuous telemetry required.
   • Aggregate instantaneous MW of all generators.6

6. If the generation, for protection, requires transfer trip communication, then generation site transfer trip communication status shall be telemetered. ComEd may also require Generation Commercial Management (GCM) or similar communication software. GCM helps to facilitate communication between ComEd’s operation center and the generating unit. GCM will ensure the timely and effective communication of:
   • changes in unit status
   • changes in dispatch
   • switching orders
   • emergency conditions

The implementation of GCM will be developed during the interconnection engineering and design phase. ICS supplying ancillary services will require additional telemetry. Appendix 3 provides ComEd’s telemetry standards. PJM may have additional standards. Details of the specific telemetry requirements will be provided at the initial project meeting with ComEd. The IC will be responsible for the installation cost and monthly communication costs of the required telemetry.

7. Generators that do not participate as capacity resources must provide instantaneous real power data only if:
   • they are 10 Mw or larger
   • they are greater than 1 Mw and connected at a bus operating at 34 kV and above

Refer to PJM Manuals M-01 and M-14D for further data requirements.

Manufacturer specifications for frequency and voltage protection schemes must be submitted to ComEd for review. If this protection is not an integral part of a listed, manufactured power source interconnection system, ComEd shall have the right to require testing of the protection device systems at the IC’s expense.

Real Estate

It is the IC’s responsibility to purchase property, acquire rights and obtain any required permits for interconnecting its generation station to the point of demarcation. The Interconnection Agreement stipulates that the IC will grant to ComEd such rights and interests as may be reasonably necessary to interconnect the generation station to the ComEd System.

Customer Maintenance of Equipment

The IC must provide ComEd with calibration and functional test data for the associated equipment upon request. Minimum intervals are indicated below:
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The customer must include the identities and qualifications of the personnel who performed the tests. ComEd personnel may need to periodically witness the testing.

Account Management

ComEd System Maintenance

ComEd routinely performs maintenance on its system. While ComEd tries to perform all maintenance on a scheduled basis, sometimes emergency maintenance is necessary. For both scheduled and emergency maintenance, the work is generally planned to minimize both customer inconvenience and company cost. As a prudent cost control, ComEd schedules most routine maintenance during normal daylight working hours. To this end, ComEd routinely transfers customer load among electric sources, so that the customers involved remain in service while the maintenance work is being performed. For most customers involved this “switching” is transparent.

However, when a customer is operating a generator in parallel with the electric system, no load transfer can occur. If the situation is not an emergency, possible action may include the following:

- The customer may choose to turn off the generation and continue electric consumption. Electricity may be purchased from ComEd under the provisions of the Standby Service Rate.
- The customer may choose to turn off the generation while curtailing electric consumption. Electricity may also be purchased from ComEd under the provisions of the Standby Service Rate.
- The customer may request ComEd to perform the work at times when the customer’s generation is not being operated. The customer is responsible for, and will be billed for, the full extra cost that ComEd experiences due to the request (83 Illinois Administrative Code, paragraph 430.30, definition of “Costs of interconnection”).
- The customer’s generation and load may be switched away from the ComEd System while the work is in progress. This option is available only if the customer’s electric system can operate independently of the ComEd System. Notwithstanding the above, switching equipment capable of isolating the customer’s generation from ComEd shall be accessible to and under the exclusive control of ComEd always. At its option, ComEd may choose to operate the switching equipment if, in ComEd’s opinion, continued operation of the customer’s generation in connection with ComEd’s system may create or contribute to a system emergency, an unsafe condition, or interfere with service to other customers.
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The switching equipment referred to above must be accessible to and capable of being operated and locked by ComEd personnel. This equipment must provide a visible break in the circuit.

Net Metering

If you are a residential or commercial customer who owns or operates an eligible renewable electric generator of up to 2,000 kW that generates electricity for your own use, you may qualify for Net Metering.

For more information please visit our online Net Metering page, then visit ComEd’s Frequently Asked Questions for guidance on common net metering application inquiries.

If ComEd is your electric supplier, Net Metering applications may be submitted electronically online or by mail.

Online: https://interconnect.comed.com
By Mail: NetMeteringApplication.pdf

If ComEd is not your electric supplier, you must contact your electric supplier to apply for Net Metering.

Revenue Metering

For purposes of this document, revenue metering shall refer to the meter or meters used for billing purposes and the associated current transformers and potential transformers (collectively known as “instrument transformers”), communications equipment, and wiring between these devices. The basic configuration consists of directional revenue grade metering (import and export) at each point of interconnection with the ComEd system. Additional separate revenue metering for the gross output of the generation and for auxiliary retail loads may be required, depending on the generation capacity, telemetry requirements, applicable contractual provisions and associated tariffs.

All revenue metering equipment must comply with the latest edition of ComEd’s Information and Requirements for the Supply of Electric Service, Section VI, and the applicable specification sections covering revenue metering.

Another requirement concerning all generation and auxiliary metering is the ability to connect to an Advanced Metering Infrastructure (AMI)system.

For more information on revenue metering, please see Section 7 of ComEd General Terms and Conditions.

Service and Meter Requirements

The Service and Metering Requirements book is issued by Commonwealth Edison Company (herein called the “Company”) as a reference and guide to its regulations, specifications, and practices for the connection and supply of electric service. It is intended for the use of
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customers, architects, engineers, contractors, electricians, and other persons engaged in the planning or construction of buildings, or the installing or replacing of equipment that is to be connected to and served from the Company’s electric distribution system.

Proper Installation of Metering Equipment - Residential and Commercial Customers

ComEd Customer Requirements for Proper Installation of Metering Equipment - Residential and Commercial Customers contains some of the most common metering equipment installation examples. The illustrations depict “Acceptable” and “Not Acceptable” metering configuration installations. Improper installation of metering equipment yields safety hazards to ComEd personnel and may potentially delay the customer’s service date.

CATALOG OF METER CONNECTION DEVICES

This document provides a list of meter connection devices approved by meter engineering and standards.

Retail Electric Service

All retail electric customers in the ComEd service territory have the opportunity to choose their provider of electric power and energy as well as metering services. This right is often referred to as Customer Choice and ComEd supports the right of customers to elect their service provider. Regardless of the elected service provider, ComEd will provide the delivery of electric power and energy.

More information can be found online for the following:

- ComEd - Customer Choice
- ComEd Certified Supplier List
- Energy Supply Options Frequently Asked Questions.

Tariffs

Customers seeking additional information regarding current rates and tariffs should our website at [https://www.comed.com/MyAccount/MyBillUsage/Pages/CurrentRatesTariffs.aspx](https://www.comed.com/MyAccount/MyBillUsage/Pages/CurrentRatesTariffs.aspx)
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DER Interconnection Guidelines for Customers

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APPENDIX 3 Telemetry

Communication Options for Projects >5MW:

<table>
<thead>
<tr>
<th>Type</th>
<th>Benefits</th>
<th>Risk</th>
<th>Costs</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber – ComEd installed</td>
<td>- Ensure scope, cost and schedule</td>
<td>- Higher costs</td>
<td>- Included in Study estimates</td>
<td>Per ComEd construction schedule</td>
</tr>
<tr>
<td></td>
<td>- Highly reliable x5 – 9's</td>
<td>- Required to run fiber to substation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Single spur is less reliable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Railroad crossing permitting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wireless RADWIN</td>
<td>- ComEd has infrastructure available</td>
<td>- Separate pole required at IC location</td>
<td>- Provided during detailed engineering</td>
<td>Per ComEd construction schedule</td>
</tr>
<tr>
<td></td>
<td>- High bandwidth low latency</td>
<td>- Site survey required to determine availability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiber Ethernet (Carrier)--3rd Party install</td>
<td>- Reduced Cost from ComEd fiber to install due to potential closer connection point</td>
<td>- Higher costs</td>
<td>- Install costs</td>
<td>3rd party construction schedule</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Required to run fiber to substation</td>
<td>- Monthly fees</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Monthly fees</td>
<td>- Single spur limits redundancy options</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Railroad crossing permitting</td>
<td>- Per ComEd construction schedule</td>
<td></td>
</tr>
<tr>
<td>Wireless Radio Network (MAS, SSN)</td>
<td>Not an option today due to 5-minute pole cycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jet Stream – public Internet with firewall behind it - direct to PJM</td>
<td>- Satisfies the need for limited real-time telemetry but not for revenue meter sharing</td>
<td>- Limited number of projects allowed to be installed</td>
<td>- 3rd party estimates</td>
<td>3rd party construction schedule</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Only allows limited operational data</td>
<td>- Install costs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Data would come to ComEd SCADA through ICCP link</td>
<td>- Ongoing lease costs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Requires carrier ethernet connection</td>
<td>- Router &amp; Firewall Install</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Back to back firewall required</td>
<td>- Router &amp; Firewall O&amp;M</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Monthly fees</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Need PJM to provide limited data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cellular (LTE) not an option today due to 5-minute pole cycle</td>
<td>- Low cost</td>
<td>- Polling rates exceed the allowable rates</td>
<td>- Outdoor antenna normally side wall mounted.</td>
<td>Per ComEd construction schedule</td>
</tr>
<tr>
<td></td>
<td>- Ease of installation</td>
<td>- Risk of disconnection, if rates exceed limits</td>
<td>- Antenna cable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- With advent of 5G the polling rate for machine to machine should go away</td>
<td>- No SLA from carrier</td>
<td>- Router and firewall.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Need to verify there is signal in the area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Carrier coverage area is unknown</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Carrier maintenance unknown</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## APPENDIX 4 Relay & Protection Requirements

### Common DER Configurations

<table>
<thead>
<tr>
<th>Level</th>
<th>Power Range</th>
<th>Certification</th>
<th>Exporting</th>
<th>Additional Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>25 kW or less</td>
<td>Must be lab certified</td>
<td>No</td>
<td>No additional protection requirements for lab certified equipment</td>
</tr>
<tr>
<td></td>
<td>Inverter based generation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 2</td>
<td>5 MW or less, dependent upon line voltage</td>
<td>Must be lab certified</td>
<td>No</td>
<td>No additional protection requirements for lab certified equipment</td>
</tr>
<tr>
<td></td>
<td>Inverter based generation</td>
<td></td>
<td></td>
<td>Proposed Interconnection is to a radial distribution circuit or spot network (&lt;50kW) limited to servicing one customer</td>
</tr>
<tr>
<td>Level 3a</td>
<td>25 kW or less</td>
<td>Non-lab certified</td>
<td>Non-exporting</td>
<td></td>
</tr>
<tr>
<td>Level 3b</td>
<td>&gt;25 kW to 5 MW</td>
<td>Non-lab certified</td>
<td>Non-exporting</td>
<td></td>
</tr>
<tr>
<td>Level 3c</td>
<td>≤ 50 kW</td>
<td>Area Network</td>
<td>Non-exporting</td>
<td>Uses reverse power relays to prevent exported power</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aggregate of all generation does not exceed 5% of area network maximum load or 50 kW</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Note: Evaluated on a case-by-case basis.</td>
</tr>
<tr>
<td>Level 3d</td>
<td>10 MVA or less</td>
<td>Radial Distribution Circuit</td>
<td>Non-Exporting</td>
<td>Uses reverse power relays to prevent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not served by a shared transformer</td>
</tr>
<tr>
<td>Level 4a</td>
<td>25 kW or less</td>
<td>Non-lab certified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 4b</td>
<td>&gt;25 kW to 5 MW</td>
<td>Non-lab certified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 4c</td>
<td>≤ 50 kW</td>
<td>Area Network</td>
<td>Aggregate of all generation does not exceed 5% of area network maximum load or 50 kVA</td>
<td></td>
</tr>
<tr>
<td>Level 4d</td>
<td>10 MVA or less</td>
<td>Radial Distribution Circuit</td>
<td>Not served by a shared transformer</td>
<td></td>
</tr>
<tr>
<td>Part 467</td>
<td>Total generation is equal to or greater than 10MVA, up to 20MVA</td>
<td>-And-</td>
<td>Connected ComEd transmission line is 69kV or 138kV</td>
<td>-And-</td>
</tr>
<tr>
<td>Wholesale</td>
<td>Any project electing to participate in the wholesale market</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### APPENDIX 4 Relay & Protection Requirements Cont.

<table>
<thead>
<tr>
<th>Common DER Configurations</th>
<th>These are general guidelines for protection requirements and may vary based on IC's total system configuration. Individual protective device functions may be implemented using multifunction relay.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Level 2</td>
</tr>
<tr>
<td>11 - Multifunction Device/Relay - Required protective functions may be implemented in a single multifunction relay</td>
<td>✓</td>
</tr>
<tr>
<td>21 - Distance or Impedance - Requirement determined by capacity. Does not apply to inverter based generation</td>
<td>✓</td>
</tr>
<tr>
<td>25 - Synchronizing or Synchronism Check (Customer DER location) - May only be required for rotating equipment</td>
<td>✓</td>
</tr>
<tr>
<td>25 - Synchronizing or Synchronism Check/back feed Detection (ComEd substation)</td>
<td>✓</td>
</tr>
<tr>
<td>51N - Neutral Time Overcurrent*</td>
<td>✓</td>
</tr>
</tbody>
</table>
## DER Interconnection Guidelines for Customers

### Interconnection for Parallel Generation

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3a</th>
<th>Level 3b</th>
<th>Level 3c</th>
<th>Level 3d</th>
<th>Level 4a</th>
<th>Level 4b</th>
<th>Level 4c</th>
<th>Level 4d</th>
<th>Part 467</th>
<th>Wholesale</th>
</tr>
</thead>
<tbody>
<tr>
<td>51V - Voltage Restrained/Controlled Time Overcurrent*</td>
<td></td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>67V - Voltage Restrained/Controlled Directional Time Overcurrent*</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>810 - Over frequency*</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>Over frequency protection is part of lab certified equipment.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>81U - Under frequency*</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Under frequency is a part of lab certified equipment.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>86 - Lock-Out</td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>87 - Current Differential*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>Power Transformer - As required for system interconnection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>Interrupting device - May be required for inverter-based generation depending on capacity and transformer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>Breaker Failure backing tripping (BF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>Relay Failure Protection/Alarm - May be required if there is a separate protective relay.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
</tbody>
</table>
APPENDIX 7 Pre-Interconnect Inspection Standards

Before parallel operation with the ComEd System, witness testing may be required and inspected by ComEd. The IC is responsible for providing qualified personnel who will complete all required tests. Witness testing is generally required for larger generators. ComEd reserves the right to require witness testing in all DER Interconnected scenarios.

Qualified testing personnel must perform tests on the IC's protective relaying prior to energizing from the ComEd system. Testing requirements will be evaluated and determined on a case-by-case basis by ComEd, dependent upon the configuration of the proposed generating facility. Portions of the IC's equipment may be energized when the associated testing for that portion has been completed and verified. The following is provided to serve as guidance and may or may not be prescribed in the IC's relay equipment inspection requirements.

<table>
<thead>
<tr>
<th>Relay Equipment</th>
<th>Protection Device Function</th>
<th>Acceptance Testing</th>
<th>Setting Calibration</th>
<th>Tripping Check</th>
<th>Sensing Devices</th>
<th>Primary Current/Voltage</th>
<th>Telemetry for Protection Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable determined by relay type</td>
<td>Test Document Review</td>
<td>Witness / Functionality</td>
<td>Test Document Review</td>
<td>Witness / Functionality</td>
<td>Witness / Functionality</td>
<td>Witness / Functionality</td>
<td></td>
</tr>
</tbody>
</table>
DER Interconnection Guidelines for Customers

Interconnection for Parallel Generation

APPENDIX 9 Interconnection Process Overview and Timeline

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It is the user's responsibility to ensure the most current version is used - if printed, this document is no longer controlled/current. 8/9/2018 3:59 PM
Appendix 9 (cont.) - Interconnection Process Timeline by Level

<table>
<thead>
<tr>
<th>275BD</th>
<th>205BD</th>
<th>60BD</th>
<th>90BD</th>
<th>22BD</th>
<th>25BD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>25</td>
<td>45</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>15</td>
<td>25</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>90BD</td>
</tr>
<tr>
<td>7</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td>22BD</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td>25BD</td>
</tr>
</tbody>
</table>

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# Development History

<table>
<thead>
<tr>
<th>Revision 0</th>
<th>Date: 7/20/2018</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Writer</strong></td>
<td>Dan Gabel, Manager DER Interconnections</td>
</tr>
<tr>
<td><strong>Reason written</strong></td>
<td>Description of Interconnection process, timeline and recommended guidelines for public awareness.</td>
</tr>
</tbody>
</table>