



# Xcel Energy Requirements for DER Application Completeness Review

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*Applicable to Xcel Energy Minnesota*



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## 1.0 Scope

Outlined below are the engineering documents and associated minimum requirements for a Distributed Energy Resource (DER) interconnection application to be deemed complete. The requirements apply to all DER for the purpose of providing additional detail on how application completeness will be reviewed with respect to governing interconnection requirements. Interconnections using Energy Storage Systems must also follow the Xcel Energy Storage Interconnection Guidelines in addition to the below requirements. In the context of this document, “Dedicated Power Production Facility” refers to interconnections that connect directly to the Distribution System for the sole purpose of exporting energy to the distribution system and do not have electrical services associated with serving a customer load or premise.

Appendix A – Template for Notice of Incomplete Initial Application Materials provides a notification template for communicating with Interconnection Customers when their initial application cannot be deemed complete in accordance with this document.

## 2.0 Terms and References

Applicable terms and company/industry references are provided below.

### 2.1 Glossary

**Distributed Energy Resource (DER):** Distributed Energy Resources (DERs) include all sources, including energy storage systems. All sources interconnected in parallel with Xcel Energy’s system require an interconnection review.

**Reference Point of Applicability:** The location, either the Point of Common Coupling or the Point of DER Connection, where the interconnection and interoperability performance requirements specified in IEEE 1547 apply. With mutual agreement, the Area EPS Operator and Customer may determine a point between the Point of Common Coupling and Point of DER Connection. See Minnesota DER Technical Interconnection and Interoperability Requirements for more information.

### 2.2 References

1. Xcel Energy [Section 9 Tariff](#)
2. Xcel Energy [Section 10 Tariff](#)
3. Xcel Energy [Standard for Electric Installation and Use](#)
4. Xcel Energy [Storage Interconnection Guidelines](#)
5. [National Electric Code](#)
6. [UL 1741](#)
7. [IEEE 1547](#)



### 3.0 One Line Diagram

One-Line diagram, also known as a single-line diagram, showing the installation of the DER system and associated equipment shall be required with each interconnection application. To reduce the chances of a delayed deemed-complete status by increasing the overall clarity of the one-line, it is strongly recommended to use a standard graphical symbol set, such as that found in IEEE 315, when such a standardized symbol exists. The following information shall be clearly depicted on the one-line diagram:

#### Contact information and General

##### 3.1 Customer Name.

*Note: The Customer Name on the one-line should match the Customer Name on the application.*

##### 3.2 Application OID, SRC, or case number assigned to the project

##### 3.3 Clearly identify the Reference Point of Applicability (RPA). This is the location that the DER system will meet the requirements of IEEE 1547.

*Note: For practical purposes, indicating the location that measurements will be taken as the "RPA" for the witness test is sufficient to satisfy this requirement in most cases. If measurements are being taken at a disconnect, it should be clear which side of the disconnect measurements are being taken.*

##### 3.4 For systems larger than 250 kW, a signature from a professional engineer licensed in Minnesota is required.

#### Electrical Component Schematic

##### 3.5 The electrical connections of all major components between the main service meter<sup>1</sup> and the DER system.

*Note: Examples of major components include interconnection transformers, breakers, fuses, reclosers, meters, current transformers<sup>2</sup>, potential transformers, and inverters.*

*Note: All customer equipment shall be located on the customer-side of the main service meter*

*Note: All Dedicated Power Production Facilities require a dedicated transformer with no other associated load or DER interconnections.*

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<sup>1</sup> Xcel Energy infrastructure is not required to be shown on the customer one-line. Any Xcel Energy equipment shown is subject to change at Xcel Energy's discretion and should not be used for planning/design purposes by the customer

<sup>2</sup> CT polarity should be clearly marked on the drawing.

3.6 Main service meter and main service panel

*Note: Breakers serving only load do not need to be shown in detail, but some indication that load is served from the main service panel, or any other panel in the drawing, is requested. The presence of another breaker is enough to indicate to the reviewer that additional load is served from this panel.*

3.7 Main service protection between DER and the utility

*Note: This protective device shall be provided immediately after the main service meter. Typical protective devices include circuit breakers and fuses. An unfused disconnect is not considered a protective device. When connected behind a main service panel, the main service breaker will suffice as the protective device.*

3.8 The main service meter voltage and number of phases, and if present, any transformer winding configuration and voltages. Please do not include any instrument transformer ratios.

3.9 The aggregate kW AC nameplate rating of each DER system

*Note: For example, this will be the sum of all inverters present on a PV system.*

3.10 The AC Voltage of the DER System

3.11 The expected individual kW AC nameplate rating of each inverter of the system

*Note: Effort should be made to include the most accurate inverter model at the time of application submission, as it adds greater clarity to the expected performance and operation of the system, reducing the likelihood of additional requests for information at the next step in the process. However, it is expected that designs may be non-materially modified after application submission and prior to commissioning. This includes the inverters models. Some flexibility will be provided for this requirement, but final one-lines will need final inverter makes and models prior to permission to operate being granted.*

3.12 Number of phases of the inverters.

3.13 Number of phases of the DER system. If a three-phase system is using single-phase inverters, indicate the quantity of inverters per phase.

3.14 *When multiple DER units are existing or proposed on a single service:* all DER systems shall be shown with proposed and existing marked

3.15 *For energy storage systems:* the Configuration Mode being applied for shall be clearly indicated on the one-line. Refer to Section 10 in the TSM for Configuration Mode details.

3.16 If auxiliary DER equipment power is necessary, the circuit for this auxiliary equipment shall be shown

*Note: Examples of auxiliary DER equipment include axis trackers, heaters, lighting, etc.*

3.17 If used, indicate any control system, such as a power control system or plant controller. Give a functional description of the control system.

*Note: A description of the system should be provided to help the reviewer understand the goals or purpose of the control system. If the control system relies on additional sensors, such CTs or PTs, these should be indicated and referenced in the description.*



## Metering

- 3.18 PV Production meter, if applicable, with ownership noted (utility or customer)
  - 3.18.1 For single-phase installations, the meter shall be specified as 1-phase, 3-wire
  - 3.18.2 For three-phase installations, the meter shall be specified as 3-phase, 4-wire
    - Note: No loads shall be connected on the DER side of an Xcel Energy-owned production meter. Energy Storage Systems are permissible, provided they only charge from the DER, and not the grid, at any time. Indicate PV-only charging if this is the case.*
  - 3.18.3 All Xcel-owned production meters shall be installed at an Xcel Energy standard voltage<sup>3</sup>
- 3.19 The PV production meter will be required to have the PV generation wired to the line side terminals. Please indicate the LINE SIDE and LOAD SIDE of the PV production meter on the line diagram.
  - 3.19.1 Customer owned meters shall not be located on the DER side of the Xcel Energy production meter<sup>4</sup>
- 3.20 *For systems with an output of 200 amps or more:* any Xcel-owned metering requiring PTs shall be shown with the PTs unfused

## AC Disconnect

- 3.21 A visible-open type, lockable, and readily accessible AC disconnect for purposes of isolating the DER from the utility source labeled “Utility AC Disconnect,” “Photovoltaic Utility AC Disconnect,” or similar shall be shown
  - 3.21.1 Other AC Disconnects shall not be labeled or identified as a “Utility” AC Disconnect, if applicable
    - Note: The “Utility AC Disconnect” must be accessible to Xcel Energy’s personnel 24/7 without escort, hindrance, or delay. Rack-out/draw-out breakers<sup>5</sup> do not qualify as a “Utility” AC Disconnect.*
  - 3.21.2 For installations that require a Production Meter, the Utility AC Disconnect shall be located between the DER and production meter
  - 3.21.3 For installations not requiring a Production Meter, the Utility AC Disconnect shall be located between the DER and main service

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<sup>3</sup> Xcel Energy standard service voltages can be found on Pg. 24, section 3.1.1 of the Electric Standard For Electric Installation and Use. The inverter side of a step-up transformer may be a non-standard Xcel Energy voltage, provided that no Xcel Energy metering is located between the step-up transformer and the inverter

<sup>4</sup> Refer to applicable state interconnection tariffs and program rules to determine if production meters are applicable

<sup>5</sup> Xcel Energy crews do not operate customer rack-out/draw-out breakers and would require customer’s personnel to operate to create a visible-open, which causes hindrance and delay that is not acceptable for the “Utility” AC Disconnect.



- 3.21.4 *When multiple DER units are existing or proposed on a single service:* if a single Utility AC Disconnect cannot be used to disconnect all DER, all Utility AC Disconnects should include numerical identification such as “Utility AC Disconnect 1 of 2” or similar. The number of disconnects required to be operated to isolate the DER from the utility should be clear.

Ground Referencing (applies only to systems 100 kW and greater)

- 3.22 Ground referencing<sup>6</sup> equipment shall be installed between the main service meter and production meter to provide a ground reference for the system
- 3.22.1 Details of the ground reference equipment required on the one-line:
- 3.22.1.1 Type/winding configuration of ground referencing equipment
  - 3.22.1.2  $X_0$  value
  - 3.22.1.3  $X_0/R_0$  ratio
  - 3.22.1.4 Neutral current rating
  - 3.22.1.5 Equipment fault withstand rating
- 3.22.2 Loss of ground referencing equipment shall immediately trip the DER system offline
- 3.22.2.1 The method of monitoring and tripping shall be shown on the one-line

## 4.0 Site Plan

Site Plan or location plan identifying location of equipment noted on the one line shall show the following information:

### Contact Information and General

#### 4.1 Customer Name

*Note: The Customer Name on the site diagram should match the Customer Name on the application*

#### 4.2 Installation premise address

*Note: The Installation address shall match application address*

#### 4.3 Installer name & contact information

#### 4.4 Application OID, SRC, or case number assigned to the project

#### 4.5 Building(s) and streets shall be labelled

*Note: A minimum of one street should be included on the site plan, with the name, distance, and direction to the nearest cross street, if the nearest cross street is not shown*

#### 4.6 Compass direction (indicate North)

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<sup>6</sup> See the “[PV and Inverter-based DER Ground Referencing Requirements and Sample Calculations](#)” document for ground reference requirements



## Electrical Component Locations

- 4.7 Main service entrance, all meter locations, disconnects, transformers, proposed and existing DER systems
  - 4.7.1 Distance shall be noted between metering and disconnects.
  - 4.7.2 *For dedicated power production facilities:* when an overhead primary service interconnection is used, the customer pole shall be no less than 25' from the Xcel Energy meter pole. Typical acceptable distance from the Xcel Energy meter pole to the customer pole is 40'
- 4.8 The Production Meter and AC Disconnect should be located together in a readily accessible location within 10' of the main service meter
  - 4.8.1 If the AC disconnect or Production Meter is not located within 10 feet of the main service meter<sup>7</sup>, a label meeting all requirements of the "Label Details" section should be placed at the main service meter clearly showing the location of the AC Disconnect
- 4.9 24/7 unescorted keyless access shall be provided to all Xcel Energy equipment
- 4.10 If DER facilities are in close proximity to overhead electric service lines, position, distance and clearance concerns in relation to facilities should be noted. All customer facilities are subject to NESC clearance requirements in relation to Xcel Energy owned facilities.
- 4.11 A separate Detail View or Plan View may be required to clearly show location of meters, main service and AC disconnect, when the site layout is unclear or illegible when printed on an 11"x17" sheet

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<sup>7</sup> If either the metering equipment or disconnect, or both, will be located indoors, this will be evaluated as an exception, which may or may not be approved based on the accessibility of the AC Disconnect or the clarity of the placard





## 5.0 Revision History

Revision	Date	Prepared By	Approved By	Notes
2.0		JCH		Converted to standard format/layout, added several sections
3.0	3/3/2021	MMH		Removed sections already covered in the TSM or in other parts of the process and are not required by MN DIP to be submitted in the initial application, clarified requirements for the One Line Diagram and Site Plan
3.5	5/25/2021	MMH		Added clarification on Utility AC Disconnect and alignment with TSM

## 6.0 Document Dependencies

### 6.1 Internal Documents

1. Xcel Energy Section 9 Tariff
2. Xcel Energy Section 10 Tariff
3. Xcel Energy Standard for Electric installation and Use
4. Xcel Energy Storage Interconnection Guidelines

### 6.2 External Documents

1. National Electric Code
2. UL1741
3. IEEE 1547



## **Appendix A – Template for Notice of Incomplete Initial Application Materials**

If a DER interconnection application is incomplete, complete the form on the following page and provide a copy to the responsible Program Manager. The Program Manager will then communicate with the Interconnection Customer to address any issues within the required timeframe. Save a copy of this form in the appropriate engineering folder for the project.



May 25, 2021

To Whom it May Concern:

Regarding your DER interconnection request for application number(s):

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in the state of \_\_\_\_\_, we are writing to inform you that one or more aspects of your application are not complete and require action to update before we can proceed with more detailed engineering reviews. Missing information is noted below under the relevant section heading.

**Section 3.0 One Line Diagram**

**Section 4.0 Site Plan**

Please update your relevant application documents and resubmit for Xcel Energy review in accordance with the governing interconnection process timelines.