

OMPA Facility Connection Requirements

Scope: This Facility Connection Standard applies to any connection to the electric system of OMPA regardless of voltage. It includes detailed requirements for the connection of generation and/or load.

1.0 General Facility Connection Requirements:

Facility Connection with Regional electric transmission and distribution facilities may be permitted provided such connection complies with the procedures and requirements set forth herein:

1.1 Definitions:

1.1.1 Transmission Provider: Provider shall mean OMPA and by reference include all applicable transmission facilities and all transmission facility owners within the Region. This definition does not imply the taking of transmission service under the SPP Regional Open Access Transmission Tariff.

1.1.2 Owner: Owner shall mean a person or entity responsible for ownership, operation and maintenance of facilities connected with Transmission Provider.

1.1.3 Facility Connection: Facility Connection shall mean the point where the Transmission Provider's and Owner's facilities physically meet.

1.1.4 Transmission: Transmission shall mean Transmission Provider facilities operated at 60 kV and higher.

1.1.5 Generating Source: A Generating Source is defined to exist when ANY of the following conditions are met:

- A. Owner's facilities can produce sustained watt or var flow into Transmission Provider's facilities at the closed Facility Connection.
- B. Owner's facilities can energize Transmission Provider's facilities across the Facility Connection at sustained levels of fifty-one (51) volts or more during times when the Transmission Provider's source is de-energized.
- C. Owner's facilities can energize the Facility Connection with sustained voltage magnitude and frequency quantities that differ from Transmission Provider's values.
- D. Owner's facilities can contribute fault-current to Transmission Provider's facilities at the Facility Connection.

Note: Sustained shall mean in excess of one (1) second duration.

1.1.6 End User Facilities: Those facilities installed to provide electrical energy to a load.

1.1.7 Balancing Authority: Balancing Authority (BA) shall mean the Transmission Provider's host BA which includes AEP/PSO, OG&E, and WFEC. It can also mean the SPP.

1.2 All applicable Local, State, and Federal statutes shall govern connection of Owner's facilities with Transmission Provider's facilities. In addition, Owner's facilities shall be installed in accordance with all provisions set forth in: OMPA's Facility Connection Requirements; National Electrical Safety Code (ANSI C2); National Electrical Code (NFPA70); or North American Electric Reliability Corporation (NERC); American National Standards Institute (ANSI); Institute of Electrical and Electronics Engineers (IEEE); or

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other Regulatory or Governing Body having jurisdiction. Connection of Owner's facilities with Transmission Provider's facilities shall further be governed by any applicable statute, rule, order, provision, guide, or code of an organization, council, institute, regulatory or governing body having jurisdiction over such matters.

1.3 Owner shall be responsible for all engineering studies, design, modeling data, impact and facilities studies required by the Regional Transmission Organization (RTO), and installation, required for connection with Transmission Provider's facilities.

1.4 Owner shall be responsible for compliance with all permits, licenses, fee, rules, regulations, standards, agreements, ordinances, inspections, and other requirements imposed by Transmission Provider or any regulatory or governmental body having jurisdiction. There is no obligation on the part of the Transmission Provider to connect, or to remain connected whenever Owner's facilities are out of compliance. In addition, Owner shall be responsible for and Transmission Provider shall require Owner facilities or the Facility Connection between Owner's facilities and Transmission Provider's facilities to be modified in accordance with all applicable statutes, rules, orders, provisions, guides, or codes of an organization, council, institute, regulatory or governing body having jurisdiction over such matters.

1.5 Because of increased risks and potential hazards inherent with operating Owner's facilities connected with Transmission Provider's facilities, overall safety for life, quality of service and property is paramount. Transmission Provider shall disconnect Owner's facilities anytime Owner's facilities pose a dangerous condition, and such disconnection is appropriate to protect safety of Transmission Provider's employees, customers, general public, or to maintain integrity of the Transmission Provider's facilities.

1.6 Owner shall provide Transmission Provider a minimum, of one hundred and eighty (180) days written notice of its intent to connect facilities with the Transmission Provider's system. Failure to give such notice shall render Owner liable for all damages to Transmission Provider's property, other customers' property, injury to persons, or any other damages resulting from unauthorized connection. Notice of intent shall include, but is not limited to, such information as:

1.6.1 Location of proposed facility connection

1.6.2 Voltage level

1.6.3 Average and Peak Watt Demand

1.6.4 Reactive Power Requirements

1.6.5 Connected Generation & Type: (ex: synchronous, induction, converter)

1.6.6 Large Motors including Type (ex: synchronous, induction, VFD)

1.6.7 Fault Current Limits

1.6.8 Power Quality Requirements

1.6.9 Reliability Requirements

1.6.10 Voltage, Reactive Power and power factor control

1.6.10 Other Requirements

Requests to install Facility Connection shall be submitted to:

General Manager

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OMPA
P.O. Box 1960
Edmond, Oklahoma
73083-1960

- 1.7** Within forty-five (45) days of submitting a written request to connect facilities, but not less than ninety (90) days prior to facility connection, the Transmission Provider shall submit to Owner preliminary general equipment requirements such as breaker(s), switches, supervisory control and data acquisition (SCADA), and existing Transmission Provider facility protection scheme, required for Owner to proceed with Facility Connection design. In addition, Transmission Provider shall notify owner of costs to evaluate the proposed Facility Connection.
- 1.8** Within sixty (60) days of receipt of a complete copy of Owner's detailed engineering studies, design specifications, proposed protective relaying schemes, and payment of costs for evaluation, Transmission Provider shall review, perform analysis, and notify Owner of approval and/or conditions for acceptance. Should Transmission Provider be unable to evaluate Owner's request to connect as submitted, Transmission Provider shall provide Owner a written explanation of information required to complete the evaluation.
- 1.9** Only written notice shall constitute acceptance by Transmission Provider. Written approval by Transmission Provider does not waive any requirements pertaining to Owner's installation which may be governed directly by other jurisdictional bodies. Transmission Provider's specifications and requirements are designed towards protecting the safety of life, quality of service and the Transmission Provider's property, and do not assume nor ensure proper protection of Owner's facilities equipment during electrical faults.
- 1.10** When Transmission Provider is required to incur expenses necessary to make extensions or improvements of its lines or additions to its disconnecting devices, transformers, meters, breakers, relays, controls, data systems, or to make any other equipment modifications relating to its circuits, substations, or apparatus necessary to connect Owner's facilities, and such expenses made are attributable to this application, then all costs incurred by Transmission Provider for Facility Connection shall be borne by Owner as set forth in the connection agreement. Such costs are due and payable prior to Transmission Provider commencing construction, and are non-refundable in whole or in part at anytime.
- 1.11** Owner and Transmission Provider shall execute appropriate agreements for connected service prior to installation of any equipment. Energy supplied to Transmission Provider, as well as energy used by Owner, shall be compensated in accordance with applicable tariffs, rules, and regulations currently on file with the regulatory body having jurisdiction, or which may be filed and approved by the regulatory body having jurisdiction.
- 1.12** Transmission Provider may require Owner's facility design to include an appropriate automatic disconnecting device to be controlled by any or all of the following: overcurrent relays, automatic synchronizing relays, voltage relays, frequency relays, ground fault detection relays, or any other automatic relaying equipment necessary to ensure proper protection and safety of Transmission Provider employees, customers, equipment, and overall system integrity. The Transmission Provider reserves the right to review, inspect, and approve Owner's design and shall not give approval to connect until

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any concerns relating to Owner's design have been remedied. Refer to Appendix A, "Relay Standard for Connected Generating Facilities", and Appendix B, "Relay Standard for Connected Load Facilities."

1.13 Transmission Provider shall procure, install, and maintain all metering equipment required to measure energy exchanged between Owner and Transmission Provider across the Facility Connection. Energy shall be measured at delivery voltage. Owner will seek written confirmation with the Balancing Authority that the new or materially modified generation facilities are within the BA's metered boundaries.

2.0 Transmission Facilities Connection Requirements

2.1 Transmission Provider's electrical facilities include transmission lines operating at voltage levels of 60 kV and higher. Higher voltage levels require stringent standards of security, reliability, quality, and controllability of the electrical facilities.

2.1.1 Transmission Facilities - General Requirements

A. Any electrical structure or equipment utilized for high-voltage service shall be connected to an earth-ground grid that measures no more than 0.6 ohms resistance to earth. Such value shall be measured with equipment and techniques approved by the Transmission Provider and shall be certified by a measuring contractor qualified for this service. The connectors and components of the grounding grid shall be adequate for the anticipated short-circuit current magnitude and duration.

B. Supervisory remote control and electrical metering shall be provided using devices and communications paths specified by the Transmission Provider. Such equipment shall be proven operational before electrical operation begins.

C. Maintenance at the Facility Connection shall be coordinated with the Transmission Provider.

2.1.2 Transmission Facilities - 60 kV through 138 kV Requirements

A. Multiple remotely controllable line-sectionalizing switches or circuit breakers with protective relays may be required at Facility Connection.

B. Transformers capable of serving load greater than 10.0 MVA shall be controlled by a primary circuit switcher or circuit breaker with appropriate protective relaying.

C. Structures at the Facility Connection may be required to be of steel construction.

D. Sectionalizing devices may require load breaking and/or fault interrupting capability.

E. Protective relay schemes of Owner shall be integrated to operate with protective relay schemes on Transmission Provider facilities.

F. Protective relaying shall include both primary and backup schemes.

G. Substations with three or greater transmission facility connections shall be ring-bus configuration.

H. Substations with six or greater transmission facility connections shall be breaker-and-a-half configuration.

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3.0 Generating Source Facility Connection Requirements

3.1 General Requirements

- 3.1.1 Generating Sources 1,000 kVA and larger shall be three (3) phase to qualify for Facility Connection with Transmission Provider's facilities.
- 3.1.2 Generating Source shall not close or reclose automatically onto a de-energized Transmission Provider Facility Connection.
- 3.1.3 Disconnecting equipment shall have a visible break between Owner and Transmission Provider facilities for connections 600 volts and above.
- 3.1.4 Transmission Provider shall determine the acceptable minimum aggregate power factor at Facility Connection. Appropriate billings, payments, or adjustments to compensate Transmission Provider shall be specified in the Facility Connection agreement.
- 3.1.5 Owner Standby or Emergency Generating Sources will require no special relaying or metering when installation is designed to prevent "hot transfer of Owner's load" going "on" or "off" from the Standby source to the Transmission Provider's facilities, provided all requirements can be handled with control circuit interlocks.
- 3.1.6 Supervisory Control and Data Acquisition (SCADA) may be required by Transmission Provider to connect Generating Source to Provider facilities.
- 3.1.7 Connection to the Transmission Provider's facilities shall be at 60 Hz alternating current.
- 3.1.8 For parallel generation connection, the generator shall be connected using a WYE-DELTA Generator Step Up transformer and shall be connected WYE to Transmission Provider's facilities.

3.2 Generating Source Types

3.2.1 Synchronous Generating Sources

Synchronous Generating Sources shall utilize three-phase circuit breakers, which meet or exceed the following requirements:

- A. Rated for 2.0 per unit voltage across open contacts.
- B. Interrupt maximum available fault currents between Owner's Generating Source and Transmission Provider's facilities.
- C. Open for frequency and voltage deviations specified by Transmission Provider.
- D. Utilize synchronism check within +/- 10 degrees and +/- 5 percent of nominal voltage on each side of the breaker prior to closing the breaker between Transmission Provider's and Owner's facilities.
- E. Provide ground fault detection and tripping for breaker anytime an ungrounded circuit configuration exists as the result of opening the Transmission Provider's source to the Facility Connection.
- F. Continuously monitor breaker control power source.

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3.2.2 Induction Generating Sources

Induction Generating Sources shall utilize three-phase circuit breakers, which meet or exceed the following requirements:

- A. Transmission Provider shall specify frequency and voltage deviations to Owner for which circuit breaker shall open.
- B. Breaker control power source shall be continuously monitored.

3.2.3 Converter Generating Sources

Converter Generating Sources shall meet the following requirement:

- A. Converter Generating Sources shall cease operation for frequency and voltage deviations specified by Transmission Provider.

3.3 Generating Source Facility Connections – 20,000 kVA and Greater

3.3.1 Generating Sources shall be operated and maintained under the direction of the Transmission Provider or host BA

3.3.2 Generating Sources shall operate with excitation systems in automatic voltage-control mode.

3.3.3 Generating Sources shall maintain reactive power output as required by the Transmission Provider or host BA within the demonstrated reactive capability of the unit.

3.3.4 Generating Sources shall be capable of operation at over-excitation power factor of 0.95 and under-excitation power factor of 0.95 at all rated continuous power output levels as measured at the Facility Connection.

3.3.5 In addition to the protection described in 1.12, Generating Sources shall have reverse power, loss of field, differential generator current, differential transformer current, negative sequence current, and inadvertent energization of the generator protection systems.

3.4 Transitional Switching of Generating Sources

3.4.1 Owner may be permitted to utilize approved methods of transitional switching for the purpose of making a synchronized transfer of Owner's load between Owner's Generating Source and Transmission Provider's facilities. Such transitional switching shall require automatic synchronizing equipment and high speed switching devices specifically designed to synchronize Owner's Generating Source to the Transmission Provider for the sole purpose of "hot" transferring the Owner's load "On" or "Off" the Transmission Provider's facilities.

3.4.2 All Owner requests for transitional switching shall be approved by Transmission Provider and accomplished in such a manner as not to exceed one (1) second as the maximum time Owner's Generating Source operates connected with Transmission Provider's facilities.

3.4.3 Owner shall be responsible for all costs associated with transitional switching.

4.0 End Use Facilities Connection Requirements

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4.1 End User interconnections that include generation shall also meet the requirements of generation interconnections.

4.2 End user devices are not to be connected directly to potential or current transformer secondaries used for revenue metering.

4.3 Isolation device(s) for load connections will need to be installed at the point-of-interconnection to the OMPA system.

5.0 Commissioning of the Facility Connection

5.1 Transmission Provider may measure and document the harmonics present at the Facility Connection before and after such connection is made.

5.2 Transmission Provider reserves the right, but does not assume the duty, to inspect, test, or check Owner's equipment in any way deemed appropriate to confirm operation and verify system protection characteristics. Transmission Provider does not assume any responsibility in connection with such Owner's equipment or the inspection thereof.

5.3 Metering equipment shall be verified by Transmission Provider or its designated agent.

6.0 Operating Requirements:

6.1 Owner agrees to respond to Transmission Provider requests during abnormal conditions.

6.2 Owner shall ensure competent personnel are available to operate, maintain, and repair connected generating equipment at all times when such equipment operates in parallel with Transmission Provider's facilities.

6.3 Transmission Provider may require connected generating sources to have both normal and emergency paths for supervisory control, metering, or voice communications systems.

6.4 The Transmission Provider requires coordination with the Transmission Provider's automatic underfrequency load shedding. Wholesale service providers shall be required to provide the Transmission Provider with a documented manual load shed plan.

6.5 Owner shall provide all available operating data upon request.

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APPENDIX A

Relay Standards for Connected Generating Facilities

A1.0 Requirements for generating facilities defined under OMPA Facility Connection Standards:

A1.1 Owner's facility design shall include an appropriate automatic disconnecting device to be controlled by any or all of the following: overcurrent relays, automatic synchronizing relays, voltage relays, frequency relays, ground fault detection relays, or any other automatic relaying equipment necessary to ensure proper protection and safety of Transmission Provider employees, customers, equipment, and overall system integrity.

A1.2 Protective relay schemes of Owner shall be integrated to operate with protective relay schemes of Transmission Provider facilities. Generating Sources shall:

A1.2.1 not supply sustained fault current to Transmission Provider facilities.

A1.2.2 open for frequency and voltage deviations specified by Transmission Provider.

A1.2.3 utilize synchronism check within +/- 10 degrees and voltage limits of +/- 5 percent of nominal on each side of the disconnecting device prior to connecting Owner's and Transmission Provider's facilities.

A1.2.4 provide ground fault detection and tripping for disconnecting device whenever an ungrounded circuit configuration exists as the result of opening the Transmission Provider's source to the Interconnection.

A1.2.5 continuously monitor disconnecting device control-power source.

A1.2.6 not reclose automatically.

A1.2.7 accept transferred-tripping initiated from Transmission Provider facilities

A1.2.8 be capable of transferring data to and from Transmission Provider's SCADA system.

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A2.0 Outline of generating facility protective-relay features:

A2.1 Protective relay features shall include:

- A2.1.1 alternate modes of operation for generating and non-generating conditions. Voltage, frequency, synchronism and backfeed requirements will differ between modes.
- A2.1.2 tripping for all faults on Transmission Provider source while in generating mode. This protects Transmission Provider equipment from inadvertent energization and non-synchronous reclosure, and other Transmission Provider customers from unpredictable electrical quality.
- A2.1.3 acceptance of direct-trip signal from Transmission Provider source while in generating mode.
- A2.1.4 closure of the interconnecting device through direct or indirect supervision of the protective relay for all modes of operation. This assures that the interconnection will be protected by a viable relay before closure.
- A2.1.5 closure of the interconnecting device through permissive synchronism-checking supervision of the protective relay. Hot-source / dead-bus supervision should be utilized in the non-generating mode.
- A2.1.6 waveform and event-capture of all opening and closing events.
- A2.1.7 digital communication compatibility with Transmission Provider's SCADA system. This is presently DNP-3, level 2 implementation.
- A2.1.8 alarm capability to Transmission Provider dispatch for DC- or relay failure.
- A2.1.9 real-time telemetry capability of interconnection watt and VAR flows when generating.

A3.0 Required generic protective-relay functions:

- A3.1 Inputs:
 - <> 3-phase AC potentials and currents
 - <> Close command
 - <> Trip command
 - <> Transferred-trip command
 - <> Synchronism-check permissive
 - <> Alternate-settings mode
 - <> Breaker trip-coil monitor
 - <> Breaker-indication contact

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- A3.2 Algorithms:
- <> Breaker state
 - <> Nondirectional overcurrent trip
 - <> Directional overcurrent trip
 - <> Negative-sequence overcurrent trip
 - <> 3-phase over- and under-voltage trip
 - <> 3-phase over- and under-frequency trip
 - <> Breaker failure-to-trip alternative protection scheme
 - <> Breaker trip-circuit "open" alarm
 - <> Malfunctioning or inoperative protective-relay alarm
 - <> Loss of control power alarm
 - <> Synchronism-check of breaker "close" command
 - <> Event-capture of each breaker operation
 - <> Waveform-capture of each breaker operation
 - <> DNP-3, Level 2 communication protocol
- A3.3 Outputs:
- <> TRIP Command
 - <> CLOSE Command or synchronism-check permissive
 - <> LOCKOUT Command for failure-to-trip or malfunction
 - <> Alarms defined in section A4.2
 - <> Metering values for voltage and frequency
 - <> Fiber optic, RS-232 or RS-485 communications port

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APPENDIX B Relay Standards for Connected End Use Load Facilities

B1.0 Requirements for facilities defined under OMPA Connection Standards:

B1.1 Protective relay schemes of Owner shall be integrated to operate with protective relay schemes of Transmission Provider facilities.

B1.2 Owner equipment shall be capable of transferring data to and from Transmission Provider SCADA system.

B2.0 Outline of connection protective-device features:

B2.1 Connection with Transmission Provider electrical system shall be appropriate for the requirements of the electrical-system protective schemes. Such connection may utilize fuses, circuit-switchers or circuit-breakers with appropriate control schemes.

B2.2 Fuse ratings shall be in accordance with Transmission Provider standards.

B2.3 Protective-relay response shall not exceed transformer-damage specifications.

B2.4 Protective relay characteristics shall coordinate with Transmission Provider schemes.

B2.5 Digital communication protocol shall be compatible with Transmission Provider SCADA system. This is presently DNP-3, level 2 implementation.

B3.0 Required generic protective relay functions:

B3.1 Inputs:

- <> 3-phase AC potentials and currents
- <> Close command
- <> Trip command
- <> Breaker trip-coil monitor
- <> Breaker-indication contact

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- B3.2 Algorithms:
- <> Breaker state
 - <> Nondirectional overcurrent trip
 - <> Breaker failure-to-trip
 - <> Breaker trip-circuit "open" alarm
 - <> Malfunctioning or inoperative protective-relay alarm
 - <> Loss of control power alarm
 - <> Event-capture of each breaker operation
 - <> DNP-3, Level 2 communication protocol

- B3.3 Outputs:
- <> TRIP Command
 - <> CLOSE Command or synchronism-check permissive
 - <> LOCKOUT Command for failure-to-trip or malfunction
 - <> Alarms defined in section B4.2
 - <> Fiber optic, RS-232 or RS-485 communications port

Revision History:

Version #	Date	Action	Approval
00	12/10/2010	New	Jim McAvoy
01	04/23/2015	Revised to address new FAC-001-1 Standard revision.	Jim McAvoy
02	12/19/2016	Annual Review; revised Scope	Jim McAvoy
03	01/01/2019	Review; revised to align with FAC-001-3	Jim McAvoy
03	08/04/2023	Periodic review of procedure. No revision change required.	