



Austin Energy Facility Connection Requirements

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1 OVERVIEW

1.1 Document Purpose

This document informs entities seeking to connect to the AE Transmission System and will seek to communicate the facility connection requirements. Part 2 of this document applies to generation facilities, transmission facilities, and end-user facilities and has been prepared to help ensure that all requests for transmission interconnection are treated in a consistent manner. Austin Energy has a similar document for power production facilities connecting to the distribution system. Section 2.17 of this document provides directions for locating the “AE Distribution System Interconnection Guide for Customer Owned Power Production Facilities less than 10 MW”. Both documents are subject to change and may be revised from time to time.

Austin Energy facilities are confined within the ERCOT Interconnection and in the ERCOT Balancing Authority area. Many of the Facility Connection Requirements mentioned herein are addressed in greater detail in the interconnection agreement between Austin Energy and the interconnecting party.

For generator interconnection requests, the requirements contained in Part 2 of this document generally apply to all new generating facilities with a net rating of 10 MW or greater and which are connected to the Transmission System.

1.2 Definitions

- 1.2.1 AE System: The Electric Utility System of Austin Energy.
- 1.2.2 Good Utility Practice: Any of the practices, methods, and acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period or any of the practices, methods, and acts that, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety, and expedition. Good utility practice is not intended to be limited to the optimum practice, method, or act, to the exclusion of all others, but rather is intended to include acceptable practices, methods, and acts generally accepted in the region.
- 1.2.3 IEEE: Institute of Electrical and Electronic Engineers
- 1.2.4 Interconnection: The physical means by which electric energy is received from a generating source. The principal elements of an electric interconnection include transmission and distribution circuits, transformers, and switching devices such as circuit breakers, fuses, and isolating disconnect switches. Supplemental elements may include sensing devices and protective relay equipment.
- 1.2.5 Interconnection Point: The point at which energy first enters or leaves the line or apparatus owned by the customer and leaves or enters the line or apparatus owned by AE.
- 1.2.6 Planning Criteria: The Austin Energy Planning Criteria document provides details concerning the reliability philosophy used to plan Austin Energy's electric transmission system, the minimum levels of performance for Austin Energy's transmission system under normal and contingency conditions, and the types of analyses used by Austin Energy for planning and testing the performance of Austin Energy's transmission system.
- 1.2.7 Transmission System: The transmission facilities owned, operated, or controlled by Austin Energy, including conductors, circuit breakers, switches, transformers, and other associated equipment used to control the transfer of energy, and shall include any modifications, additions, or upgrades made to those facilities.
- 1.2.8 Qualified Change Interconnection: A qualified change interconnection refers to a modification of an existing interconnection such that the modification has at least one of the following characteristics:
- The modification falls within [ERCOT's definition of a qualified change](#) as made publicly available within [ERCOT's Compliance Site](#).
 - Not implementing the modification will result in a violation of the AE/ERCOT Planning Criteria or a NERC Reliability Standard.

- The project required to implement the modification is significant enough to be documented and included in the CIP Plan Book, which describes all major capital improvements to the AE transmission system.
- Implementing the modification will alter steady-state power flows on at least one transmission line by more than 2%
- The project qualifies for inclusion in the ERCOT Transmission Project and Information Tracking (TPIT) report.

1.2.9 ERCOT: Electric Reliability Council of Texas

1.2.10 NERC: North American Electric Reliability Corporation

1.2.11 NESC: National Electrical Safety Code

1.2.12 OSHA: Occupational Safety and Health Administration

1.2.13 PUCT: Public Utility Commission of Texas

1.2.14 ANSI: American National Standards Institute

1.3 Contact Information

Entities requesting a new Facility interconnection or Qualified Change to an existing interconnection should contact Austin Energy Transmission Planning at: TDSP@austinenergy.com

2 INTERCONNECTION REQUIREMENTS FOR GENERATION, TRANSMISSION, AND END-USER FACILITIES

All interconnecting entities requesting interconnection to Austin Energy shall plan, design, and operate their facilities, new or existing, in accordance with these Facility Connection Requirements and any applicable requirements of ERCOT, NERC, NESC, OSHA, and the PUCT.

AE will work with the interconnecting transmission entities to furnish an Interconnection Agreement detailing the Point of Interconnection (POI) and individual responsibilities. Generation Interconnection requests will be handled in accordance with the ERCOT Planning Guide Section 5: Generation Resource Interconnection or Change Request process and requirements.

2.1 **Summary of Basic Interconnection Requirements**

Transmission Service Voltages:	69, 138, or 345 kV (nominal)
Operating Voltage Limits:	
Normal Conditions	98 – 105%
Post-Contingency Conditions	95 – 105%
Power Factor:	
Load	97%
Generator	95% leading and lagging

All interconnections to the AE system must be three-phase, 60 Hertz alternating current facilities.

2.2 **Interconnection Planning and Coordinated Studies**

AE conducts transmission and transformation planning assessments each year to evaluate the AE system performance of the interconnected system. AE utilizes the power flow cases developed by the ERCOT Steady State Working Group (SSWG) and short circuit cases developed by the ERCOT System Protection Working Group (SPWG) for the steady state and short circuit analysis. Stability studies are conducted using the dynamic cases developed by the ERCOT Dynamic Working Group (DWG). Regional load flow base cases are established for a range of generation and load configurations. In each of these cases, simulations are run to determine compliance with the planning criteria throughout the planning horizon. Stability studies are also conducted based on data availability from ERCOT as well as on an "as needed" basis for generator interconnections. On an annual basis, the individual members of ERCOT cooperatively prepare load flow simulations of their interconnected system. Once the base cases are complete, contingency analyses are conducted individually by the members. Based on these assessment results, AE recommends new projects necessary to meet electric system performance requirements and reliability obligations in compliance with national (North American Electric Reliability Corporation), regional (Electric Reliability Council of Texas), and internal Austin Energy planning criteria over the following five-year period.

Austin Energy uses the ERCOT Planning Guide Section 5, "Generator Interconnection or Modification," for coordinated studies to interconnect large generation facilities. General procedures used for other coordinated studies involving new or Qualified Change to existing

interconnections, including transmission customer (end-user) facilities, are found in the ERCOT Planning Guide Section 3, "Regional Planning."

In coordination with ERCOT and other Transmission Planners via ERCOT-required processes where applicable, the minimum studies performed will be:

- a) The reliability impact of the new interconnection, or Qualified Change to existing interconnection, on the affected system(s);
- b) Adherence to applicable NERC Reliability Standards; ERCOT Requirements and Austin Energy system planning criteria; and Facility interconnection requirements; and
- c) Steady state, short-circuit, and dynamics studies, as necessary, to evaluate system performance under both normal and contingency conditions.

Study reports shall include study assumptions, system performance, alternatives considered, and coordinated recommendations. These studies may be performed independently or jointly with other entities and the results will be evaluated and coordinated by the entities involved.

2.3 Procedures for Notification of New or Qualified Changes to existing Facilities

Austin Energy informs the ERCOT ISO and other interested parties of new or qualified changes to existing interconnections using the SSWG case development and update processes. The "ERCOT Transmission Project and Information Tracking (TPIT)" report reflects the data used for SSWG case development and updates. The TPIT is then posted on the ERCOT website for Market Participants to access. The TPIT report is described in Section 6.4 of the ERCOT Planning Guide.

2.4 MW and MVAR Demand and Voltage Level

Austin Energy uses ERCOT Planning Guide Section 6.5 "Annual Load Data Request (ALDR)" in conjunction with the TPIT report to collect and address voltage level and MW and MVAR capacity or demand at the point of connections. Austin Energy has no wholesale customers and only one transmission level retail customer connected to its system. The transmission system shall be planned with the objective that voltages shall not exceed 105 percent nor fall below 98 percent of nominal voltage during normal conditions. Also, the transmission system voltages shall not exceed 105 percent nor fall below 95 percent of nominal voltage during post-contingency conditions.

2.5 Breaker Duty and Surge Protection

AE will provide the maximum available short-circuit current at the point of interconnection to the Interconnecting Entity based on the short circuit analysis. AE's Breaker Duty and Surge Protection requirements are covered in the AE Substation Design Reference Manual under sections of 2.2 Distribution Switchgear, 2.3 Circuit Breakers and Circuit Switchers, and 2.12 Surge Arrestors. These guides identify and comply with applicable IEEE, ANSI, NESC, and OSHA standards and specifications. These documents provide guidelines to prevent these events from happening.

2.6 System Protection and Coordination

Interconnecting Entities are required to provide dependable and secure protection systems for their portion of the Interconnecting Facility. The protective relay systems shall be designed to meet applicable NERC Reliability Standards, IEEE standards, and specifications, ERCOT Nodal Operating Guides, and Austin Energy requirements and in accordance with Good Utility Practice. Austin Energy shall review protection system coordination between the Interconnecting Facility and Austin Energy. Austin Energy may require the submittal of operational and relay one-line diagrams, relaying schematics, relay types, proposed settings, equipment specifications, Aspen OneLiner model or additional project-specific items for review.

Specific requirements for the protection system and coordination are documented in the Interconnection Agreement or determined during the conceptual and design stages of a project.

If requested by Austin Energy, Interconnecting Entities shall, at its expense, provide corrections, upgrades, or additions to existing control and protective equipment required to protect the transmission system or to comply with government, industry regulations, or standard changes.

Prior to modifying any protection system design or relay setting(s) involving the connecting facility and Austin Energy, the proposed changes shall be submitted to Austin Energy by the Interconnecting Entity for review and approval. Austin Energy's review and approval shall be for the limited purpose of determining whether such proposed changes coordinate with the Austin Energy protection systems.

2.7 Generation Facility Requirements

Specific requirements for the Generation facility interconnections are documented in the Interconnection Agreement or determined during the conceptual and design stages of a project.

Prior to modifying any connecting facilities between the Generation Facility and Austin Energy, the Generation Facility shall submit the proposed changes to Austin Energy for review and approval. Austin Energy's review and approval shall be for the limited purpose of determining whether such proposed changes coordinate with the Austin Energy system.

2.8 Transmission Facility Requirements

Specific requirements for the Transmission facility interconnections are documented in the Interconnection Agreement or determined during the conceptual and design stages of a project.

Prior to modifying any connecting facilities between the Transmission Facility and Austin Energy, the Transmission Facility shall submit the proposed changes to Austin Energy for review and approval. Austin Energy's review and approval shall be for the limited purpose of determining whether such proposed changes coordinate with the Austin Energy system.

2.9 End-User Facility Requirements

Specific requirements for the End-User Facility are documented in the Interconnection Agreement or determined during the conceptual and design stages of a project.

3. **METERING AND TELECOMMUNICATIONS**

Certain AE Metering and telecommunications requirements are described in section REL 1.6, Metering and Telemetry of the Relay Design Manual. Other requirements are described in the Data and Voice Communications Process document contained in the AE Reliability Process Manual. For further details of related requirements, contact the associated Austin Energy work group.

ERCOT requirements for metering and telecommunications are found in the following documents:

- ERCOT Settlement Metering Operating Guide
- ERCOT Nodal Operating Guides; Section 7; Telemetry and Communication
- ERCOT Nodal Protocols; Section 10: Metering

Project-specific requirements for operational metering, settlement metering, and telecommunications are determined during the design phase and documented in the interconnection agreement. General requirements are listed below.

Instrument Transformers Used for Settlement Metering

All current and voltage transformers used for settlements must conform to 0.3 percent accuracy or better and shall meet or exceed other requirements as stipulated by the ERCOT Settlement Metering Operating Guide.

Instrument Transformers Used for Operational Metering

All current and voltage transformers used for Operational Metering shall be of sufficient accuracy as per ERCOT Protocols and Operating Guides. It is understood that the same meters used for settlements may also be used to provide TDSP/ERCOT operational data.

Metering Communications

An internal network connection (fiber or Ethernet) shall be provided for ERCOT and Austin Energy MV-90 translation departments to interrogate the meters for power and energy billing units in accordance with ERCOT Protocols and Operating Guides.

This section defines the AUSTIN ENERGY TDSP's SCADA policy and responsibilities for connecting Transmission and Generation Facilities to the AUSTIN ENERGY TDSP transmission system.

SCADA Policy

The AUSTIN ENERGY TDSP SCADA policy is to install a Remote Terminal Unit (RTU) at substations connected to the AUSTIN ENERGY TDSP transmission system. The RTU shall monitor the status and/or control transmission system switching devices, Customer load, transmission bus voltage, and select alarms and indications. The RTU shall be operated by AE System Operations through an AUSTIN ENERGY TDSP-provided communications system using AUSTIN ENERGY TDSP's preferred DNP protocol –.

RTU specification

AUSTIN ENERGY TDSP shall provide the RTU. The RTU will be installed in a climate-controlled environment (control house) and shall require 125 VDC power and 120 VAC power. For locations with a small point count application, like a single transformer, or inline substation, AUSTIN ENERGY TDSP will use a small, 24"x36"x12" RTU mounted on a 24" wide rack. For locations with a larger point count application, AUSTIN ENERGY TDSP will install a 24"x 24"x 84" RTU in a cabinet and a 24" wide Supervisory Interface Panel (SIP). Both installations require front and back access. RTUs are capable of control (DO), status (DI), analog telemetering (AI), or interrogating select IEDs with an RS-232 connection by DNP protocol.

AUSTIN ENERGY TDSP Responsibility

AUSTIN ENERGY TDSP shall provide, install, and maintain:

- An AUSTIN ENERGY TDSP RTU
- Communication system between AUSTIN ENERGY TDSP Energy Control Center (ECC) and the RTU
- Cable and conduit between AUSTIN ENERGY TDSP equipment and the RTU
- Termination between AUSTIN ENERGY TDSP RTU and Customer SCADA cables

Customer Responsibility

The customer shall operate within the metered boundaries of ERCOT and shall provide, install, and maintain:

- Analog load values per transformer – MW, MVAR, Amps.
- Shielded cable from transducer or meter to RTU Supervisory Interface Panel (SIP).
- As an option, provide analog values from the IED via DNP utilizing RS-232 connection(s).

- For Customer-owned and remotely switched equipment directly connected to AUSTIN ENERGY TDSP transmission system, SCADA control and status shall be provided for AUSTIN ENERGY TDSP's use per the interconnect agreement.
- Cables from the Customer panel(s) to the AUSTIN ENERGY TDSP RTU SIP.
- Schematics and wiring diagrams for Customer equipment connected to the AUSTIN ENERGY TDSP's RTU.
- 120 VAC and 125 VDC power sources for AUSTIN ENERGY TDSP RTU.
- Communication system between the AUSTIN ENERGY TDSP RTU and the Customer RTU

3.1 Grounding and Safety

AE's substation grounding and safety philosophy and design procedure are detailed in the AE Substation Design Reference Manual section 3.1 Substation Grounding and 3.2 Substation Shielding. These guidelines identify the applicable IEEE, ANSI and NESC grounding and safety standards and specifications and shall be met to satisfy AE's facility connection requirements. Adequate grounding provides for a safe working environment for personnel under normal and abnormal conditions; protection of substation equipment; prevention of electrostatic buildup and good ground relay sensitivity.

3.2 Insulation and Insulation Coordination

AE's insulation and insulation coordination philosophy are detailed in section 4.1 Insulation Coordination and Appendix A.1 Insulation Coordination of the AE Substation Design Reference Manual. These guides identify and comply with the applicable IEEE standards and specifications. Insulation Coordination is the correlation of protective devices and electrical insulation systems, and the goal is to provide the most economical application of equipment consistent with reliability and survival of protective devices.

3.3 Power factor, Reactive Power, and Voltage Control

Austin Energy uses an internal “Voltage and Reactive Guide” document to address voltage, reactive power, and power factor control requirements for facility connections. The guide is an outline of general guidelines for system operation of AE’s Transmission and Distribution System. The object of the guide is to provide for bus voltage control and availability of reactive power sources that will result in a secure and reliable system. Interconnecting Generation Resources must meet the reactive power requirements and voltage ride-through capabilities in accordance with the NERC and ERCOT reactive support requirements.

3.4 Power Quality Requirements

The requirements on power quality for interconnection with AE facilities comply with PUCT rule (chapter 25 Substantive Rules Applicable to Electric Service Providers, Subchapter 1 Transmission and Distribution, Division 2 Transmission and Distribution Applicable to All Electric Utilities, 25.212 Technical Requirements for Interconnection and Parallel Operations of On-Site Distributed Generation). Interconnecting Entities are required to meet applicable NERC Reliability Standards, IEEE standards and ERCOT, and in accordance with Good Utility Practice. Austin Energy may require detailed studies and/or permanent power quality monitoring for performance testing, troubleshooting, post-event analysis, and determining the responsibility for mitigating power quality issues.

3.5 Equipment Ratings

Austin Energy uses an internal “Transmission Facility Ratings Methodology” document to address equipment ratings. Transmission conductor ratings are established in accordance with IEEE Standard 738-2006. The overall rating for a transmission facility is determined using the Most Limiting Series Element (MLSE) database and includes the normal and emergency rating of each element that comprises a transmission facility such as the conductor, a circuit breaker, air switch, etc. A facility rating shall equal the most limiting applicable equipment rating of the individual equipment that comprises that facility. Planned loading on autotransformers, during normal or contingency conditions shall be limited to 100 percent of the auto-transformer’s continuous megavolt-ampere (MVA) rating as specified by the manufacturer unless AE Electric Service Delivery Engineers have established alternate 2-hour and/or 15-minute ratings. Planned transmission line loading shall be such that National Electrical Safety Code line-to-ground

clearances shall be maintained for all anticipated normal and contingency conditions (NERC contingency categories and ERCOT categories).

3.6 Large Generation Facilities

3.6.1 Interconnecting Generating Units Larger than 10 MW.

The interconnection process begins when the new generator contacts ERCOT with a request for possible interconnection. The process proceeds in accordance with ERCOT Planning Guide Section 5 “Generator Interconnection or Modification”. The ERCOT “Standard Generation Interconnection Agreement (SGIA) is used for interconnections with large generation facilities and can be found on the ERCOT website. New Generators should note that Article 5 and Exhibit ‘C’ of the SGIA are of particular interest. Section 5.5 addresses requirements for Metering, Telemetry and Communications for Generation interconnections. Section 5.6 addresses System Protection and other Control Requirements. Exhibit ‘C’ addresses specific interconnection details.

3.6.2 Synchronizing Facilities

Improper synchronizing on the electrical system may lead to damage and loss of equipment for AE and other entities. New Generators seeking to interconnect with Austin Energy are responsible for synchronization to the AE Transmission System. Austin Energy is not responsible for the design of the Generation Facility’s synchronization controls or relaying.

3.6.3 Maintenance (Outage) Coordination

Austin Energy requires generation, transmission, and end-user entities to operate and maintain interconnection facilities in accordance with Good Utility Practice. The interconnected entity shall coordinate its operations to maintain continuity of services to its respective customers to the extent practicable. Planned facility maintenance that will cause a deviation from the normal power and energy flow on the interconnection facilities shall be scheduled at a mutually agreeable time. No changes shall be made in the normal operation of the interconnection facilities without the mutual agreement of Austin Energy. Austin Energy and the interconnected entity shall, to the extent necessary to support continuity of operations, coordinate the operation of protective devices on the facilities they operate in the proximity of the interconnection.

3.6.4 Frequency and Voltage Operational Issues

Austin Energy and the interconnected generator, transmission or end-user entity shall design and install all apparatus and necessary protective devices on its respective side of the Point of Interconnection to reasonably minimize the likelihood of voltage and frequency abnormalities, originating in the system of one party, from affecting the system of the other party.

Under-frequency load shedding and generator under-frequency relay settings must be maintained consistent with ERCOT Nodal Operating Guides, Section 2.6 “Requirements for Under-Frequency Relaying” in order to maintain the dynamic stability of the interconnected system.

3.6.5 Inspection of Existing or New Facilities

Regarding inspection of Existing or New Facilities, AE reserves the right to require a field inspection of the interconnection facilities for compliance with minimum safety code requirements and installation rules and standards for electric service established for the AE service area.

3.6.6 Communications and Procedures during Normal and Emergency Conditions

During normal conditions, Austin Energy and the interconnected generation, transmission, or end-user entity shall assist each other in implementing all transmission switching functions as necessary to operate the transmission system safely and efficiently. Austin Energy and the interconnected entity shall notify each other and ERCOT of any abnormal relaying configuration that may affect reliability. The interconnected entity is expected to fully cooperate with Austin Energy system operators.

During emergency conditions, Austin Energy and the interconnected generation, transmission, or end-user entity shall comply with ERCOT Nodal Operating Guide Section 4 “Emergency Operation” and shall render available emergency assistance to each other provided each entity has completed implementation of its own emergency procedures. These actions shall not, however, violate safety, equipment, or regulatory or statutory requirements. Austin Energy and the interconnected entity shall notify each other and ERCOT of any abnormal relaying configuration that may affect reliability. The interconnected entity is expected to fully cooperate with Austin Energy system operators.

3.6.7 Small Generation Facilities

The Austin Energy interconnection guide for power production units smaller than 10 MW is located on the AE website at: “austinenergy.com › Contractors › Electric service design and planning › Distribution Interconnection Guide.”

4. Review Log:

This document shall be reviewed periodically, as necessary by changes in NERC or Texas RE Standards or changes in AE operational processes.

Reviewed By:	Title	Date
James Armke	Manager, T&D Planning and Regulatory Analysis	May 21, 2015
Lisa Martin	Transmission Service Compliance Program Manager	June 25, 2015
James Armke, Jeanie Doty	Manager, T&D Planning and Regulatory Analysis, Program Manager, Reliability Compliance	January 2016
Shirley Mathew David Tomczyszyn	Transmission Planning Program Manager Managing Engineer – Transmission, Substation, Relay, Protection	August 9, 2021
Jianhui Zhang Maria De La Cruz Imane Mrini David Tomczyszyn	Transmission Planning Program Manager Acting Director, Transmission and Distribution Planning Operations Compliance Program Manager Supervisor, Substation Engineering	December 5, 2023

4.1 Revision History

The change history below reflects the date changes to this document, or its structure became final.

Version	Description of change	Date
V 01.00	Initial document	May 2010
V 02.00	Annual document review and edits, update ERCOT references	May 2011
V 03.00	Annual document review and edits	May 23, 2012
V 04.00	Annual review and edits, clarify references to ERCOT market rules and other documents.	May 23, 2013
V 04.01	Annual review, update references to AE Distribution Interconnection Guide	May 23, 2014
V 04.02	Annual review; added review log and signature block for Director,	June 25, 2015

	Reliability Compliance	
V 05.00	Modified document includes “material modifications of existing interconnection Facilities” and the minimum studies to be conducted in relation to a new or modified Facility. Changed the order of the Review Log and Review History and added these to the Table of Contents.	February 2, 2016
V 2021.09	Updated Interconnection Requirements and other sections	
V 2023.12	Changed the definition of “materially modified interconnection” with “qualified change interconnection” to reflect ERCOT’s determination of a qualified change and to comply with NERC Reliability Standards FAC-001-4 and FAC-002-4 becoming effective on January 1, 2024.	December 4, 2023