TO-FAC-001
End User Facility Interconnection Requirements

Organization: Transmission Owner

APPROVALS

Transmission Director Steve Martin 2/19/2019

Signature *Date*

Garland Power & Light
217 N Fifth St
Garland, TX 75040

Applicability

This guideline applies to all City of Garland business functions performed under applicable ERCOT Registrations, NERC registrations, Joint Registration Agreements, Coordinated Functional Registration Agreements, or Delegation Agreements.

This guideline applies to Transmission Facilities owned by Texas Municipal Power Agency (TMPA) that are operated and maintained by the City of Garland.

This document shall be applicable to the City of Garland:

- Transmission Owner

Scope

The City of Garland has established the following end user facility connection requirements to ensure compliance with North American Electric Reliability Corporation (NERC) Standard FAC-001 and applicable Regional Reliability Organization (Electric Reliability Council of Texas, or ERCOT) planning criteria. The requirements follow the outline of FAC-001 and use a modified form of the outline numbering system of FAC-001. Elements of FAC-002 have been incorporated throughout this document. A written summary of plans to achieve required system performance throughout the planning phase for new connections shall be developed as necessary.

Reference Documents

North American Electric Reliability Corporation (NERC) Standard FAC-001

Garland Power and Light Facility Connection Requirements

The City of Garland has established the following end user facility interconnection requirements in compliance with North American Electric Reliability Corporation (NERC) Standard FAC-001 and other applicable ERCOT and the City of Garland planning criteria. The requirements follow the outline of FAC-001 and use a modified form of the requirement numbering system of FAC-001. Elements of FAC-002 have been incorporated throughout this document. A written Summary of plans to achieve required system performance throughout the planning phase for new interconnections shall be developed as necessary.

Coordinated joint studies of new or materially modified existing interconnections and their impacts on affected system(s).
The impact of the end user facility connection on the reliability of the interconnected transmission system shall be evaluated. This evaluation shall include independent steady-state, short-circuit, and dynamic studies of the affected transmission line by the City of Garland and by the End User in accordance with Reliability Standard TPL-001 or subsequent standards as such standards are

adopted. Documentation of the studies, including study assumptions, system performance, and alternatives considered shall be retained for a minimum of three (3) years.

The studies shall be compared by personnel from both entities to determine a joint assessment of the reliability impacts of the new facilities on the interconnected transmission system. Documentation of coordinated and cooperative assessment shall be retained for a minimum of three (3) years. The studies shall be conducted using the ERCOT load flow models as modified to include the construction of the proposed facilities.

Notification those responsible for the reliability of affected systems(s) of new or materially modified existing interconnections

The City of Garland and the End User shall coordinate submission of the proposed connection to ERCOT following the approved procedures published by ERCOT. The submission shall be made as soon as feasible following joint confirmation that the proposed connection has no adverse reliability impact.

The City of Garland and the interconnecting End User shall each be responsible for providing load flow, short circuit and transient stability model information on their proposed facilities to ERCOT to allow the development of appropriate regional load flow, short circuit and transient stability models for projects for which an Interconnection Agreement has been signed.

At the appropriate time as outlined in the ERCOT Protocols, the City of Garland and the End User shall each be responsible for providing their operational models to ERCOT to develop State Estimator and other models used by ERCOT.

Confirming with those responsible for the reliability of affected systems of new or materially modified transmission Facilities are within a Balancing Authority Area's metered boundaries.

End User shall notify the City of Garland through email or other written communication that it has verified the facilities are within the Balancing Authority Area's metered boundaries.

Voltage Level and MW and MVAr Capacity or Demand at Point of Connection

All studies shall document the anticipated voltage level and the anticipated MVA, MW, and MVAR capacity and demand at the connection point. The City of Garland and the End User shall compare this data to ensure correlation, and shall resolve any discrepancies. Documentation shall be retained for a minimum of three (3) years.

Breaker Duty and Surge Protection

The City of Garland and the End User shall ensure that the circuit breaker(s) installed to provide the proposed connection at 345 kV shall meet the following minimum standards:

- Voltage rating: 362kV
- BIL: 650kV
- Continuous current rating: 5kA
- Interrupting current (short circuit) rating: 40kA.
- 4 sets of: 5000/5 multi-ratio C-800 relay class CT with TR=2.

- The breaker(s) shall be rated to interrupt available fault current at the connection point.

The City of Garland and the End User shall ensure that the circuit breaker(s) installed to provide the proposed connection at 138kV shall meet the following minimum standards:

- Voltage rating: 145kV
- BIL: 650kV
- Continuous current rating: 3kA
- Interrupting current (short circuit) rating: 63kA.
- 4 sets of: 3000/5 multi-ratio C-800 relay class CT with TR=2.
- The breaker(s) shall be rated to interrupt available fault current at the connection point.

GP&L and the End User shall ensure that the circuit breaker(s) installed to provide the proposed connection at 69kV shall meet the following minimum standards:

- Voltage rating: 72.5kV
- BIL: 350kV
- Continuous current rating: 2kA
- Interrupting current (short circuit) rating: 50kA.
- 4 sets of: 2000/5 multi-ratio C-800 relay class CT with TR=2.
- The breaker(s) shall be rated to interrupt available fault current at the connection point.

System Protection and Coordination

The City of Garland and the End User shall review the proposed system protection schemes of each entity to ensure compatibility of the schemes. Both entities shall abide by NERC and ERCOT requirements which address protective relaying. In the event of a conflict the City of Garland reserves the right to specify relays and equipment interconnections to be installed by the End User for any protection scheme which directly affects the City of Garland facilities. Both entities shall ensure that relaying schemes and coordination are appropriate for the proposed connection. The End User shall install fault recording equipment per ERCOT requirements, and both entities shall provide facilities for time stamping recorded events to ensure correct sequencing of events for analysis, if required

Metering and Telecommunications

The City of Garland and the End User shall ensure that installed meters and related circuitry and equipment (CT's, PT's, etc.) meet or exceed NERC and ERCOT requirements. Telecommunications and relay channels between the City of Garland facilities and the End User's facilities shall be fiber optic connections, unless otherwise agreed and shall meet the City of Garland standards and equipment so that no modification of the City of Garland's existing communication other than adding components is necessary.

Grounding and Safety Issues

Facility grounding shall be designed in conformance with best engineering practice and NERC and ERCOT requirements. The grounding associated with all generation facilities shall be sufficient to minimize impact on the interconnected transmission system and ensure the safety of personnel and passers-by.

Personnel of both the City of Garland and the End User shall be made aware of the safety practices of both entities, and shall be required to meet said requirements when visiting the other entities facilities.

Insulation and Insulation Coordination

Insulation of 345 kV bus and transmission lines shall be at 650 kV BIL unless otherwise agreed.

Insulation of 138 kV bus and transmission lines shall be at 650 kV BIL unless otherwise agreed.

Insulation of 69 kV bus, transmission lines and transformers shall be at 350 kV BIL unless otherwise agreed.

Insulation of transformers or other equipment operated at 138 kV shall be rated no higher than 650 kV BIL except by mutual agreement.

Voltage, Reactive Power and Power Factor Control
The End User facility shall operate within voltage, frequency, and reactive power limits established by ERCOT and NERC, including the requirements of NERC Standards VAR-001 and VAR-002. The End User shall at all times maintain the reactive power such that the power factor shall exceed 0.97 at all times in accordance with PUCT regulations.

If the End User fails to maintain a power factor of 0.97 or higher the City of Garland shall install appropriate equipment to maintain the power factor at 0.97 or higher, such cost to be paid by the End User.

Power Quality Impacts
The City of Garland and the End User shall maintain power quality sufficient to prevent any adverse effect on the interconnected transmission system. All Federal State, or Local Regulations, Statutes, and Guidelines shall apply.

Equipment Ratings
Rating for all substation equipment installed by the City of Garland or the End User will be as follow:

345 kV service shall be rated to carry a minimum of 5 kA of continuous load current.
138 kV service shall be rated to carry a minimum of 3 kA of continuous load current.
69 kV service shall be rated to carry a minimum of 2 kA of continuous load current.

For all voltage class, the short circuit current rating of 40kA for 30 cycles is the minimum. Relays and metering equipment shall withstand a secondary current of 125 amps for 30 cycles.

New transmission lines at the interconnection should be designed for a minimum of 1400 amps unless otherwise agreed.

The City of Garland and the End User shall be responsible for developing and communicating equipment ratings as required under NERC Standard FAC-008.

Synchronization
the City of Garland and the End User shall each install facilities to ensure that connection of the new facilities to the interconnected transmission system shall occur only when the new facilities and associated facilities and the bulk electric system are in synchronization with each other or when the End User is de-energized.

The End User shall not have a method of energizing the point of interconnection which could energize the facilities of the City of Garland unless specifically authorized by an interconnection agreement.

Maintenance Coordination
The City of Garland and the End User shall coordinate maintenance activities for the facilities of both entities to ensure minimum reliability impact on the interconnected transmission system. Each facility shall document both its maintenance schedule for all equipment, and compliance with said schedule. Documentation shall be retained for a minimum of three (3) years.

Operational Issues (abnormal frequency and voltage)
The End User shall install appropriate systems to ensure that abnormal frequencies, voltage swings, or current levels shall not impact the reliability of the interconnected transmission system.

Inspection Requirements for Existing or New Facilities
The City of Garland and the End User shall each establish and maintain inspection programs to ensure the integrity and serviceability of all installed facilities to minimize impact on the reliability of the interconnected transmission system. Documentation of said programs and compliance with said programs shall be maintained for a minimum of three (3) years.

Communications and Procedures during Normal and Emergency Operating Conditions
Methods of communication and joint operating procedures for both normal and emergency conditions shall be developed and documented. These shall be published to all necessary personnel of the City of Garland and the End User.

Compliance with Standards, Operating Guides and Protocols
The City of Garland and the End User shall each be responsible to ensure compliance with NERC Reliability Standards and applicable Regional, subregional, Power Pool, and individual system planning criteria and facility connection requirements for their own facilities. Documentation of such compliance shall be retained for a minimum of three (3) years.

Design by Registered Professional Engineer
Design of all End User facilities shall be done by a Registered Professional Engineer licensed to practice in the State of Texas. All specifications, drawings, and documents related to the design shall be duly stamped and signed in accordance with the laws of the State of Texas. All designs shall be done in conformance with best engineering practice, ANSI and IEEE standards, OSHA, and other applicable Federal, State or local regulations. The GO shall submit 1-line and 3-line relaying and metering diagrams to the City of Garland for approval. The City of Garland shall provide the same diagrams of the relevant the City of Garland facilities to the GO for review.

Right to Submit Data
the City of Garland shall have the right to submit plans, designs, operational information, load projections and telemetry of the End User facilities to North American Electric Reliability Corporation (NERC), Electric Reliability Council of Texas (ERCOT), Texas Reliability Entity (TRE), Federal Energy Regulatory Commission (FERC), Public Utility Commission of Texas (PUCT) or other regulatory agencies, Transmission Operators, Reliability Coordinators, utilities, or auditors as required by statute, regulation, rule, standard, operating guide or protocol.

Modification of Requirements
Any of these requirements and responsibilities can be changed by mutual agreement of the City of Garland and the End User.

Update of Requirements / Provide Documents Upon Request

The City of Garland shall maintain and update these facility connection requirements as necessary to account for changes in relevant Reliability Standards, changes in technology, or increased demand or capacity of either the interconnected transmission system or the new transmission facilities.

All documentation specified in these requirements, including this instrument itself, shall be made available to users of the transmission system, ERCOT, and NERC within five (5) business days upon request.

Revision History

Revision	Date	Change
0	06/08/2009	Initial release.
1	08/19/2009	Updated Format
2	10/28/2009	Added Revision 0 to Revision History, Updated title page
3	02/11/2010	Added specifications for 69 kV breakers and requirement for metering accuracy CT's
4	08/18/2010	Added Headings, reordered paragraphs to track standard.
5	01/01/2019	Updated agreement to meet FAC-001-5 version, removed the **Terms and Definition** section, updated the voltage class and current ratings, updated the City of Garland logo, modified fonts and format. (mn)
6	02/19/2019	Added "**APPLICABLITY**" section to include TMPA. Replaced "GP&L" with "The City of Garland. (mn)