TEXAS MUNICIPAL POWER AGENCY
REGULATORY TRANSMISSION PROCEDURE

END USER FACILITY CONNECTION REQUIREMENTS		PROCEDURE NO.	R-T-40
		REV. NO.	3
		EFFECTIVE DATE	3/03/03
		REVISION DATE	2/22/13
APPLICATION:	**INTERPRETED BY:**	**SUBMITTED BY:**	
Transmission Dept.	Transmission Manager	Transmission Project Manager	

PURPOSE:
To avoid adverse impacts on reliability, Transmission Owners must establish end user facility connection requirements per North American Electric Reliability Corporation (NERC) Standard FAC-001. The following are the requirements established by Texas Municipal Power Agency (TMPA) to ensure the reliability of the TMPA system as well as compliance with the above NERC standard and Electric Reliability Council of Texas (ERCOT) Operating Guides. 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.

TMPA END USER FACILITY CONNECTION REQUIREMENTS

1. **Coordinated Joint Studies**
   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 TMPA 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.

2. **Notification of New or Modified Facilities to Others (those responsible for the reliability of the interconnected transmission systems) as soon as feasible**
   TMPA 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.

   TMPA 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, TMPA 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.

3. **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. TMPA 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.

4. **Breaker Duty and Surge Protection**

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

- Rated voltage: 362kV
- Rated insulation level: 1300kV
- The rated Lightning Impulse Withstand Level (LIWL): 1300kV
- Rated Power Frequency Withstand Voltage: 555kV (low frequency withstand)
- Rated SIWL (Switching Impulse Withstand Level) for voltages ≥300 kV: 825kV terminal to ground, breaker closed, 900kV terminal to terminal, breaker open
- Rated Chopped Wave Impulse Withstand voltage: 1680kV, 2 microseconds; 1500kV, 3 microseconds
- Rated frequency: 60 Hz
- Rated short-time withstand current: 6571 A, ½ hour; 6016A, 1 hour; 5758A, 2 hours; 5672 A, 4 hours
- Rated normal current: 5000A
- Rated peak withstand current: 50kA (3 second)
- Rated short-circuit breaking current: 50kA
- Rated short-circuit making current: 135kA

TMPA 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:

- Rated voltage: 145kV
- Rated insulation level: 650kV
- The rated Lightning Impulse Withstand Level (LIWL): 650kV
- Rated Power Frequency Withstand Voltage: 310kV (low frequency withstand)
- Rated Chopped Wave Impulse Withstand voltage: 838kV, 2 microseconds; 748kV, 3 microseconds
- Rated frequency: 60 Hz
- Rated short-time withstand current: 3705 A, ½ hour; 3452A, 1 hour; 3336A, 2 hours; 3297 A, 4 hours
- Rated normal current: 3000A
- Rated peak withstand current: 50kA (3 second)
- Rated short-circuit breaking current: 50kA
- Rated short-circuit making current: 135kA

5. **System Protection and Coordination**
TMPA 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 TMPA reserves the right to specify relays and equipment interconnections to be installed by the End User for any protection scheme which directly affects TMPA 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

6. **Metering and Telecommunications**
TMPA 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 TMPA facilities and the End User's facilities shall be fiber optic connections, unless otherwise agreed and shall meet TMPA standards and equipment so that no modification of TMPA's existing communication other than adding components is necessary.

7. **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 TMPA 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.

8. **Insulation and Insulation Coordination**
Insulation of 345kV bus and transmission lines shall be at 1300kV BIL unless otherwise agreed.

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

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

Insulation of transformers or other equipment operated at 345kV shall be no higher than 1300kV BIL except by mutual agreement.

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

9. **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 TMPA shall install appropriate equipment to maintain the power factor at 0.97 or higher, such cost to be paid by the End User.

10. **Power Quality Impacts**
TMPA 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.

11. **Equipment Ratings**
Ratings for all substation equipment installed by TMPA or the End User shall be rated to carry a minimum of 5kA of continuous load current at 362kV (for 345kV Equipment), a minimum of 3kA of continuous load current at 145kV (for 138 kV Equipment) and a short circuit current rating of 50kA for 30 cycles. 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.

TMPA and the End User shall be responsible for developing and communicating equipment ratings as required under NERC Standard FAC-008 and FAC-009.

12. **Synchronization**
TMPA 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 TMPA unless specifically authorized by an interconnection agreement.

13. **Maintenance Coordination**
TMPA 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.

14. **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.

15. **Inspection Requirements for Existing or New Facilities**
TMPA 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.

16. **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 TMPA and the End User.

17. **Compliance with Standards, Operating Guides and Protocols**
    TMPA and the End User shall each be responsible to ensure compliance with NERC Reliability Standards and applicable Regional, sub regional, 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.

18. **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 End User shall submit 1-line and 3-line relaying and metering diagrams to TMPA for approval. TMPA shall provide the same diagrams of the relevant TMPA facilities to the End User for review.

19. **Right to Submit Data**
    TMPA 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.

20. **Modification of Requirements**
    Any of these requirements and responsibilities can be changed by mutual agreement of TMPA and the End User.

Update of Requirements / Provide Documents upon Request
TMPA 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.

REFERENCES:

- NERC Standard FAC-001

APPROVALS:	DATE:	DESCRIPTION OF CHANGE	REV. #:
Transmission Project Manager/Paul Ricciardi	2/22/13	New document split from R-T-8 to address end user facility connection requirements; updated titles and names in signature block;	3
Transmission Engineer/Ahmad Saboor	2/22/13		
Interim Transmission Manager/Tom Chambers	2/22/13		
Compliance Officer/Brent Hebert	2/22/13		

Procedure R-T-40
End User Facility Connection Requirements Procedure
Revision History

Revision No.	Description of Revision	Date	By
0	Original	3/23/2003	Rick Gurley
1	Put into procedural format; added frequency of review	9/03/2009	Eric Schroeder
2	Updated header and footer; added Transmission Project Manager to review procedure for accuracy and/or revisions; minor formatting throughout.	2/03/2012	Frank Owens
3	New document split from R-T-8 to address end user facility connection requirements	2/22/2013	Brent Hebert