NATIONAL COUNCIL
ON ELECTRICITY POLICY

Annual Meeting 2019

Evolving Transmission, Distribution, and Customer System Coordination

Wednesday, September 11 –
Thursday, September 12

Austin, Texas

State Examples: Advancing Transmission, Distribution, and Customer System Coordination

Hon. ToNola Brown-Bland, Moderator

Mark Oliver

Constance McDaniel Wyman

Distributed Energy Resources

Constance McDaniel Wyman

Presented to NCEP

2019

Distributed Energy Resources

Three-part presentation

- Regulatory framework
- Case study of Utility A and Company B
- Current status and projects

The Regulatory Framework

Electric Infrastructure Puzzle

All three US power grids exist in Texas

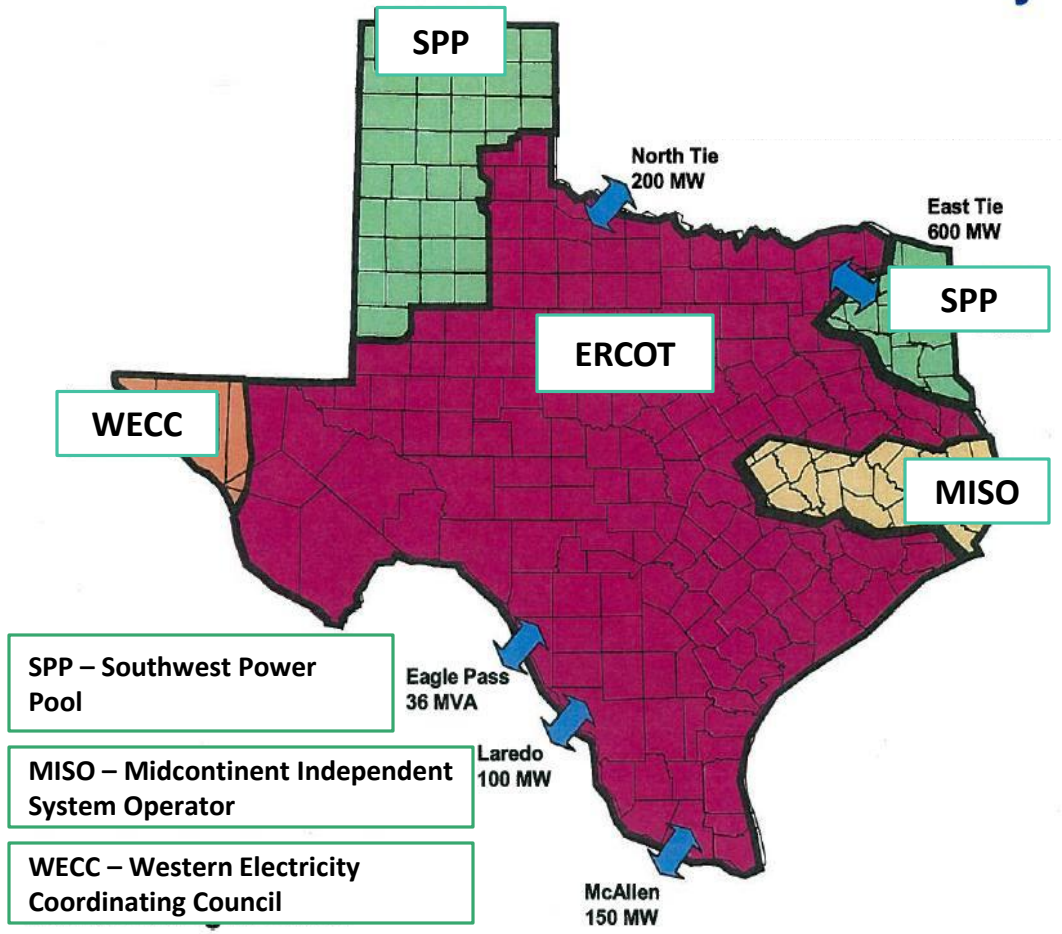
- Eastern Interconnection (EI)
- Western Interconnection (WECC)
- The Electric Reliability Council of Texas (ERCOT)

Regional Transmission Organizations (RTO's)

- ERCOT (TX only; ~85% of state; state regulated)
- Southwest Power Pool (SPP); part of EI; state and federal regulation
- Mid-Continent Independent System Operator (MISO); part of EI; state and federal regulation
- The Texas portion in WECC has no RTO; state and federal regulation

Electric Infrastructure Puzzle

Within Texas, the ERCOT grid serves 85% of the electric load, and covers 75% of the land. ERCOT is connected to the Eastern Interconnect and Mexico by DC ties.



SPP – Southwest Power Pool

MISO – Midcontinent Independent System Operator

WECC – Western Electricity Coordinating Council

ERCOT – Electric Reliability Council of Texas

The Regulatory Quilt

Vertically integrated utilities vs. wire and poles utilities

In EI (MISO & SPP) and WECC

- Investor owned utilities (IOU's), Municipally owned utilities (Muni's), and Electric Cooperatives (Coop's)
- All vertically integrated
- No customer choice

In ERCOT electric utilities can be

- IOU's which are "wires and poles" only
- Muni's and Coop's (vertically integrated)
- Coop's with or without customer choice and can be wire/poles, have generation, or be vertically integrated

The Regulatory Quilt

Regulation vs. De-regulation/Competition

- Non-ERCOT no competition
- ERCOT TDU's – competition
- ERCOT Coop's and Muni's opted in or out of competition

PURPA standard implications

- In non-ERCOT areas DER's sell power directly to the vertically integrated utility
- Within ERCOT an interconnecting DER selects a Retail Electric Provider to whom to sell their power. (It must be the same REP from whom they buy power.)

The Regulatory Quilt

Munis and Cooperatives:

- Political subdivisions of the state
- Vertically integrated
- Can write their own standards for implementation of DER
- Can choose to offer financial incentives for the installation of DER
- Can choose meter configuration

Non-ERCOT IOU's:

- Vertically integrated
- Specific tariffs containing class sizes and rates for various DER's
- Can net-meter; AMS coming soon
- Must buy the power

ERCOT IOU's:

- Only wires and poles
- All have AMS
- Obligation to interconnect, but not to buy power
- Power purchased through agreement with a REP

Distributed Resources and Regulation

- Each different combination of power grid, utility type, and regulatory framework leads to a slightly different construct for renewable energy interconnection.
- Each different combination provides different incentives and has different types installations and degrees of renewable penetration.
- The commission's rules address DG interconnection and technical requirements, metering for DRG, and are applicable statewide
- Although the rules are statewide the non-ERCOT IOU's have not had statutory language regarding cost recovery of meter conversion on AMI, hence the "coming soon" label.
- For TX DRG means a renewable energy system of <2MW; DG means 0-10 MW of any generation source

Reported Distributed Resources

- PUCT receives reports from ERCOT and Non-ERCOT IOU's detailing the distributed generation interconnections on their system. The reports for 2018 are available under **Project 49067**.
- The following numbers are from the report of CenterPoint Energy Houston Electric
- What's on this one utility's system:
  - 269.6 MW of DG on system before 2018
  - 100.4 MW of new interconnections in 2018 (brings current total to 370.0 MW)
  - 185.8 MW pending interconnection
  - 76.2 of previously ending projects were cancelled
  - 24.7 MW removed for the system in 2018
  - 370 MW is equivalent to a large scale transmission interconnected generation plant.

Reported Distributed Resources

- CenterPoint DG numbers (cont'd)
- What are these connections is made up of:
  - Landfill gas, diesel and natural gas generators, hydro? Yes, all → but mostly its small solar
  - Largest of the 3080 DG installations to CenterPoint's system only 119 are greater than 50kW.
  - Most of the systems from 12,000 to 50kW are natural gas or diesel generators, with the exception of a few 5,000kW solar installations that were added in 2018.
  - The vast majority of systems <50kW are solar installations.

The Case Study: Utility A and Company B

The Complaint

- Utilities A, Q, and Z all are “wires and poles” transmission and distribution providers in the ERCOT region.
- Company B provides back-up generation for large box stores, and when the system is in normal operation sells power onto the grid (into the market) via distribution interconnection.
- Company B has installed or is working to install their systems in the service areas of all three utilities.
- Company B complained that Utility A required different types of equipment for interconnection of the DER facilities than Utilities Q and Z, which resulted in increased costs for comparably sized installations.
- Company B also complained that Utility A was unreasonably limiting the size of the units that could be installed on a given feeder.
- Taken together these factors reduced the net economic value of the projects to Company B.

The Issues (general)

- Bulk power system visibility for dispatch and market purposes
- Policy and standardization questions that could not be addressed via complaint between a company and a utility
  - Standardization of protection schemes
  - Visibility of feeder loading to market participants
    - Fairness to all market participants
    - Physical security considerations
- Transparency in model assumption and cost estimates
- Nominal voltage used for voltage trips
- Aggregate vs. single DER configuration on a feeder

The Issues (complaint-specific)

- While the bulk power system is operated at the RTO level, and therefore, modeled and designed consistently across the transmission grid, individual utilities' distribution systems are often independent of other utilities' systems
  - Different planning and operation specifications, and tariffs
  - Different procedures, relay settings, and timings

- Different protection schemes
  - Company B favored the use of a reverse power protection scheme which was acceptable to Utilities Q and Z, but not Utility A.
  - Utility A preferred a Direct Transfer Trip (DTT) that it controlled and initiated at the substation
  - The timing for the reverse power protection was too slow for the relay settings on Utility A's system

The Issues (complaint-specific)

- Utility A has felt it was operationally prudent to model the lowest load for feeders under contingency situations where the distribution system might be in a configuration other than its normal operating configuration.
  - The 1/3rd rule: generation located on a given feeder should not exceed one-third of the load on the feeder or should employ DTT

The Process

- PUC engineering staff acted as a mediator to bring Utility A, and Company B into constructive discussions.
- Utility A and Company B both took turns presenting the issues from their perspective. Over time this led to a series of technical discussions that helped lead to resolution:
  - Possible adjustments to relay setting and timing
  - Determination of appropriate generation : feeder loading
- Utility A participated in an independent study to examine the feasibility of RP protection configuration under various scenarios
- The discussions served as a platform to educate PUC staff about real issues involved in the incorporation of the expected growth in DER's on the system

The Resolution

- The independent study informed the technical feasibility of RP protection schemes in certain scenarios
- Utility A and Company B were able to determine that RP protection schemes were feasible at some, but not all of, Company B's proposed locations
- Utility A and Company B were able to come up with a process and transparent calculations for determination of minimum feeder load that gave better certainty to the project planning of Company B.
- Company B was able to move forward with commissioning of additional synchronously-connected DER systems

The Take Away

- Additional work needs to be done in order to facilitate additional deployment of DER's on the distribution system
- Standardization and regulatory certainty are vital across individual utilities' systems and across the state
- Additional work is needed to address transmission level issues and dispatchability of DER resources
- A commission project may be called for after technical investigations are concluded

Which leads us to….

Current Status and Projects

Current Conundrums

Visibility of DER
- Power grid modeling
- Market pricing
- Managing utilities (planning, voltage stability, safety)

Adoption and Incorporation of new IEEE 1547
- Voltage and frequency (ride through)
- Communications and visibility
- Different from state rule 16 Texas Administrative Code §25.212

Distributed Energy Resource (DER) vs. Distributed Generation Resource (DGR)
- DER can choose to sell power to the market when advantageous to the owner, but is not dispatchable
- DGR is dispatchable and may provide ancillary services to the grid
- Certainty of DRG availability

Interconnection Agreements
- Necessary changes to include information regarding the transmission grid
- PUC project regarding signatories (PUCT Project 45078)

ERCOT Activities

Recent ERCOT process changes through the stakeholder processes

- **NPRR 866**: Mapping Registered Distributed Generation and Load Resources to Transmission Loads in Network Operations Model - regarding requirements for registration of exporting DG, and codifying the mapping process.

- **NPRR 889**: Replace Non-Modeled Generator with Settlement Only Generator – replaces definitions and adds clarity between distribution-connected and transmission-connected resources.

- **NPRR 891**: Removal of NOIE Capacity Reporting Threshold for the Unregistered Distributed Generation Report – Remove the 50kW size floor for the reporting of DG to capture more completely the DG resources reported to ERCOT.

ERCOT Activities

Recent ERCOT process changes (cont'd)

- **NPRR 917**: Nodal Pricing for Settlement Only Distributed Generation and Settlement Only Transmission Generators – adjusts pricing signals for SODG's and SOTG's

ERCOT is currently analyzing and considering:

- The information and data it is receiving regarding the visibility of registered system
- The processes necessary to ensure that dispatchable DGR's provide the same level of reliability as other dispatchable GR's
  - possible implications for the interconnection agreements
  - need for relationship to the DSP's comparable to the current relationship with TSP's

Projects and References

State rules relevant to DER

- **16 TAC §25.211**: Interconnection of On-Site Distributed Generation
- **16 TAC §25.212**: Technical Requirements for Interconnection and Parallel Operation of On-Site Distributed Generation
- **16 TAC §25.213**: Metering for Distributed Renewable Generation and Certain Qualifying Facilities
- **16 TAC §25.217**: Distributed Renewable Generation

PUCT Rulemaking and project (PUCT website on the 'filings' page)

- Project **48023**: Project regarding the use of non-traditional technologies
- Coming Soon: AMI project regarding cost recovery for non-ERCOT utilities
- Future potential project regarding 16 TAC §25.212, if indicated by ERCOT process

ERCOT reports

- DER Concept Paper (Aug 19, 2015)
- Reliability White Paper (March 22, 2017)

Questions?

Constance McDaniel Wyman

Director of Electric Utility Engineering

Infrastructure Division

constance.mcdaniel_wyman@puc.texas.gov

512-936-7322

State Examples: Advancing Transmission, Distribution, and Customer System Coordination

Hon. ToNola Brown-Bland, Moderator

Mark Oliver

Constance McDaniel Wyman