



CCET

Center for the Commercialization of Electric Technologies

Discovery Across Texas

A Smart Grid Demo Grant Update

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NASPI Work Group Meeting
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Project participants

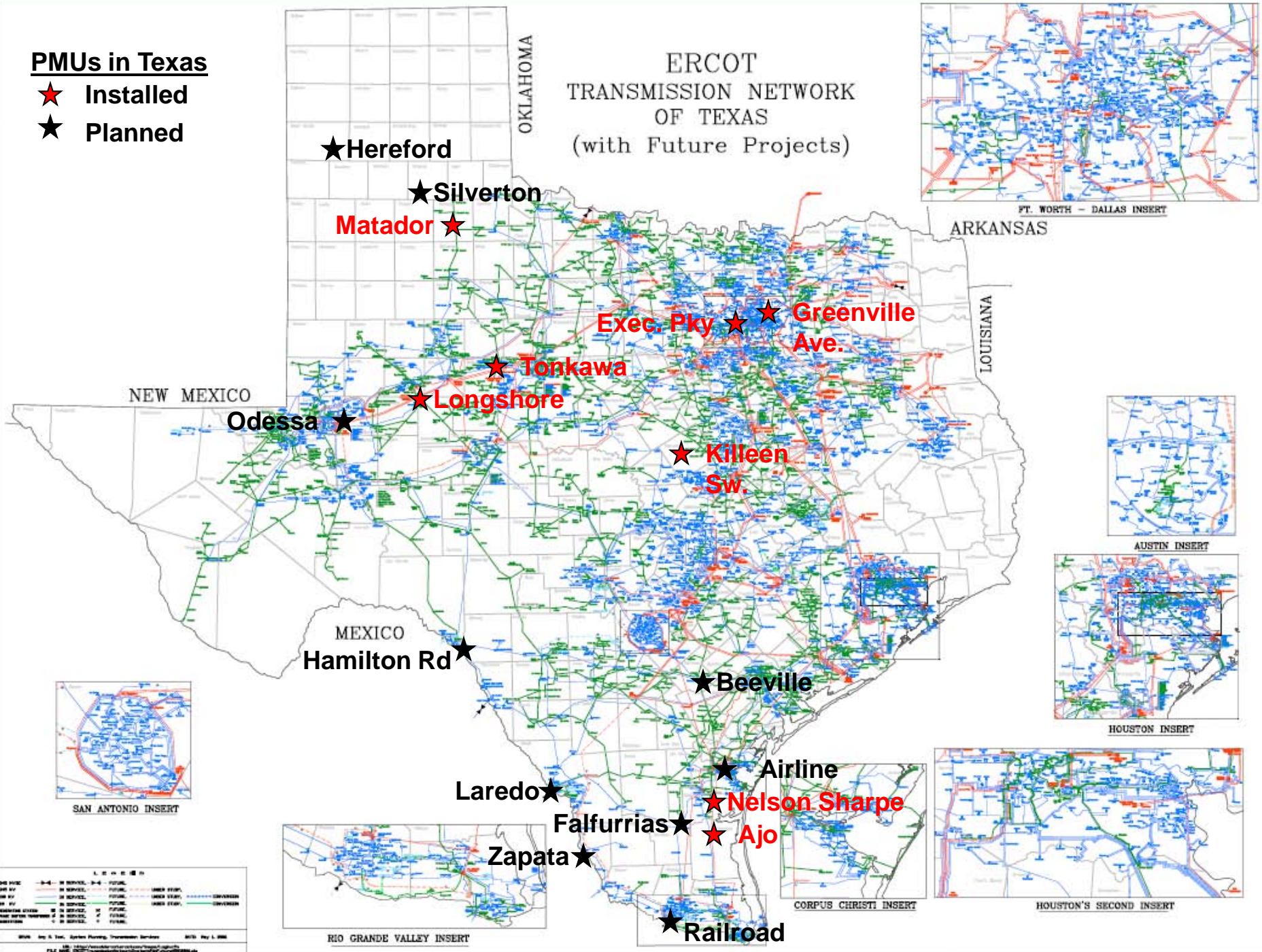
- Center for the Commercialization of Electric Technologies
 - Dr. Milton Holloway
 - contact info

Project TO/asset owner partners

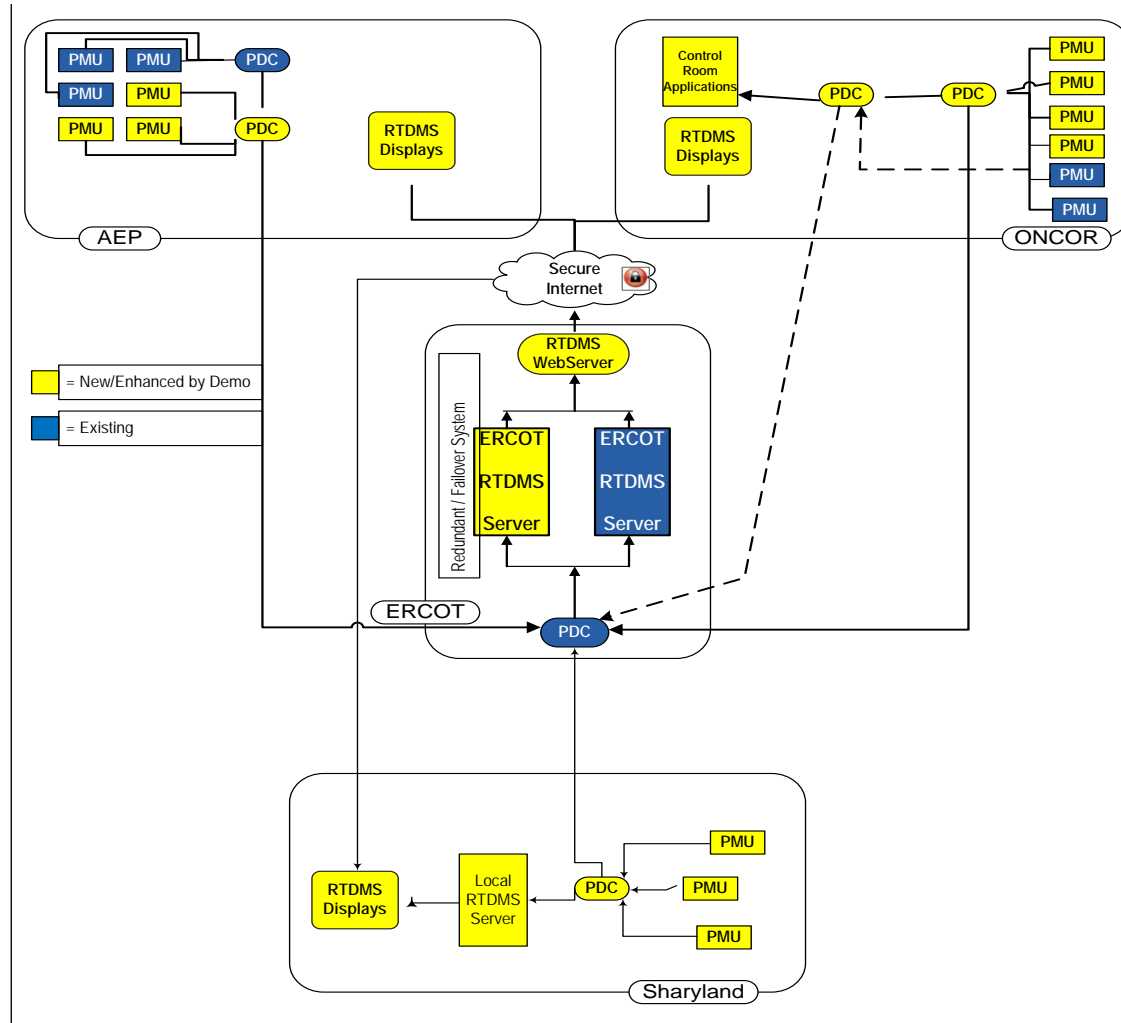
- AEP TEXAS 6 PMUs 2 PDCs
- Oncor Electric Delivery 4 New 2 existing PMUs
1-2 PDCs
- Sharyland Utilities 3 PMUs 1 PDC
- ERCOT 1 PDC
- Electric Power Group
- Drummond Group
- Southwest Research Institute

PMUs in Texas

- ★ Installed
- ★ Planned



PMU -> PDC -> RTDMS Architecture



High-Level General Use Case

- **Short Description:** PMUs at substations collect information and stream data to PDCs at control centers for the utilities. Substation PDCs may be used to aggregate PMU data before streaming the data to the utility PDC. A Central PDC at ERCOT aggregates the data from all of the PDCs. Data is then distributed to the RTDMS and data historians. Individual use cases will be developed for each aspect of the phasor system.
- **Standards Used:** IEEE C37.118, possible future use of IEC 61850
- **Interfaces:** PMUs, PDCs for TDSPs and ERCOT, Substation PDCs, RTDMS, data historian

Approach

- Add 13 PMUs
 - 6 – AEP
 - 4 – Oncor
 - 3 – Sharyland/Hunt
- Install a phasor data concentrator (PDC) at each participating utility and a central PDC at ERCOT
- Integrate and enhance the phasor data concentrators (PDCs) and the Real-Time Dynamic Monitoring System (RTDMS)
- Perform interoperability and cyber security testing
- Collect and analyze synchrophasor data
- Evaluate current transmission engineering models
- Suggest operational and model changes
- Optimize PMU positioning
- Determine future PMU needs and locations

PMUs and PDCs

- Using SEL 421 and GE D60 relays as PMUs
- Using SEL PDC, BPA PDC, EPG ePDC, and perhaps other PDCs
- PMU communications circuits include both utility-owned and leased circuits, with 56 k baud as typical bandwidth.
- PMU data streams aggregated via PDC at each utility, and delivered over ERCOT Private WAN to PCD at ERCOT

RTDMS at ERCOT

- Data streams from TDUs are aggregated in ERCOT PDC
- PDC will stream data to RTDMS Server, which supports visualization client versions 5 & 6
- ERCOT and TDU Users (grid operators and engineers) view RTDMS displays via clients
- RTDMS streams data to historian
- PGDA used for post-event analysis and reporting
- Some RTDMS data will be delivered to ERCOT EMS for display (e.g. alarms)

Security Approach

- Real-time synchrophasor displays will be used by ERCOT grid operators to monitor grid conditions and may be used as a factor in operating decisions, but phasor displays will not directly control grid response
- Synchrophasor data will also be used for modeling and analysis
- Physical and cyber-security of the PMU to TDU-PDC networks will be provided by each TDU.
- Cyber-security of the TDU-PDC to ERCOT-PDC communications via the ERCOT Private WAN will be managed by ERCOT
- Physical and cyber-security of the ERCOT PDC, RTDMS server, data historian, etc will be provided by ERCOT

Communications Approach

- PMU communications within each TDU system will be provided by TDU
- TDU PDC data streams delivered to ERCOT via ERCOT Private WAN (VPN Network)
- RTDMS Visualization Displays will be generated at ERCOT and delivered to RTDMS clients at TDUs via Private WAN
- Project plan includes interoperability testing based on applicable standards (e.g. IEEE C37.118, IEC 61850), and will include testing at the following information exchange interface points:
 - PMU \leftrightarrow PDC
 - PDC \leftrightarrow ERCOT PDC
 - ERCOT PDC \leftrightarrow RTDMS
 - RTDMS \leftrightarrow ERCOT EMS (e.g. alarms)
- Project plan includes a cyber security team review of synchrophasor security policy, procedures, and mechanisms, including risk assessment in design phase, and periodic independent verification and validation reviews during deployment phase

CCET Overview

- **Texas 501(c)6 non-profit**
- **Formed** with 4 founding members in September 2005
- **Current Membership:**
 - 20 electric and high technology companies
 - 5 collaborating universities
- **Mission:**
 - To enhance the safety, reliability, security, and efficiency of the Texas electric transmission and distribution system through research, development and commercialization of emerging technologies
- **See website for additional information:**
<http://www.electrictechologycenter.com/>

DOE Smart Grid Demonstration Project

- **Award Date:** 4 January 2010
- **Award Number:** DE-OE-0000194
- **Title:** *Technology Solutions for Wind Integration in ERCOT*
- **Value:** \$27 million total; \$13.5 million DOE
- **Term:** Five-years
- **Team:** 17 companies participating thus far
- **Phases:**
 - Planning and NEPA compliance
 - Design and installation
 - Demonstration and analysis

Project Overview

➤ **Goal:**

- Demonstrate a synergistic approach to managing fluctuations in wind power in the ERCOT transmission grid through better system monitoring capabilities, enhanced operator visualization, and improved load management

➤ **Primary Components:**

- Synchrophasors
- Smart Meter Texas Portal
- Smart Grid Community of the Future