Overview of Energy Storage in ERCOT

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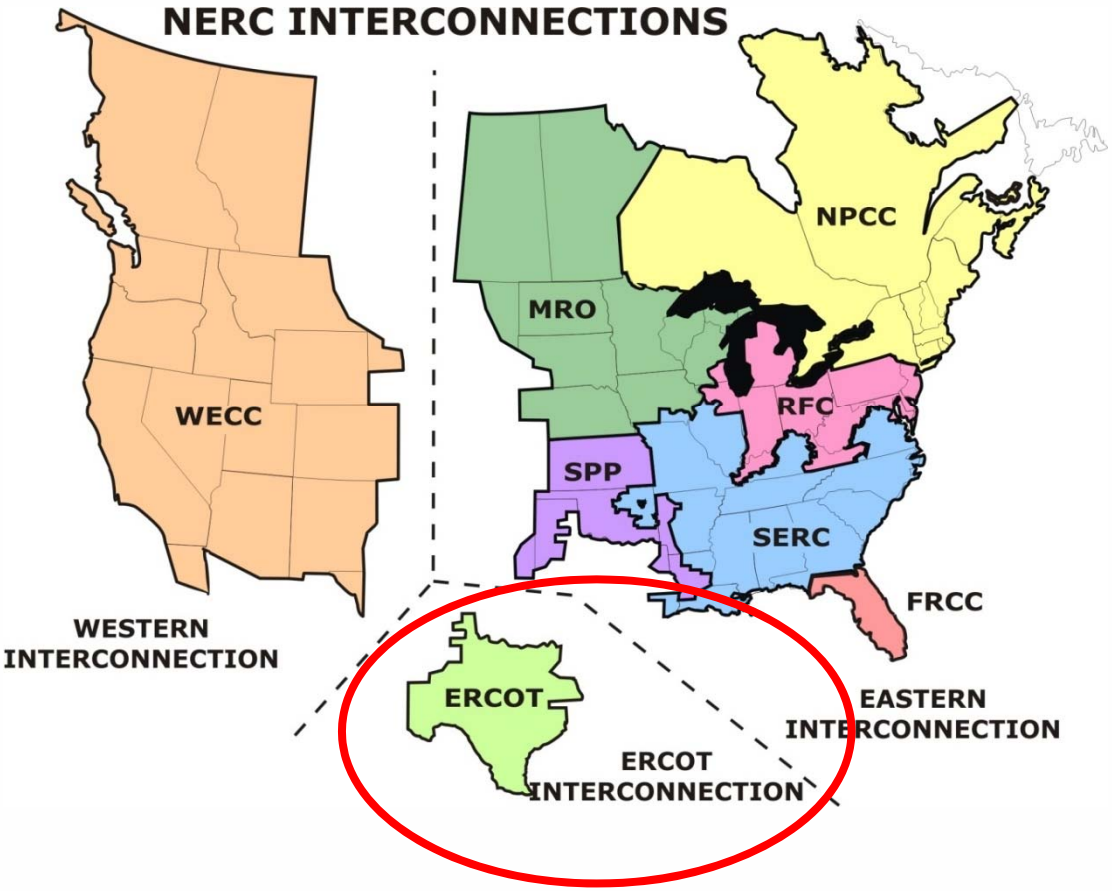
Contents

1. ERCOT Overview
   - Historical and Future Generation Mix
   - Existing and Planned Energy Storage Resources (ESRs)
     - Batteries, CAES, Turbine Inlet Cooling with Thermal Storage, Pumped Hydro, Electric Vehicles, Residential Thermal Storage, Flywheels
2. Historical Load and Price Information (relevant to storage)
3. Current Market Design Issues
   - Pricing and Settlement of Wholesale Storage Load (definition of ESR and eligibility for WSL treatment) [NPRR 461]
   - State of Charge – who should maintain? (ERCOT RTC/RTD Proposal)
   - Various Caps for Energy Storage Resources
   - November 2014 white paper: The Value of Distributed Electricity Storage in Texas
4. Overview of Fast Responding Regulation Service (FRRS)
5. Future Ancillary Services

North American Bulk Power Grids



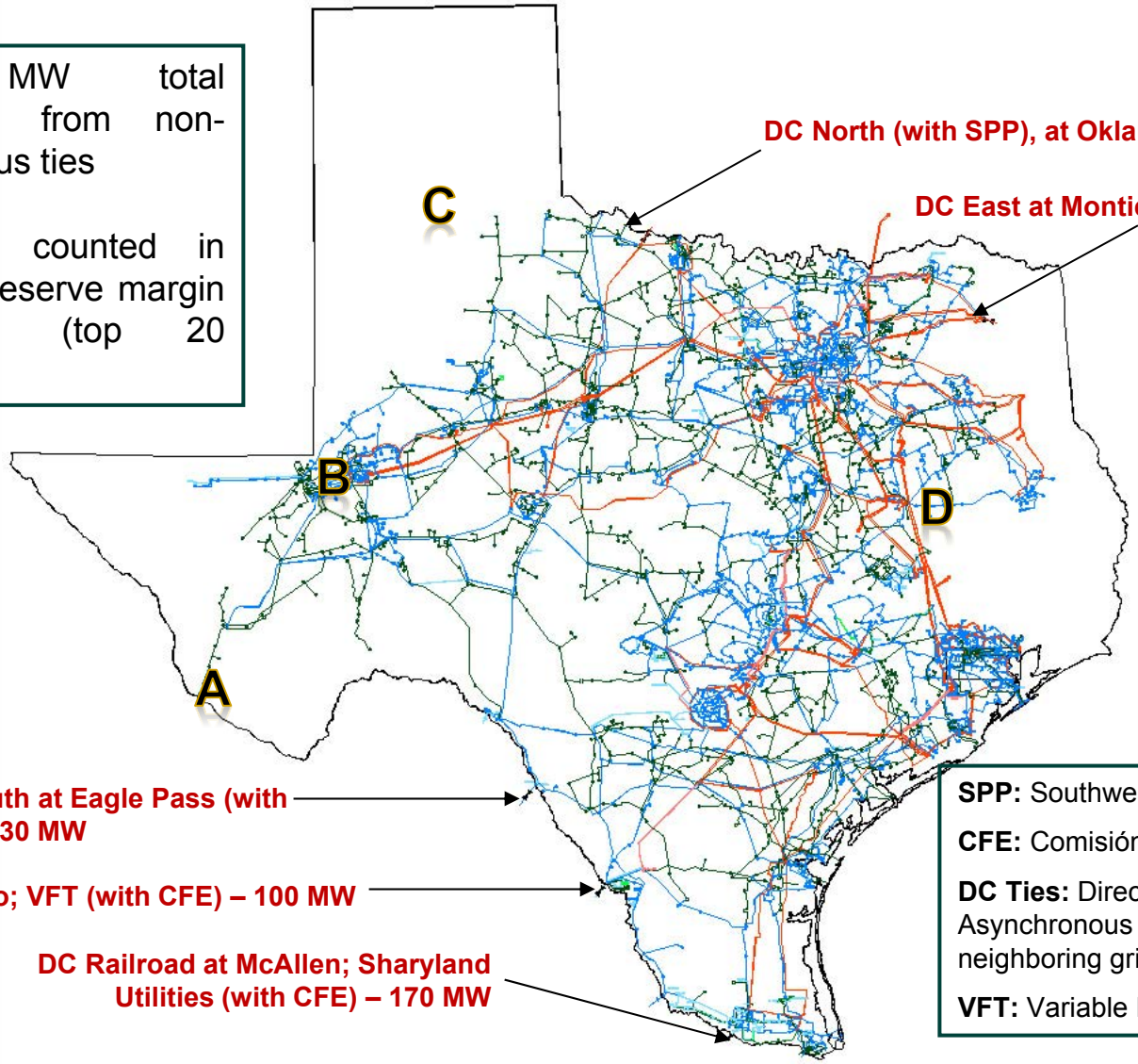
ERCOT connections to other grids are limited to direct current (DC) ties, which allow control over flow of electricity

- The ERCOT Region is one of 3 grid interconnections in USA-Canada
- The ERCOT grid:
  - Covers 75% of Texas land
  - Serves 90% of Texas load
  - >40,000 miles of transmission lines
  - >550 generation units
  - Physical assets are owned by transmission providers and generators, including municipal utilities and cooperatives

DC-Ties

1,120 MW total generation from non-synchronous ties

517 MW counted in summer reserve margin calculation (top 20 hours)



DC North (with SPP), at Oklaunion – 220 MW

DC East at Monticello (with SPP) – 600 MW

DC South at Eagle Pass (with CFE) – 30 MW

DC Laredo; VFT (with CFE) – 100 MW

DC Railroad at McAllen; Sharyland Utilities (with CFE) – 170 MW

SPP: Southwest Power Pool

CFE: Comisión Federal de Electricidad

DC Ties: Direct Current ties – Asynchronous connections with neighboring grids

VFT: Variable Frequency Transformer

Title search: Overview of Energy Storage in ERCOT

Also available as part of the eCourse
Energy Storage: Where Are We Now?

First appeared as part of the conference materials for the
2015 Renewable Energy Law session
"Energy Storage: Where Are We Now?"