



Status of Power Storage in ERCOT

*EUCI's Electricity Storage Conference
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About ERCOT

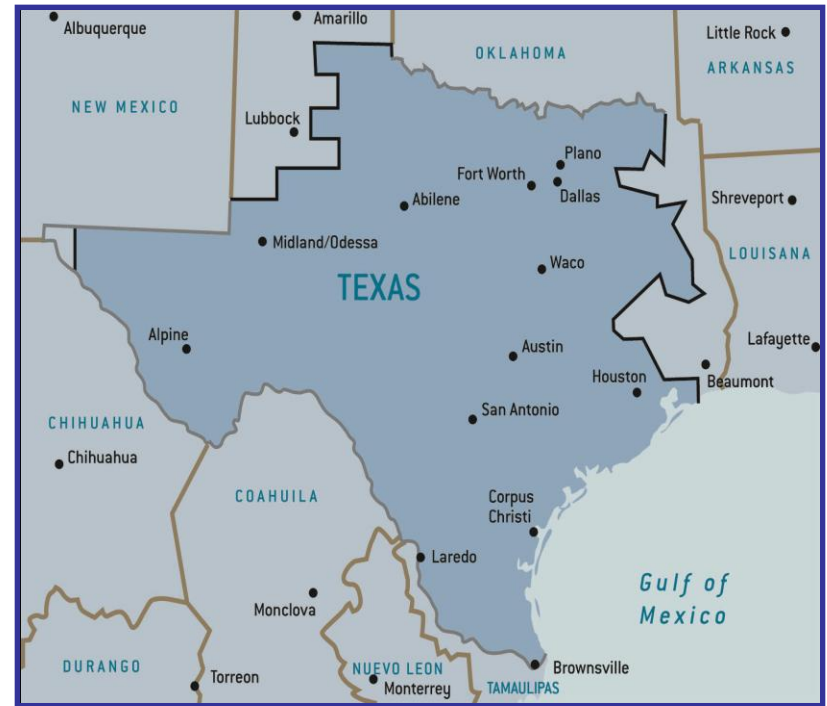
75% of Texas land area

Includes Houston, Dallas, Fort Worth, San Antonio, Austin, Corpus Christi, Abilene and the Rio Grande Valley

Does not include:

- **El Paso area**
- **Texas Panhandle**
- **Northeast Texas**
 - Longview, Marshall and Texarkana
- **Southeast Texas**
 - Beaumont, Port Arthur, and the Woodlands

85% of Texas load, 22 million Texans served



40,000 miles of Transmission Lines

more than 550 Generation Units

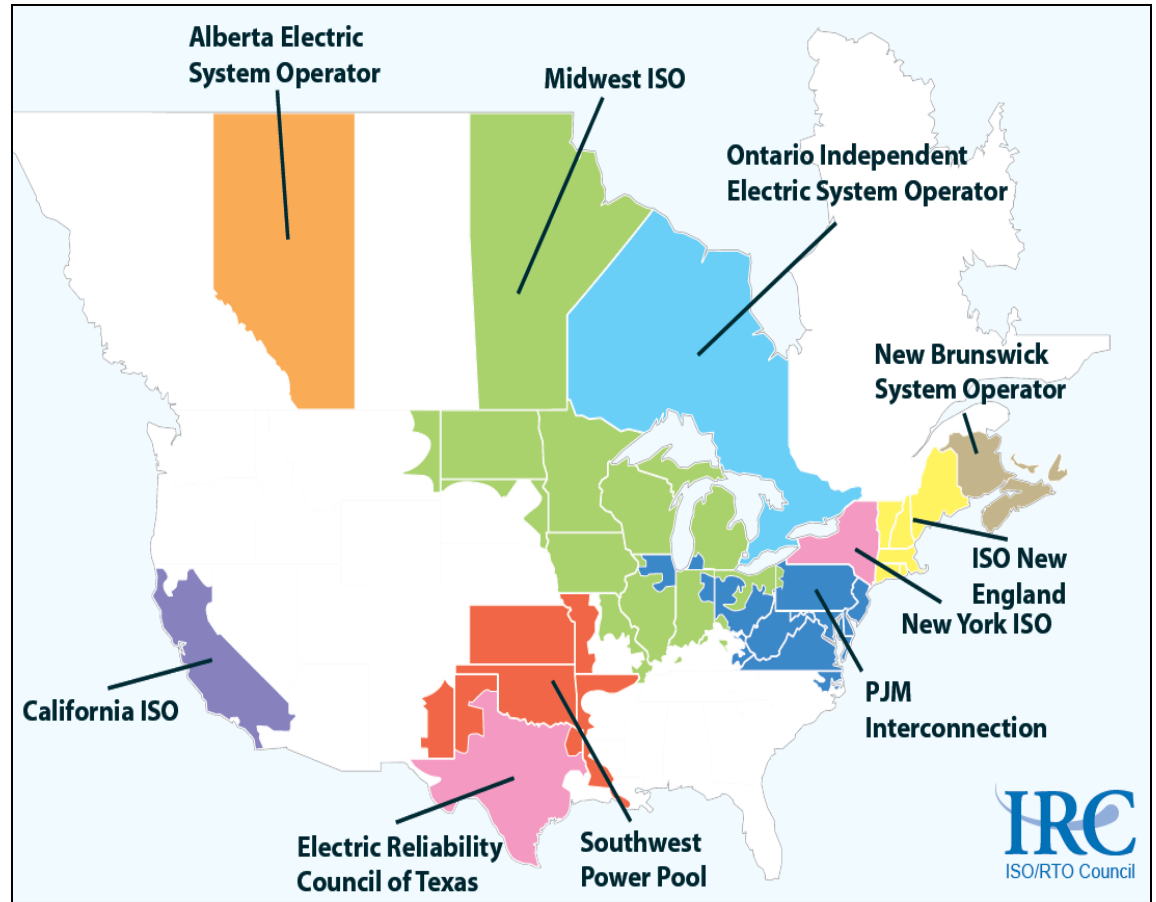
65,776 MWs – peak set 08/23/2010



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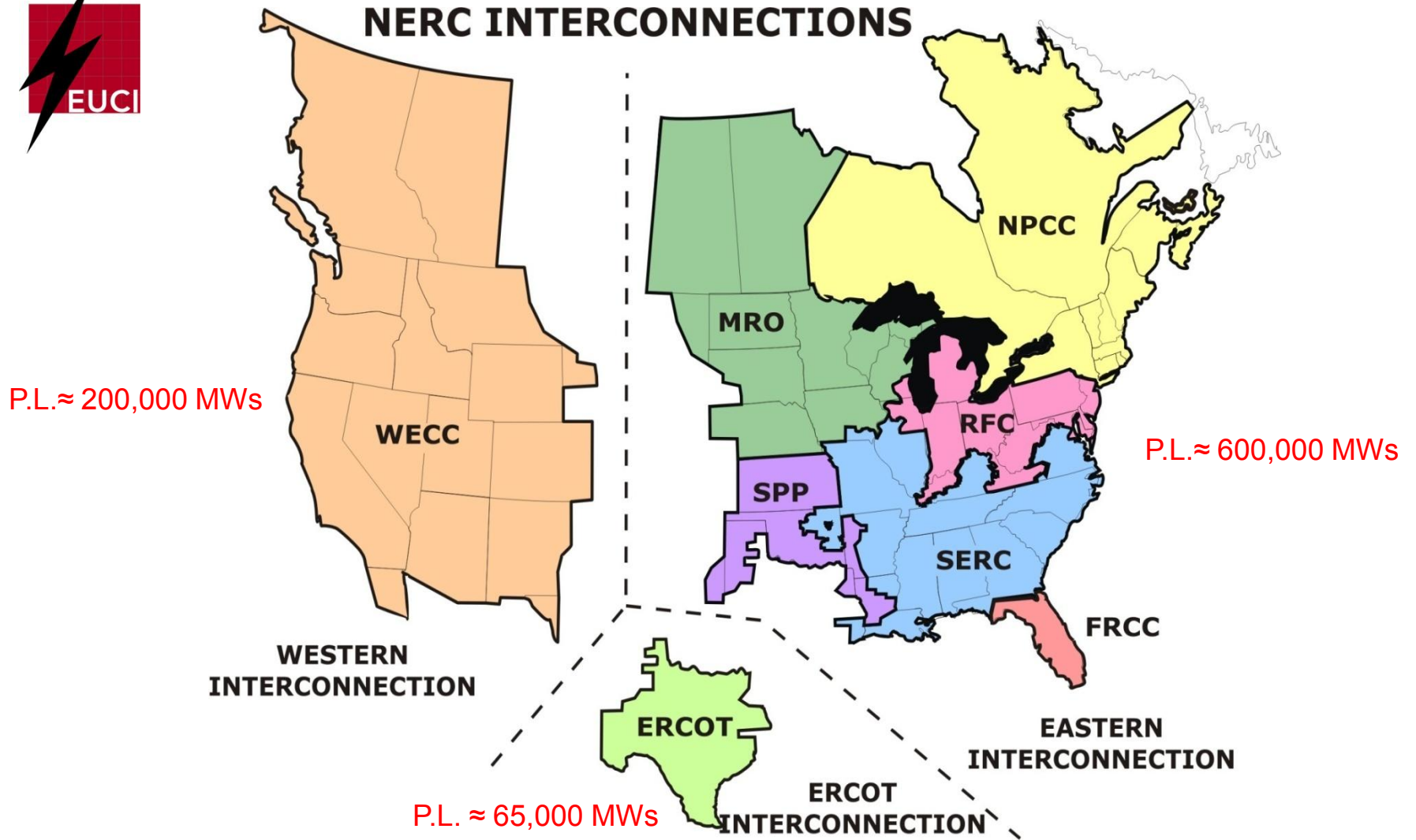
1996 – ERCOT was designated **Independent System Operator (ISO)** to insure impartial, third-party organization to oversee equal access to power grid.

10 Independent System Operators /
Regional Transmission Operators in North America





NERC INTERCONNECTIONS





ERCOT's Unique

- Larger and more frequent frequency deviations
- Regulation not dispatched to control ACE but rather ACE and input into the dispatch algorithm
- Regulation can be dispatched in the same direction for extended periods (problematic for some storage technologies)
- Nodal Design
 - Generation Resource when putting to grid
 - Load Resource when taking from grid
 - Only Generation Resources and Controllable Load Resources can provide Regulation Service
 - Energy from Load Resources are settled at Load Zone Settlement Price Points (SPPs)



Storage Technologies in ERCOT Stakeholder Discussions

- Battery Storage
- Compressed Air Energy Storage (CAES)
- Flywheel



Energy Storage Issues

- ERCOT Protocols written for conventional thermal generation
- Qualification test need to be modified for limited energy storage resources
- High Sustained Limit test (Maximum resource capability) must be changed
- Settlement changes
- Currently require registration as both Generation Resource (discharging state) and Load Resource (charging state)
- Dispatch
- Current regulation dispatch algorithm dampens Regulation deployment (reduces the value of fast responding technologies)
- Current design requires the QSEs to manage the discharging and charging state by changing participation factors.
- Limited energy technologies can only provide regulation as part of a larger portfolio under current design.



Electricity (Power) Storage issues working through
stakeholder process

Emerging Technologies Working Group (ETWG)

<http://www.ercot.com/committees/board/tac/wms/etwg/>

Questions?

