Texas Renewable Energy Industries Association

ERCOT Successes and Challenges

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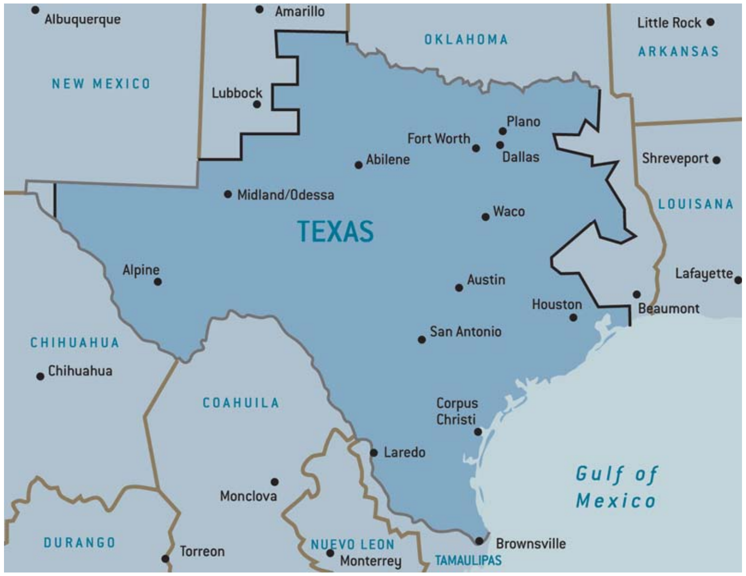
ERCOT Overview

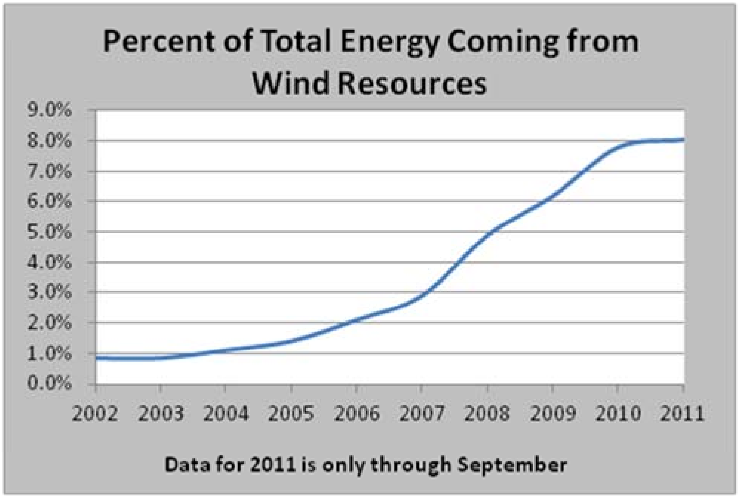
The ERCOT market covers roughly 85% of Texas' overall power usage

Record peak demand: 68,379 MW
- **Occurred on August 3, 2011**

Total installed wind capacity of 9,500 MW
- **33,921 MW of new wind capacity generation requests under review**

Wind generation record: 7,400 MW
- **Representing 15.2% of load**
- **Occurred on October 7, 2011 at 3:06 pm**





Summer 2011 – A Record-breaking Year

New Peak Demand Record: 68,379 megawatts, August 3, 2011

- 4 percent increase over 2010 record

- **The 2010 peak demand – 65,776 MW, Aug. 23, 2010 – was broken 3 consecutive days:**
  - Aug. 1 66,867 MW
  - Aug. 2 67,929 MW
  - Aug. 3 68,379 MW

New Weekend Record: 65,159 MW, Sunday August 28

- 5 percent increase over 2010 previous record – 62,320 MW

ERCOT Monthly Records since May 2011

- September – 63,184 MW (Sept. 2); beats previous record of 59,524 MW by 6.1 percent
- July – 65,195 MW; beats previous record of 63,400 MW (July 13, 2009) by 7.8 percent
- June – 63,102 MW; beats previous record of 62,278 MW (June 25, 2009) by 3.8 percent
- May – 57,356 MW ; beats previous record of 56,344 MW (May 23, 2008) by 4.8 percent

Summer 2011 – Nine ERCOT EEAs, Demand Growth

2011 ENERGY EMERGENCY ALERTS

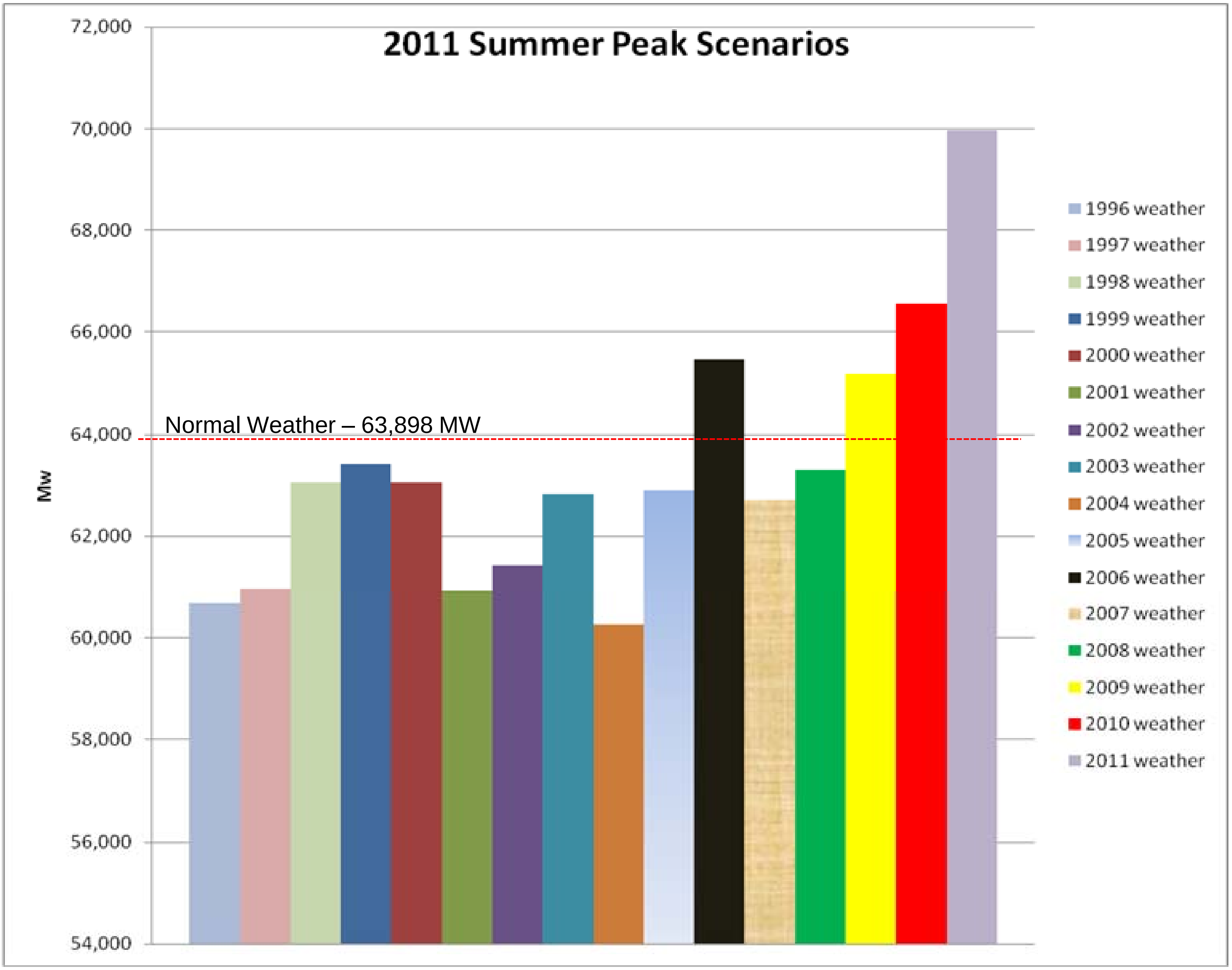
Feb. 2	EEA 1-3
March 23	EEA 1
June 27	EEA 1
Aug. 2	EEA 1
Aug. 3	EEA 1
Aug. 4	EEA 1-2
Aug. 5	EEA 1
Aug. 23	EEA 1
Aug. 24	EEA 1-2

2010 ENERGY EMERGENCY ALERTS

May 15	EEA 1
June 23	EEA 1

DATE	PEAK DEMAND, MW	CHANGE FROM PREVIOUS YEAR
8/3/2011	68,379	3.96%
8/23/2010	65,776	6.02%
7/13/2009	63,400	3.73%
8/4/2008	62,171	0.07%
8/13/2007	62,130	-0.34%
8/17/2006	62,339	3.53%
8/23/2005	60,214	2.92%
8/3/2004	58,506	-2.55%
8/7/2003	60,037	7.04%
8/26/2002	56,086	2.53%
8/15/2001	54,729	-4.99%
8/31/2000	57,606	5.03%

Summer Peak Forecasting challenge #1: what weather should we assume?



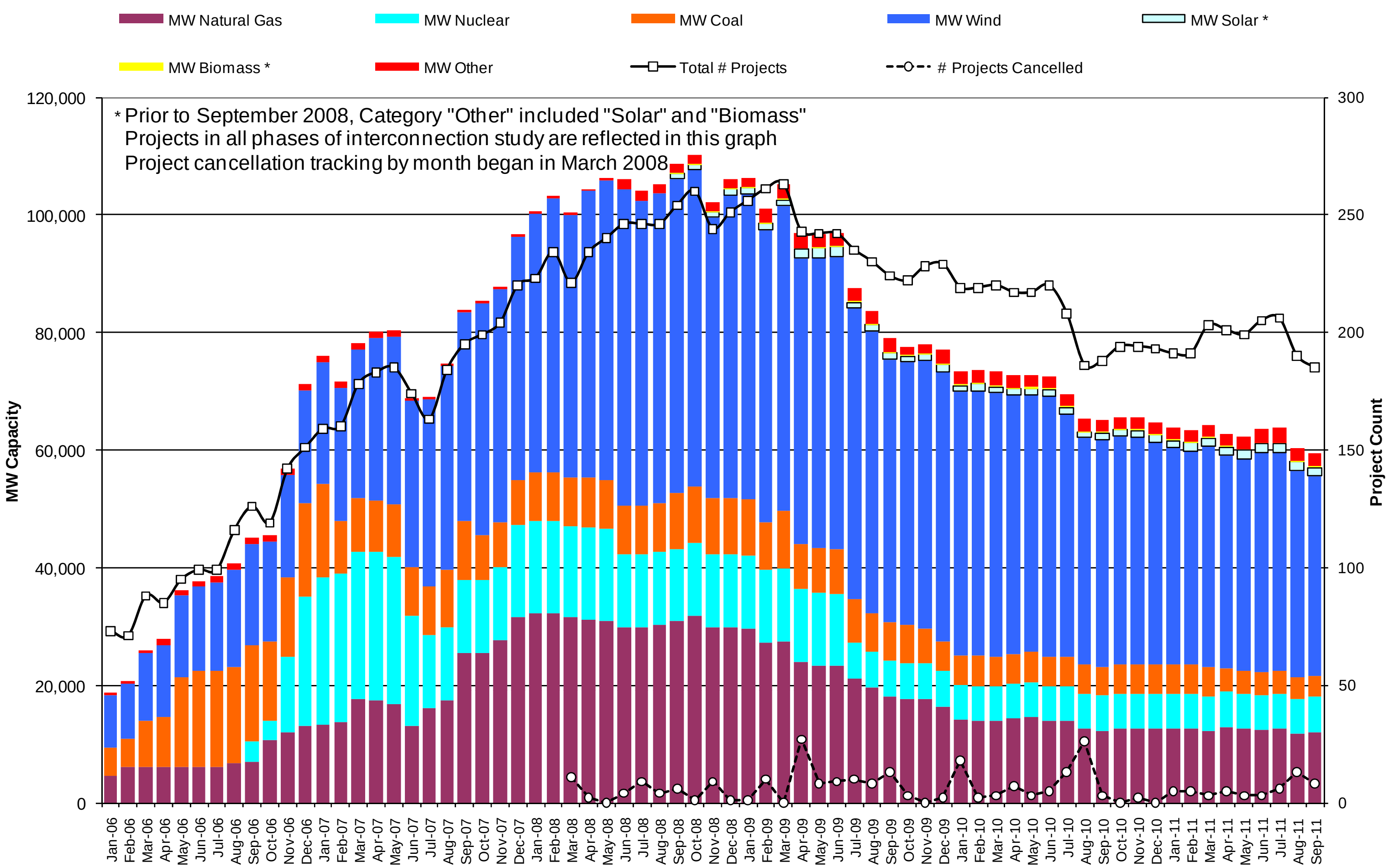
- **ERCOT is currently tracking 185 generation interconnection requests totaling over 59,000 MW.**
    - **Includes almost 34,000 MW of wind generation**

- **ERCOT is currently reviewing proposed transmission improvements with a total cost of $117.9 million**

- **All transmission projects (in engineering, routing, licensing and construction) total approximately $9.8 billion**

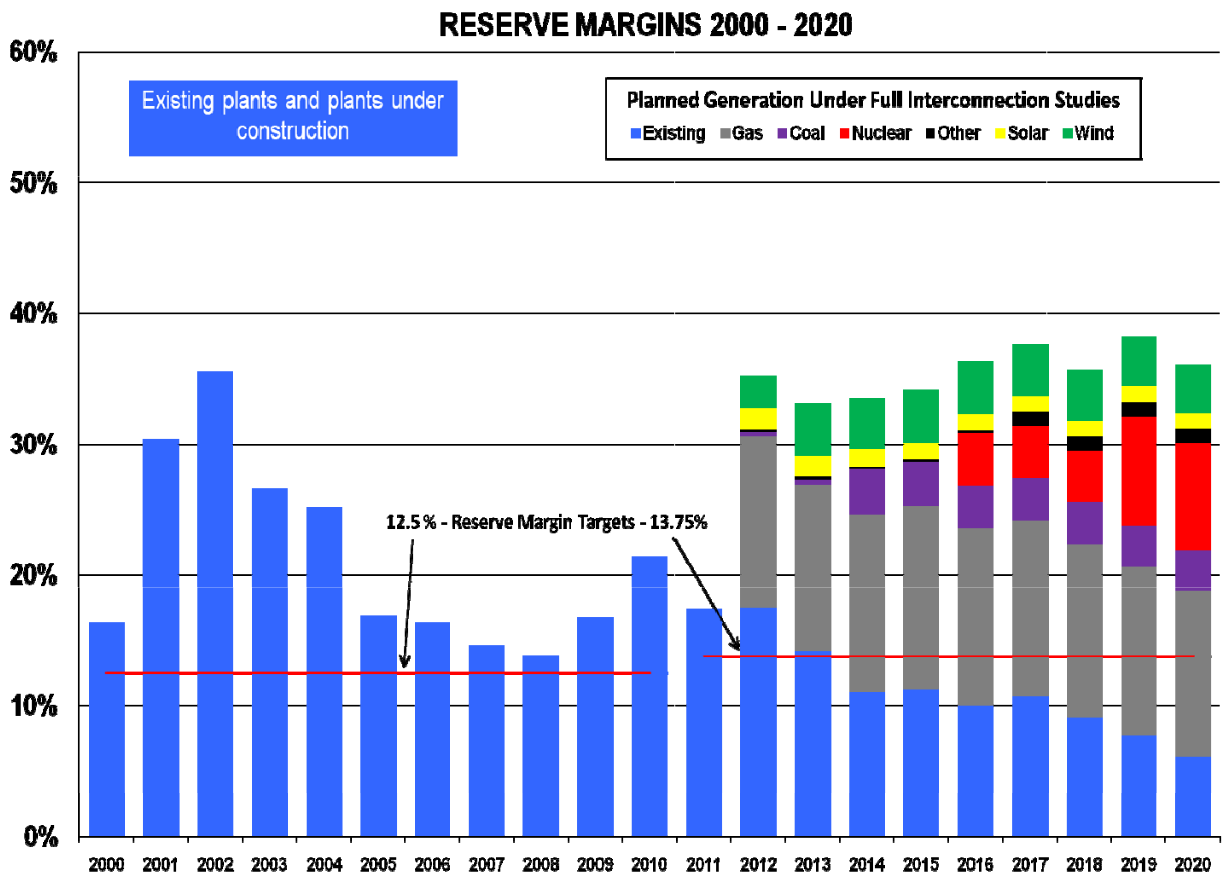
    -Transmission projects endorsed in 2011 total $579.9 million
    -Projects energized in 2011 total about $695 million

Generation Interconnection Activity by Fuel



Resource Adequacy Requires New Tools: ERCOT Developing Capacity-Demand-Reserve Improvements

- **Using High, medium and low economic forecasts**
- **Improving information about expected output during EEAs**
- **Assigning probability-weighted capacities for "committed" new generation**
- **Will tend to lower projected reserve margins; changes to generation interconnection process will eliminate inactive projects**



Graph is based on May 2011 CDR and does not include CSAPR impacts or other updates

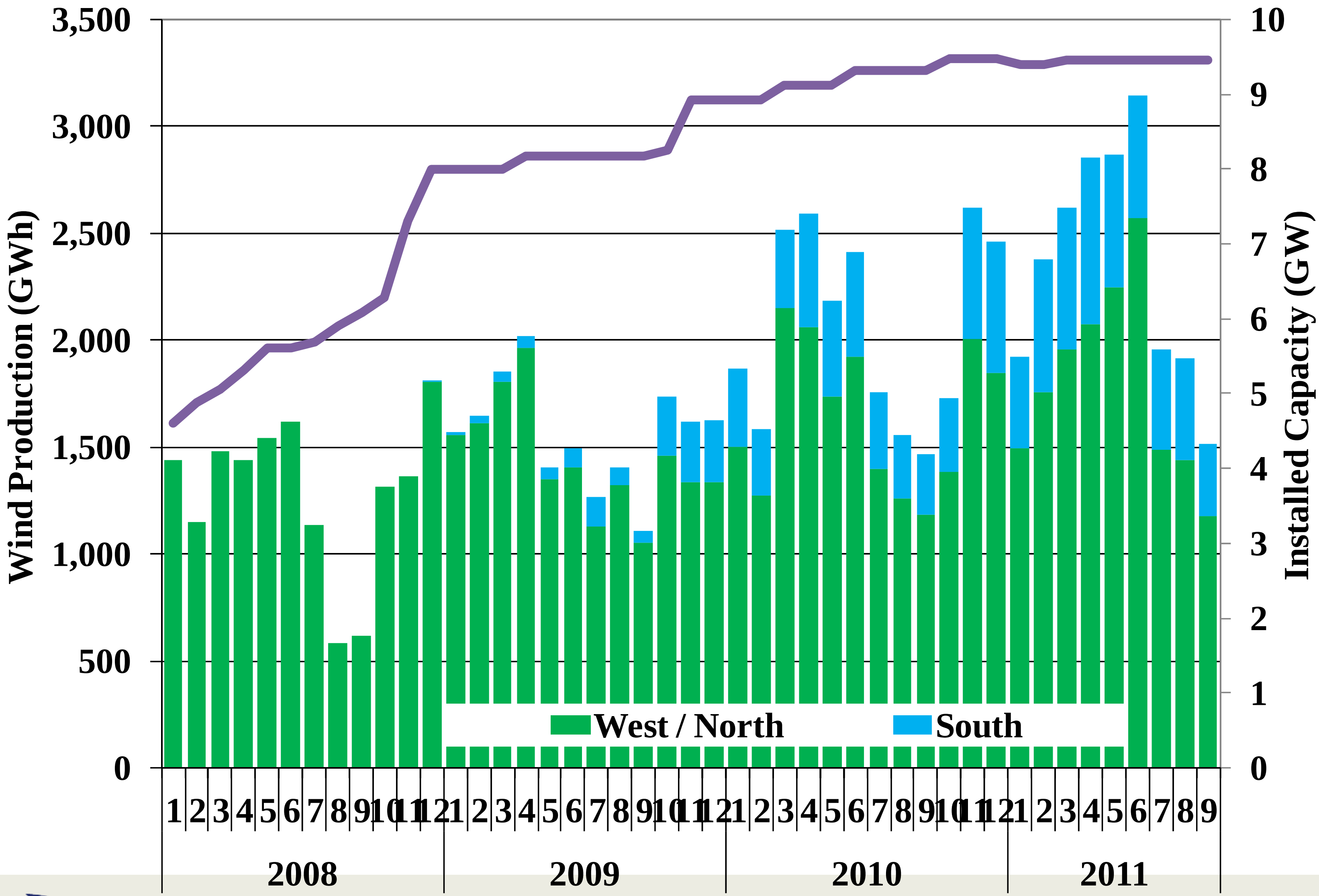
ERCOT Is Pursuing Multiple Options to Address Resource Adequacy

- **Capacity Demand Reserve (CDR) analysis**
- **Bring mothballed units to RMR**
- **Increase Demand Response**
- **Increase Imports across DC ties**
- **Block Load Transfers**
- **Private Use Network Capacity/Un-modeled Generation**
- **Storage (CAES, batteries, EVs)**
- **Reporting on impacts to resources (fuel, water, emissions, new construction)**
- **Better Outage Coordination (NPRR 365)**
- **PUCT: Resolution of Pricing Issues Related to Reliability Deployments**
- **Implementation of Look-ahead pricing (phase 1 of Look-Ahead SCED)**

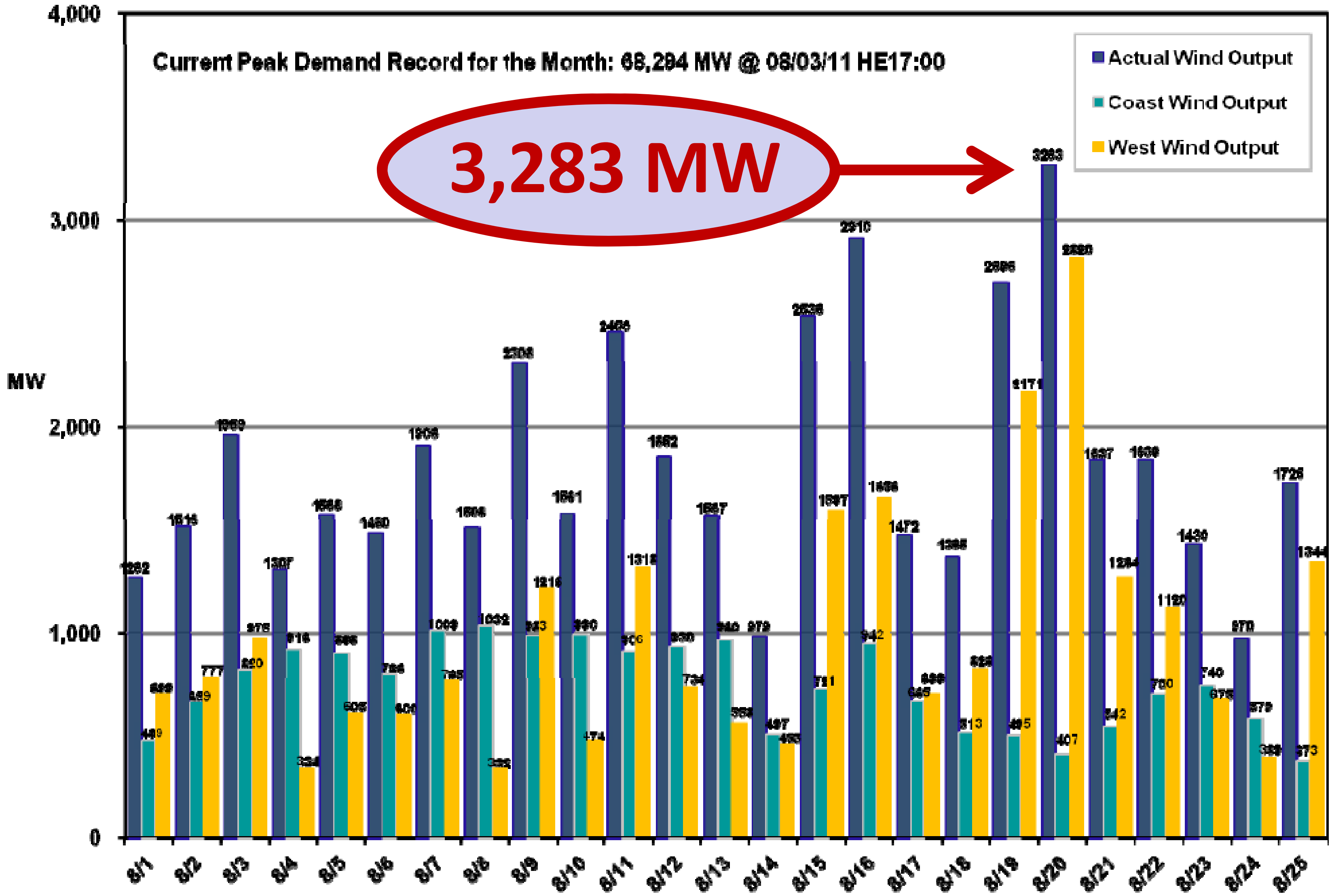
A Key Element for ERCOT Planning: Wind Performance Is Growing and Maturing and Nodal Helps

- **Wind generation in 2011 is up 18% over same period in 2010**
- **Total wind generation has been higher every month**
- **Why?**
  - Increased contribution from South Zone/Coastal wind where there are fewer transmission constraints
  - The nodal market, with its unit-specific dispatch every five minutes, allows ERCOT to operate the system so that transmission flows to are closer to limits (higher). This is due to more certainty that flows won't violate limits.
  - Instead of telling "everything in the west" to reduce output, ERCOT can be more specific; we can more fully utilize the limited transmission we have; nodal market is allowing us to absorb more renewable energy

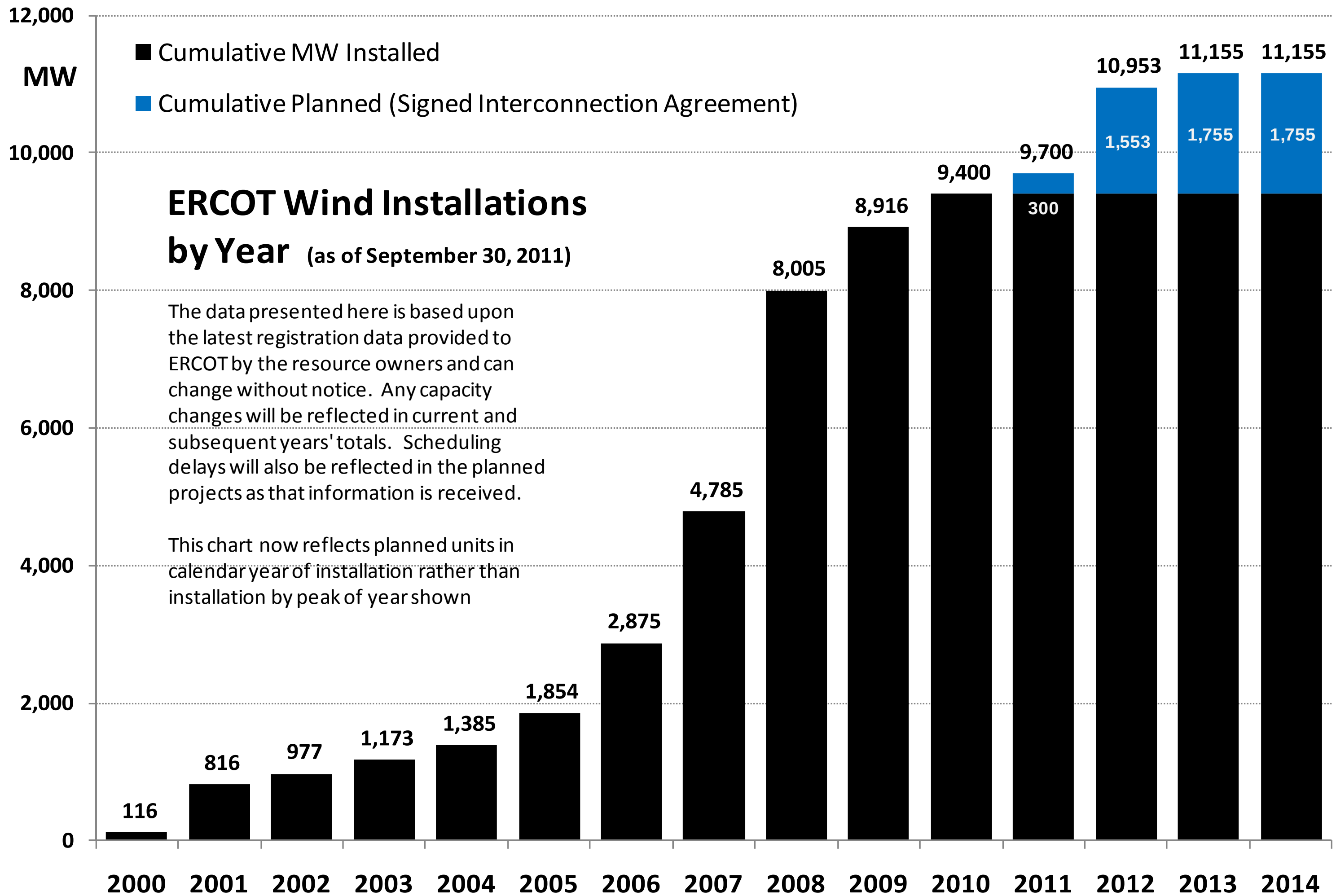
Monthly Wind Production



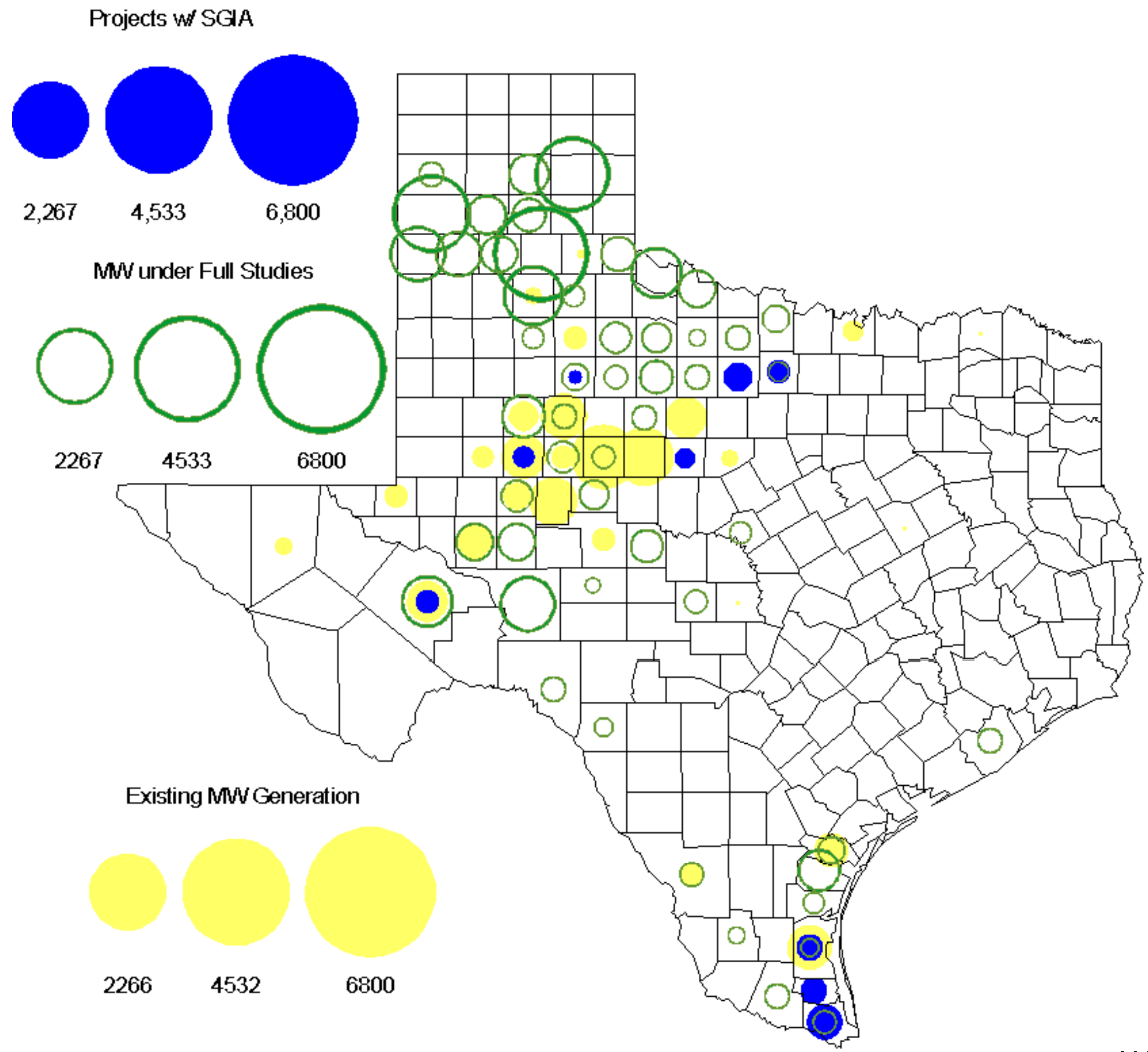
ERCOT Daily Wind Output at System Peak



Wind Capacity Installed by Year

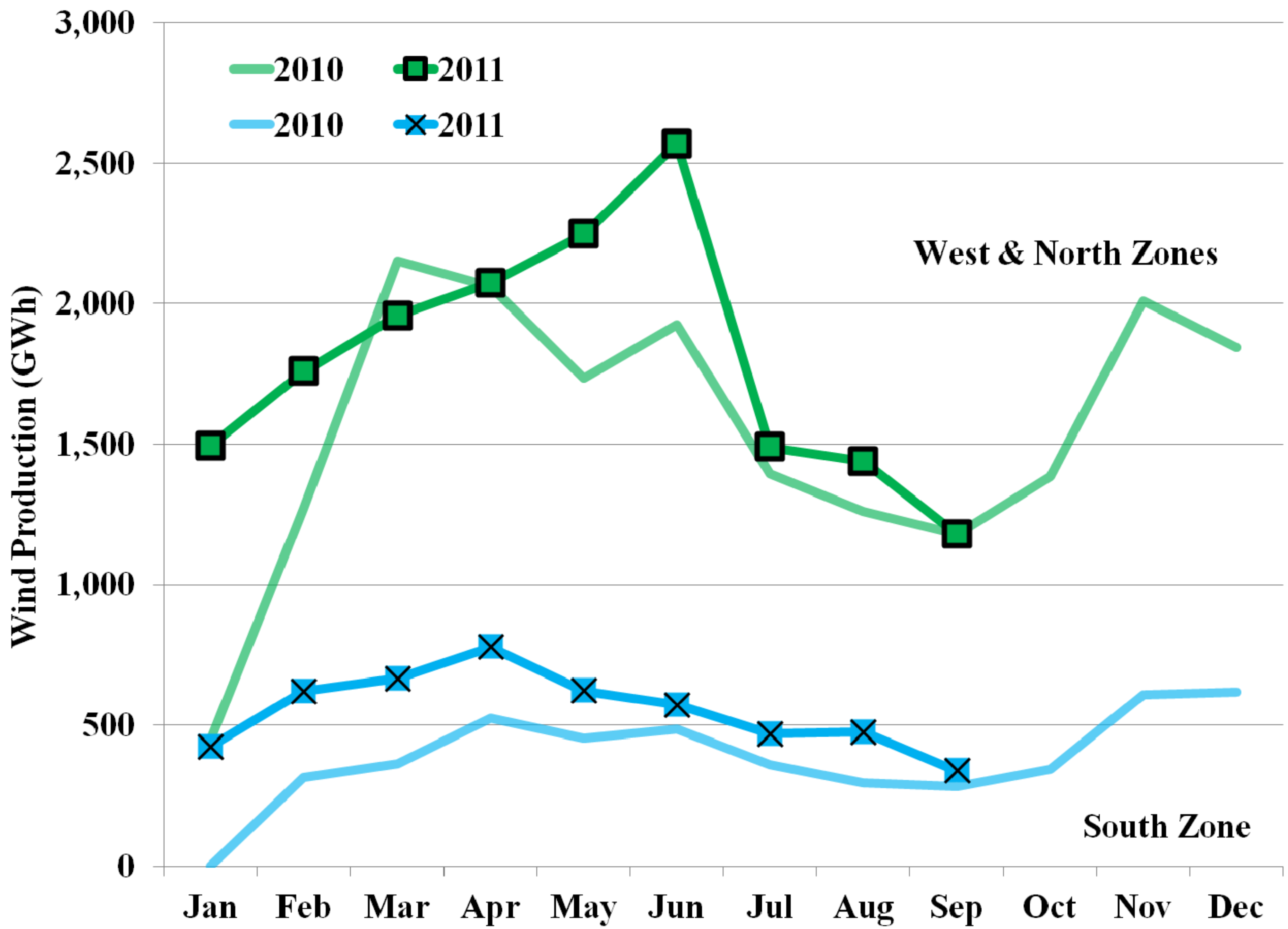


Location of Installed Wind Capacity and Interconnection Requests



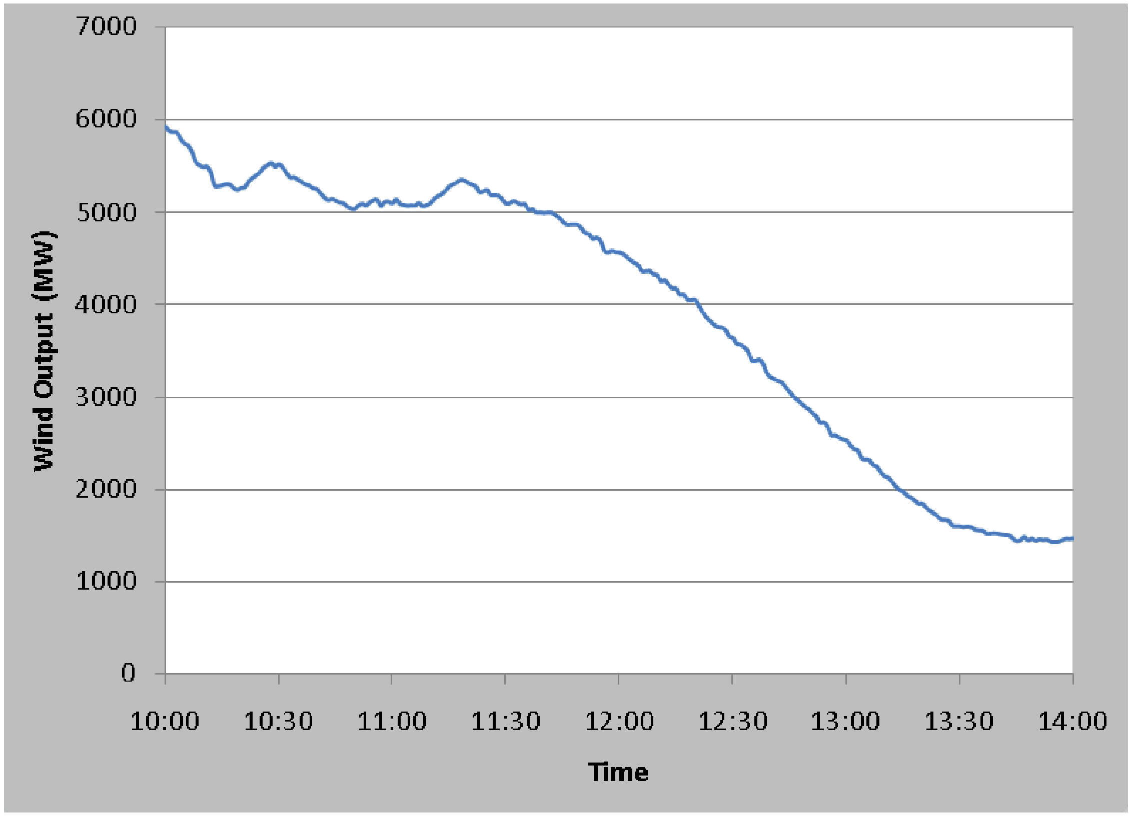
Wind only

Wind Performance by Zones Is Increasingly Important



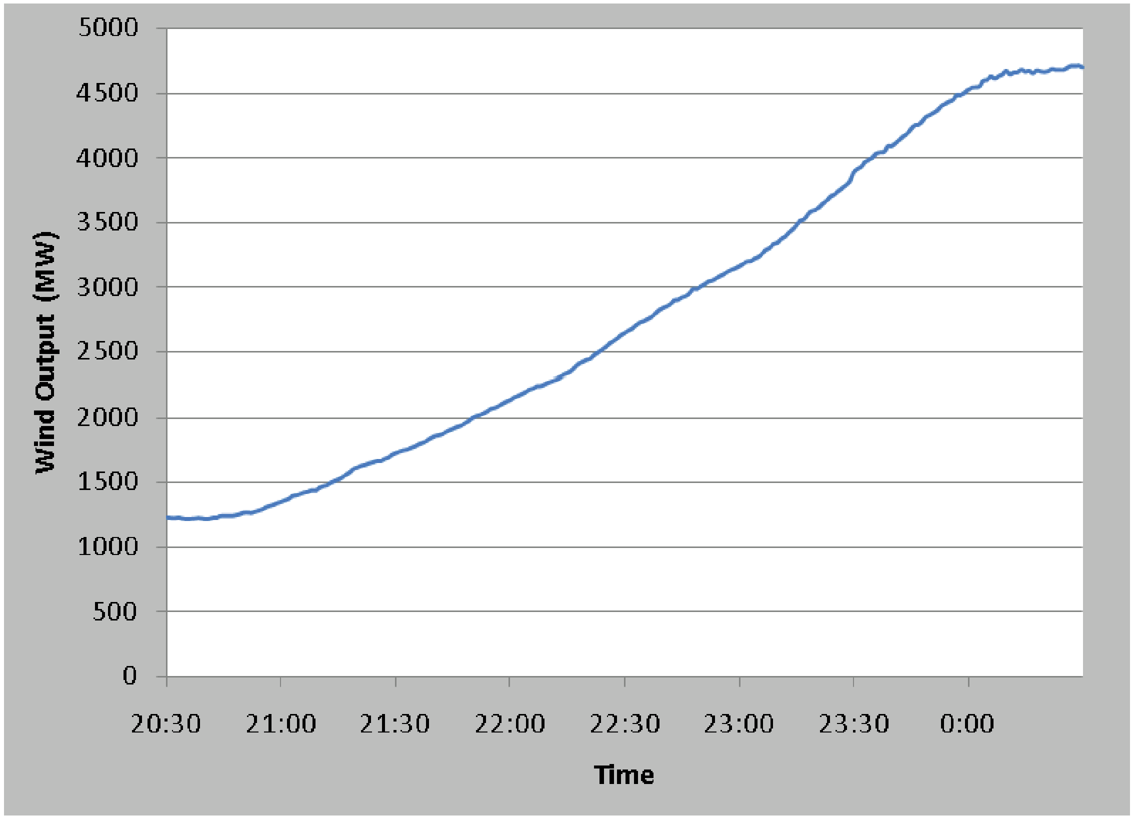
Recent Observed Wind Ramps in ERCOT – Predicting Ramps is a big challenge

- **Ramp down on June 27, 2011**
  - Ramp of ~3500 MW in 2 hours



Wind Ramps in ERCOT: big differences in little time

- **Ramp up on July 5, 2011**
  - Ramp of ~3500 MW in 3 hours



ERCOT's Approach to Integrating Wind

- **CREZ is on track**
- **ERCOT focus is on integration:**
  - Forecasting and predicting large wind ramps
  - Incorporating uncertainty into reserves and resource planning
  - Non-spin is the greatest uncertainty
  - Nodal allows better response and posturing of the system
- **Incorporating historical wind power forecast error and wind generator output behavior in the Ancillary Service requirements determination has been key in ensuring sufficient reserves**
  - multiple tools which cover different time frames have been key in providing operators with the necessary level of system awareness and different types of information

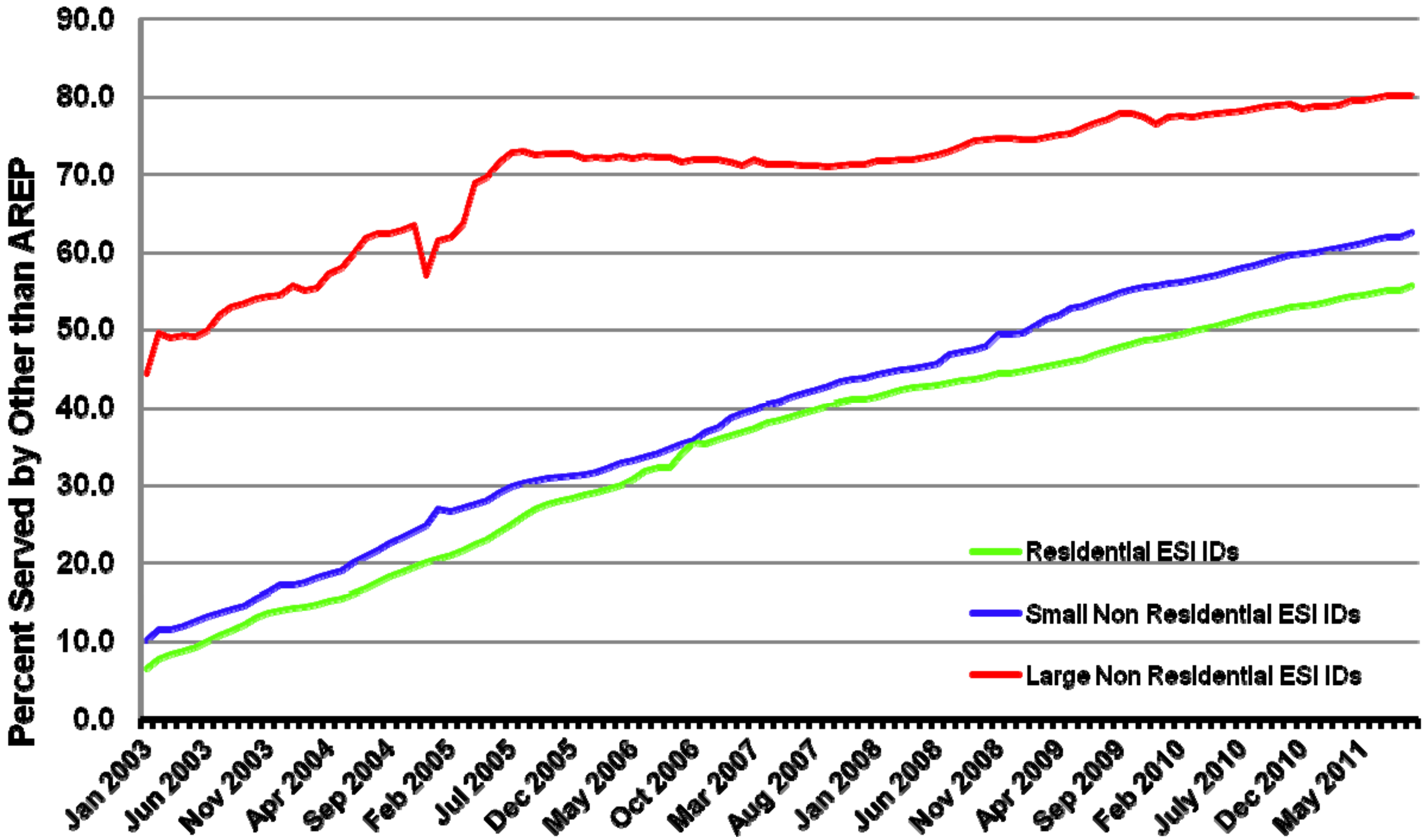
Retail Market almost 10 years old – how are we doing?

The Texas retail market has been open to competition for almost 10 years. So how are we doing?

- **In 2010 ABBACUS report, an assessment of restructured electricity markets in Canada and the US, Texas was the only jurisdiction to earn the top ranking of "Excellent" in both the Residential and Commercial/Industrial segments.**
- **176 competitive retailers – up from five in 2002**
- **Most retail customers may choose from more than 35 REPs, offering as many as 226 different rate packages**
  - Diverse products – Fixed, Variable, Indexed, 100% Green
  - May choose whether to participate in energy efficiency programs, demand response programs, distributed generation programs, etc.

56 % **of residential load** *(as of Sept. 2011)*

82 % **of small commercial load** *(as of Sept. 2011)*

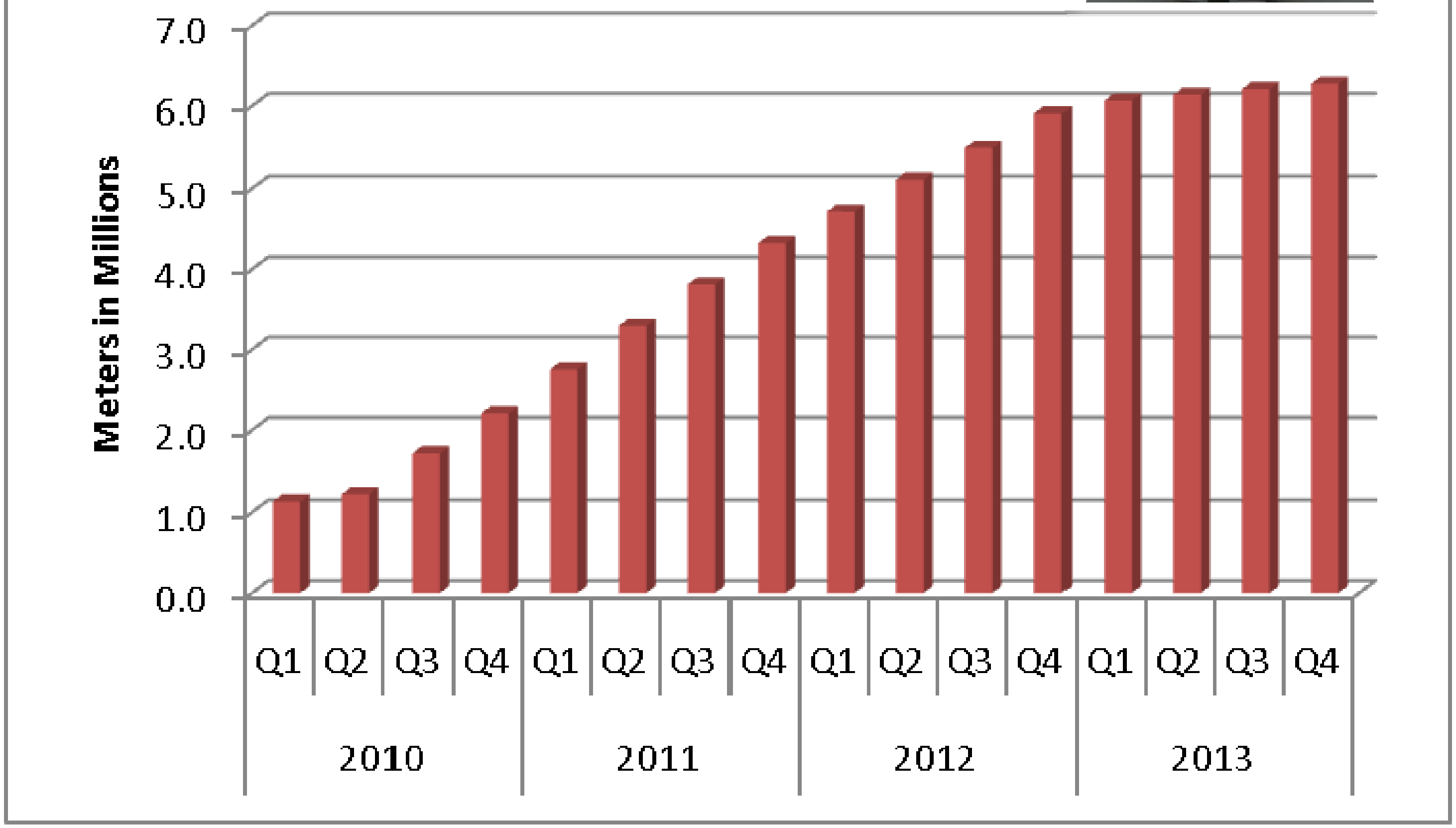


ERCOT has managed more than 43.9 million retail switching transactions

ERCOT successfully manages millions of transactions every day, every month.

- **More than 43.9 million retail switching transactions completed since June 2001**
- **ERCOT is the only ISO/RTO with responsibilities as registration agent for retail transactions**

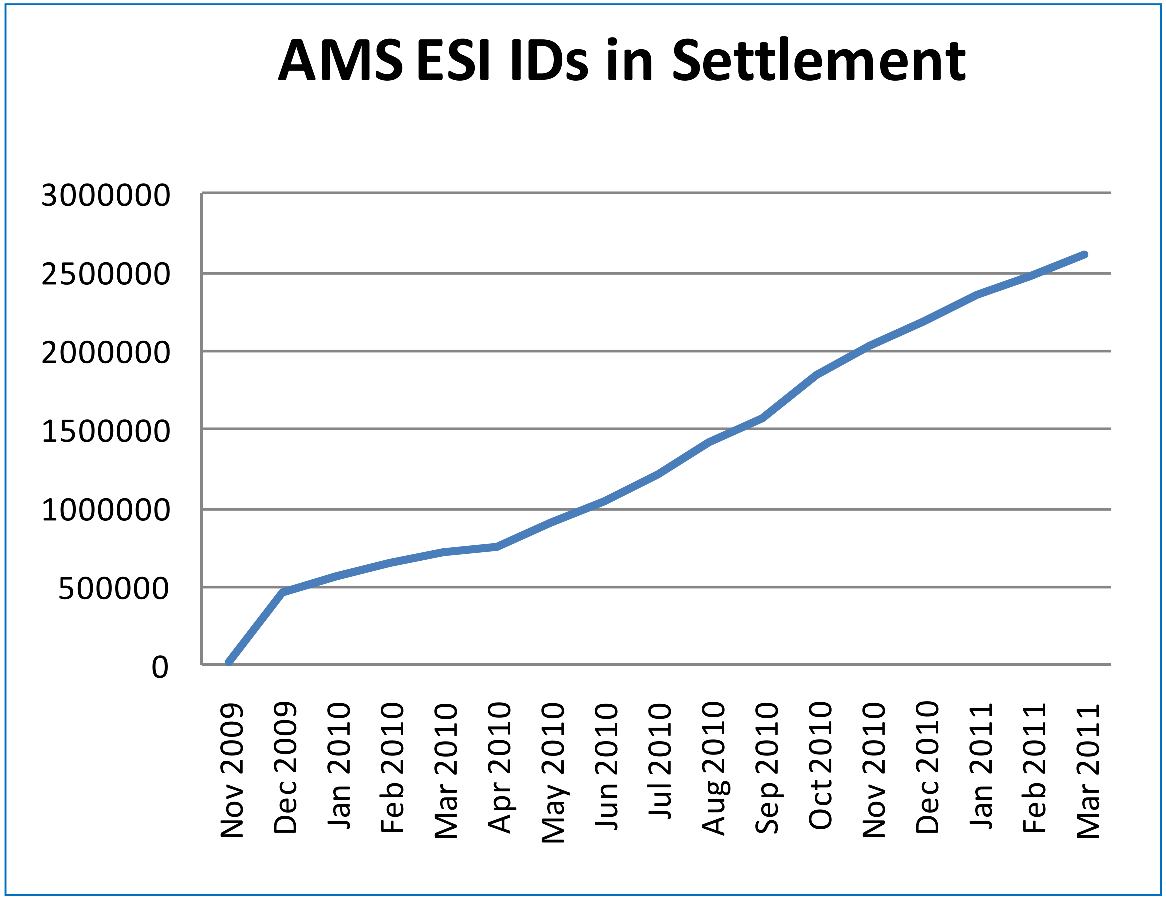
AMI Meter Deployment Plan



2.97 million advanced meters now deployed by 3 investor-owned TDSPs

AMI settlement keeping pace

ERCOT is now settling nearly 2.7 million ESIIDs with 15-minute Advanced Meter Data



• First Operating Day Settling Advanced Meters:	November 29, 2009	263 ESIIDs
• Current Status:	March 31, 2011	2,693,726 ESIIDs

Demand Response potential

- **FERC estimates >18 GW of DR potential in Texas by 2019**
  - Attributed to high peak demand
  - Would represent 20-25% of ERCOT peak

  'Full participation' scenario assumes default dynamic pricing tariff

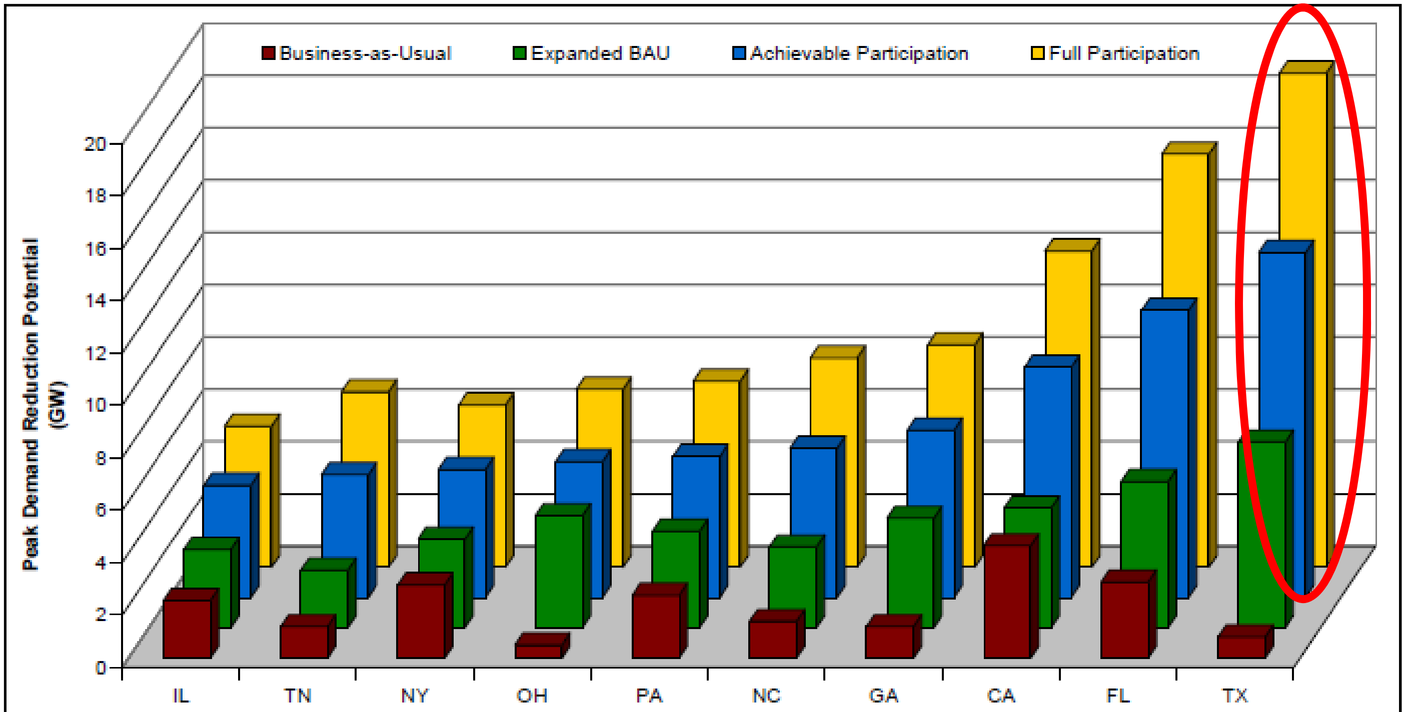
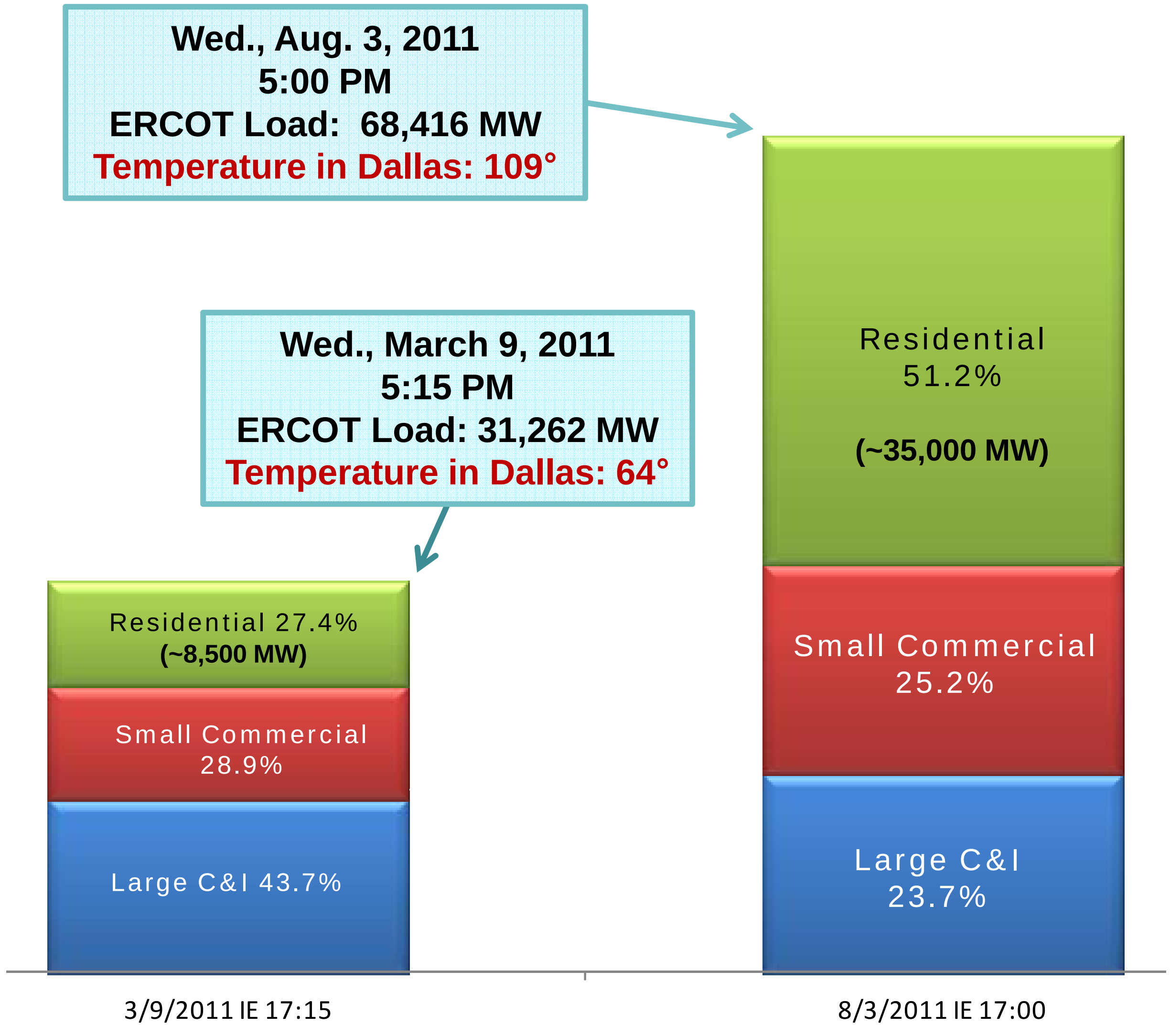


Figure 16: Top Ten States by Achievable Potential in 2019 (GW)

Source: FERC 2009 National Assessment of DR, page 42

Off-peak vs. on-peak load by customer type



- Customer class breakdown is for competitive choice areas; percentages are extrapolated for NOIEs to achieve region-wide estimate
- Large C&I are IDR Meter Required (>700kW)

Residential & small commercial DR opportunities

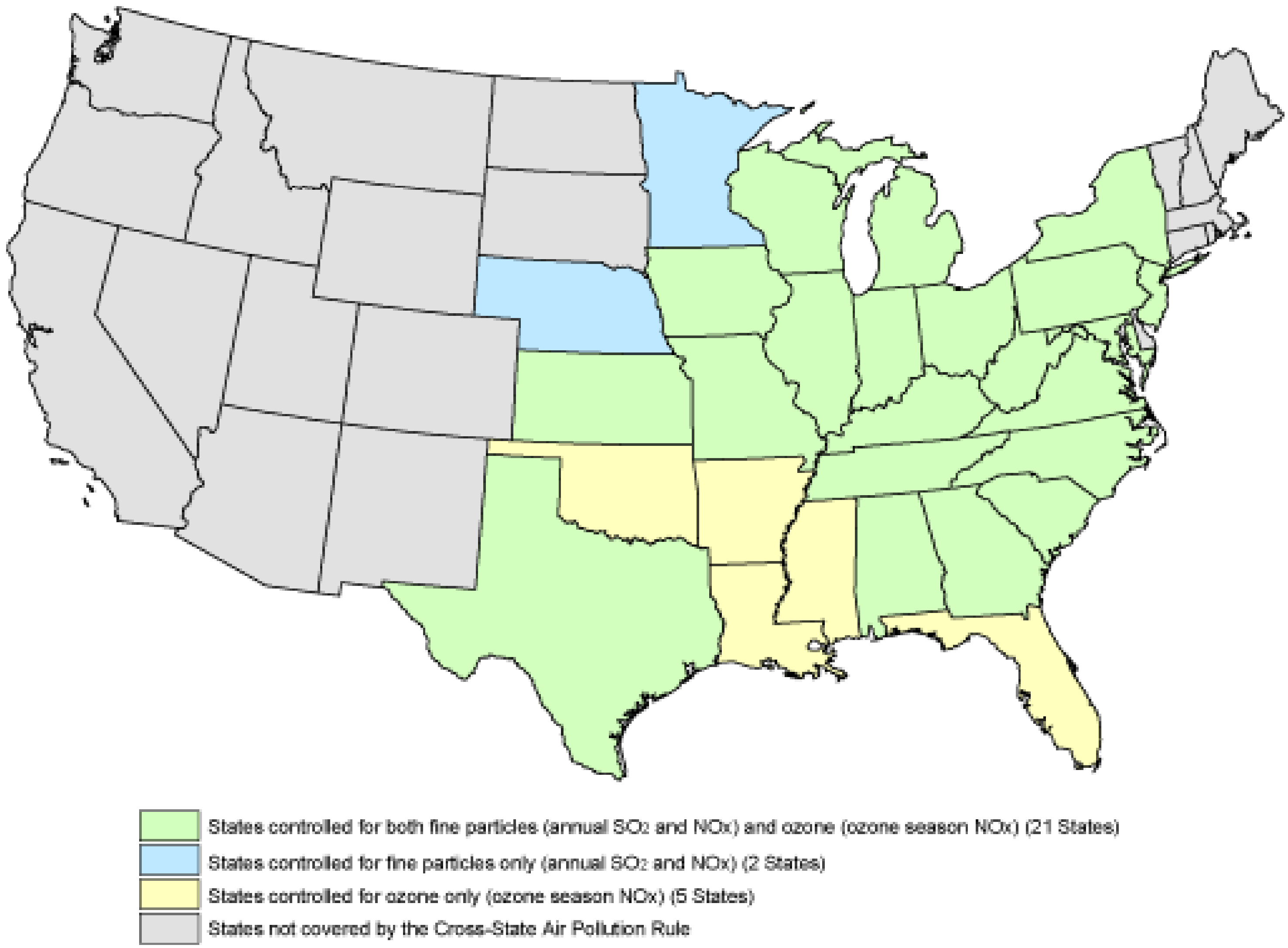
- **Small Loads are driving summer peaks but not much is harnessed for DR yet**
  - No residential load currently in ERCOT-administered DR
- **15-minute interval meter data, combined with ERCOT settlement data at the wholesale market level, is the smart grid backbone for the ERCOT region**
- **Price elasticity of demand has reliability value even if it is not dispatched by ERCOT**
  - In the Nodal market, prices and shortage conditions are aligning better than in the old Zonal market
  - $3,000/MWh prices across the peak on Aug. 4

Energy Storage – Current Regulatory Initiatives

- Texas Legislature passed Senate Bill 943 incorporating energy storage into the wholesale power market; intended to clarify that storage can be classified as generation.
  - PUCT Project No. 39657 implementing SB 943; will add language to PUCT rules to conform to statute.
  - PUCT Project No. 39764, Issues Relating to Energy Storage and Emerging Technologies, workshop held October 6
  - ERCOT is proposing pilot program option that would allow for testing of fast-responding, duration-limited resources. Currently being considered by PUCT.

Central Question: Do we focus on technologies or products?

States included in the Cross State Air Pollution Rule (CSAPR)



Cross-State Air Pollution Rule (CSAPR)

- **CSAPR was released on July 6, 2011, and was published in the Federal Register on August 8, 2011.**
- **ERCOT is reviewing the potential impacts of the final CSAPR on generation resources and transmission system reliability in the ERCOT region.**
- **The *proposed* CSAPR rule, (then known as the Clean Air Transport Rule [CATR]), only included Texas in the peak season NOX program. Based on this proposed rule, an ERCOT study completed on June 21 2011 did not include any incremental impacts from the CATR.**
- **In the *final* rule, Texas is included in the annual SO2 and annual NOX programs, as well as the peak season NOX program. For Texas, the annual SO2 limits appear to be the most restrictive.**
- **Rule is effective January 1, 2012. ERCOT's initial analysis focused on near-term reliability implications.**

CSAPR Rule Requirements

- **CSAPR affects generating units in most of the eastern US.**
- **Under CSAPR, generating units must have CSAPR allowances to match annual emissions of SO_2 and NOX and separate allowances for peak season (May – Sept.) NOX emissions.**
- **Units are allocated a number of allowances based on historical generation.**
- **Trading of allowances within a state is unlimited. Interstate trading of allowances is allowed, but net state-wide imports of allowances are capped at approximately 18% of a state's total allocation.**
- **For SO_2 allowances, owners of resources in Texas will be allowed to trade with owners of resources in the "Group 2" states: Kansas, Nebraska, Minnesota, Alabama, Georgia, and South Carolina**
- **Based on information obtained to date, ERCOT does not anticipate the emergence of an active market for trading of Group 2 SO_2 allowances.**

CSAPR Update

- **ERCOT is analyzing the reliability impact of the proposed changes in the CSAPR rule announced by the EPA on October 6, 2011.**
- **The changes did not alter the rule's January 1, 2012 implementation date and do not revise modeling errors that ERCOT has reported inaccurately reflect actual conditions on the ERCOT electric grid.**
- **The announced revisions arise from changes in unit-specific assumptions that effectively increase Texas' SO_2 budget.**
- **ERCOT is gathering information from generators regarding changes in their compliance plans reported to ERCOT after the initial adoption of CSAPR. Impacts are a moving target.**

Reliability Implications from CSAPR – Scenario 1

ERCOT has developed three possible CSAPR impact scenarios

- Scenario 1 models successful implementation of the compliance plans of the resource owners. Under this scenario, the incremental capacity reductions are expected to be approximately 3,000 MW in the off-peak months (March, April, October and November) and approximately 1,200 – 1,400 MW in the peak months.
- Capacity reductions in off-peak months are expected to be greater because power prices are lower during these periods, making them a more attractive time for resource owners to take the extended outages required to comply with the Rule.

In 2011, if ERCOT had experienced the incremental reductions in available generation expected to result from CSAPR, customers in the ERCOT region would have experienced rolling outages in August.

Other CSAPR Uncertainties

- **Resource owners have not finalized their compliance strategies.** System impacts could be affected by changes in specific unit operations.
- **Reliability impacts in 2013 & 2014 will be greater as unit retrofit projects are implemented.** – Retrofit projects will require Clean Air Act permit modifications.
- **CSAPR will affect national fuel markets, increasing demand for natural gas and low sulfur coals.** Near-term demand will likely exceed existing mine and/or railroad capacity.
- **ERCOT does not expect a liquid market for SO2 allowances.**
- **Resource owners may sell allowances outside ERCOT, increasing reliability impacts.**

Bottom line: this is good for renewable energy!

Keep up with ERCOT: new communications options

ERCOT home page:

- **Follow us on Facebook or Twitter**
- **Subscribe to RSS feeds**
- **See real time grid conditions**

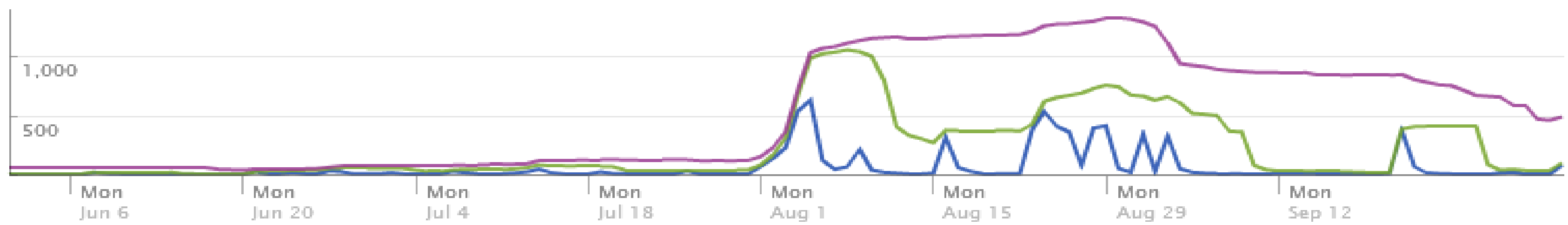
Social media engagement with ERCOT on the rise

New Likes ?
935 ⇧ 3,496%

Lifetime Likes ?
937

Active Users ?

Daily Active Users Weekly Active Users Monthly Active Users



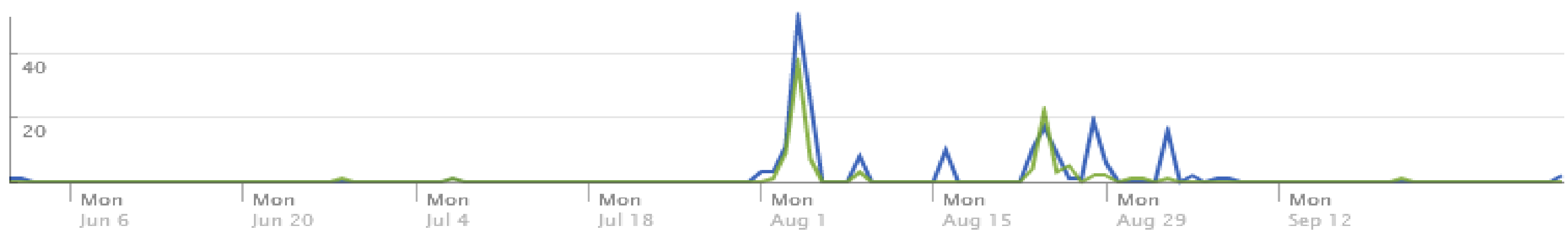
Interactions See Details

Post Views ?
123,319 ⇧ 11,255%

Post Feedback ?
300

Page Content Feedback ?

Likes Comments



ERCOT: So much is going right!

- **Nodal market**
- **Wind performance**
- **Managing weather extremes**
- **New technologies entering the market**
- **CREZ transmission in construction; other transmission being built**
- **Wind and load forecasting enhancements**
- **AMI installations on track**
- **Texas retail market appears robust**
- **Leadership and collaboration**

ERCOT has big challenges and uncertainties

- **Growth**
- **Integrating more renewable energy**
- **Drought/weather extremes**
- **Impact of environmental regulations (e.g., CSAPR)**
- **Impact of new technologies**

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. . . days 'til the next Texas Legislative session!

Questions?