



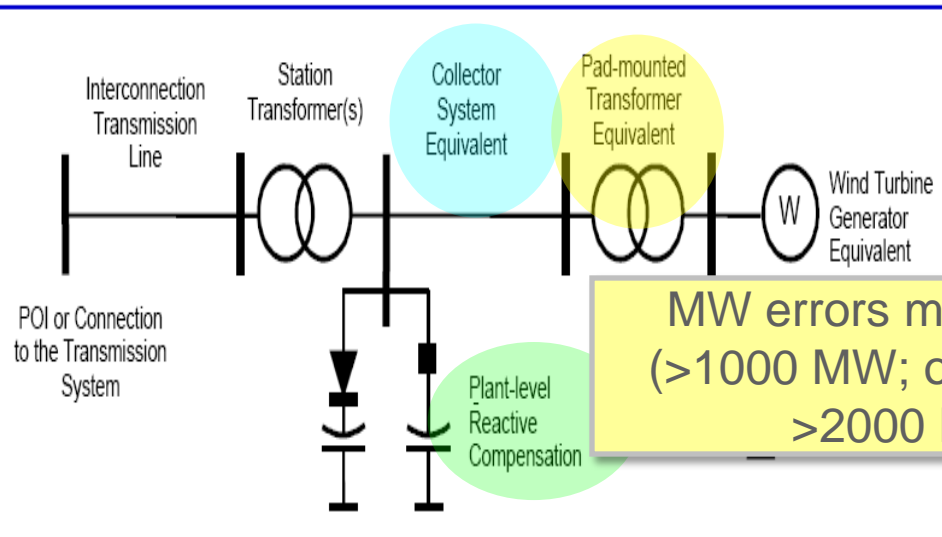
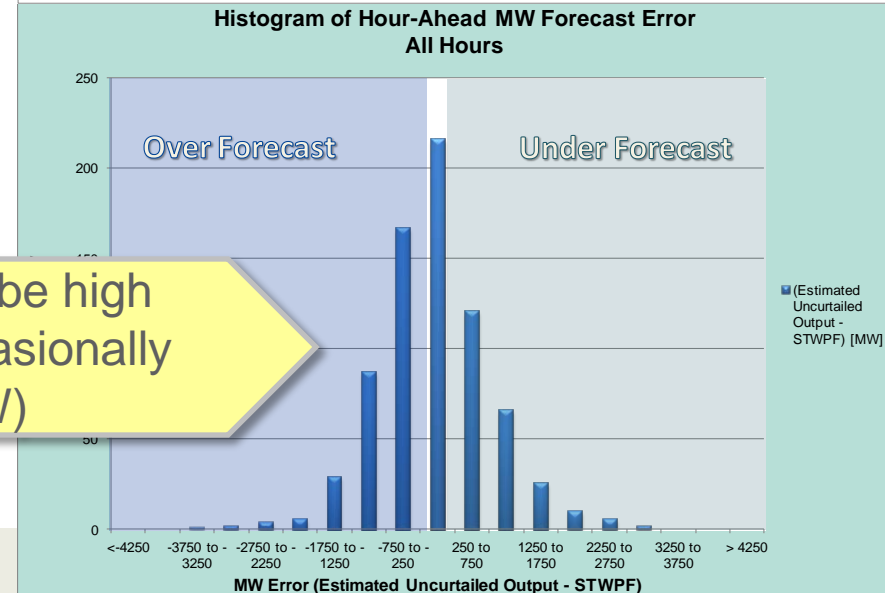
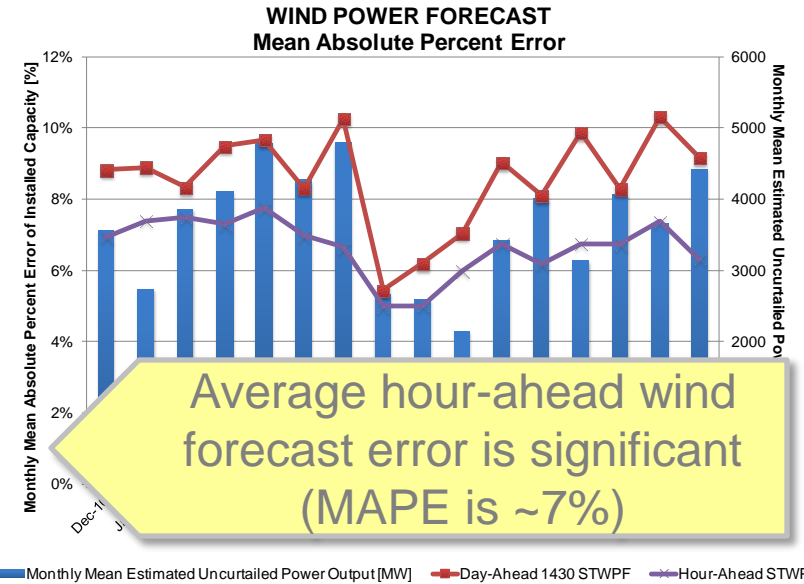
# ERCOT Operational concerns with Wind Energy

John Adams  
Principal Engineer  
Electric Reliability Council of Texas

June 7, 2012

# Operational Challenges for Wind Integration

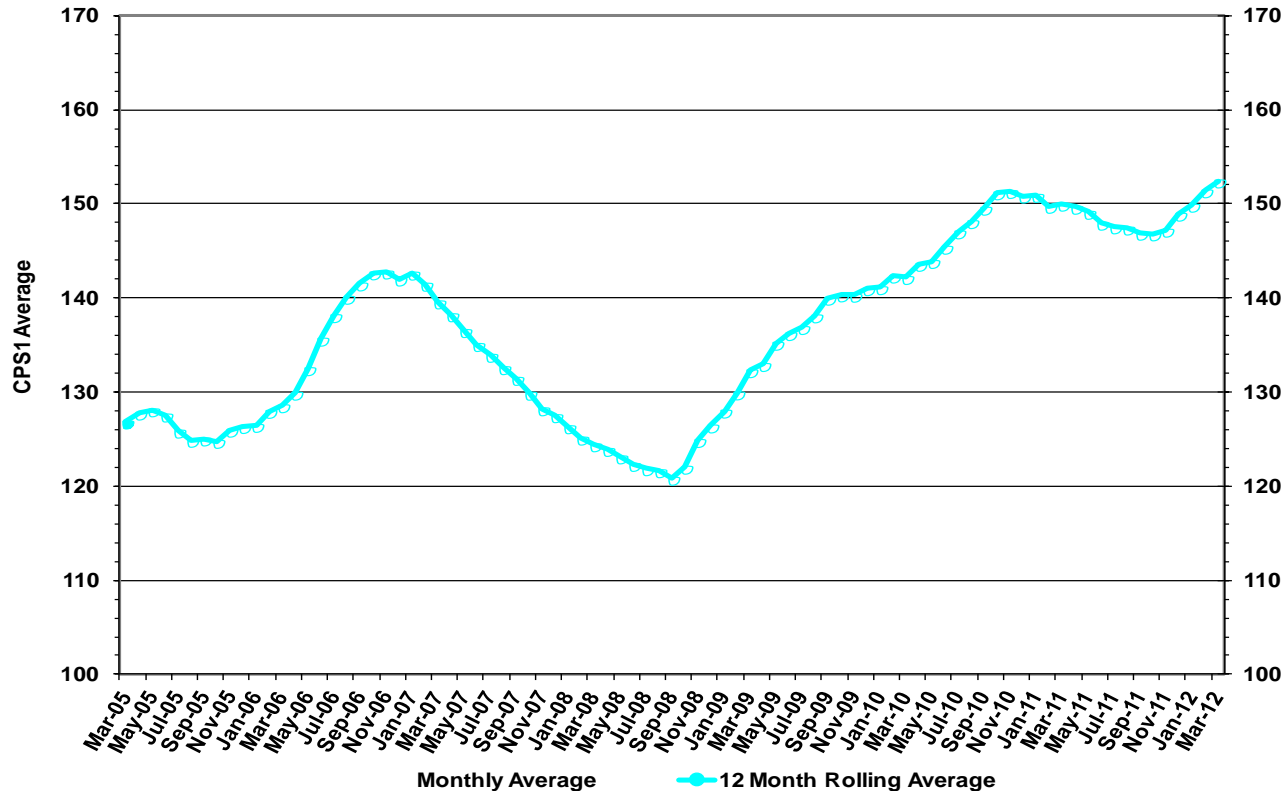
- **Uncertainty**
- **Variability**
- **Interconnection**



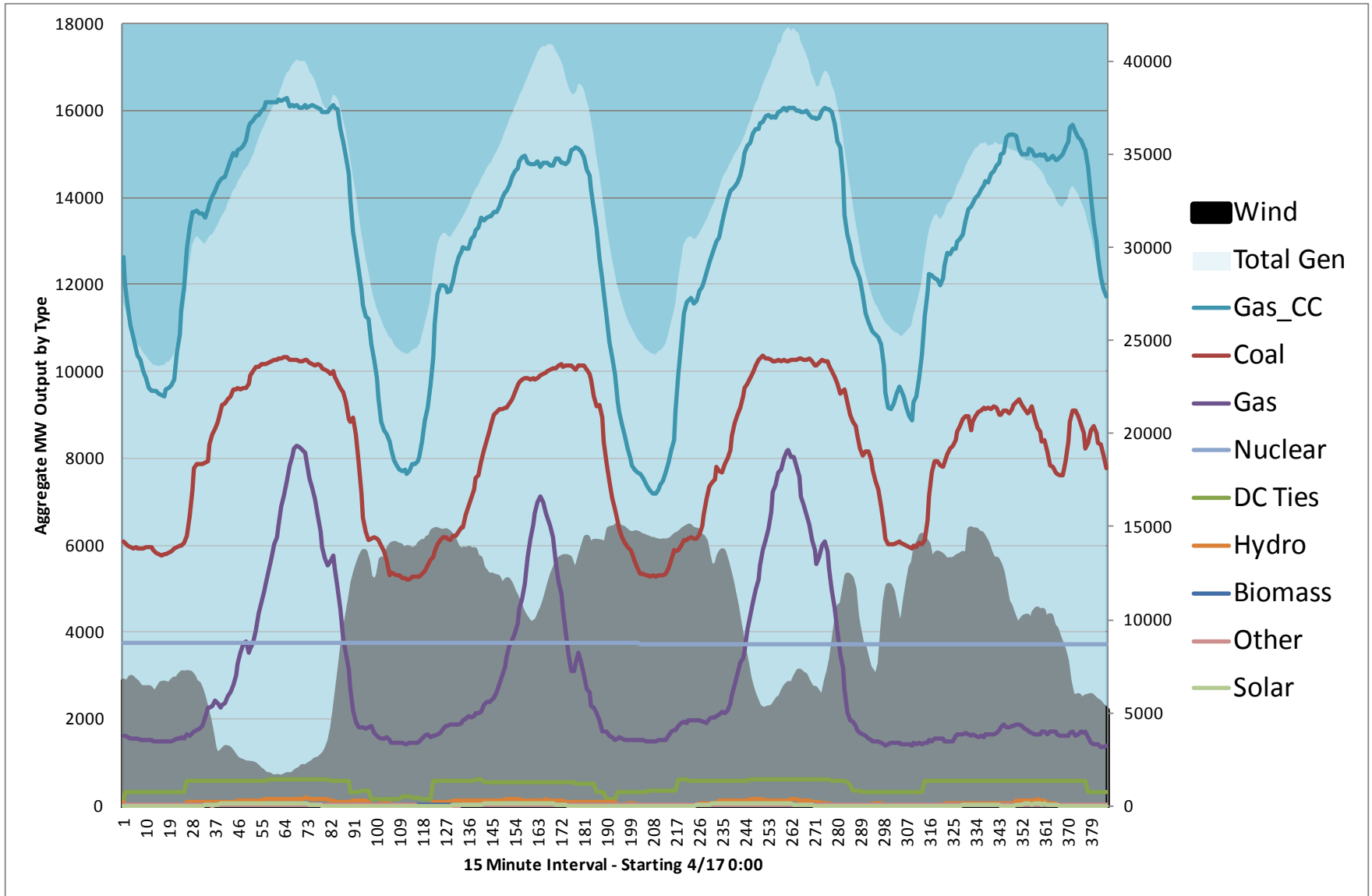
MW errors may be high (>1000 MW; occasionally >2000 MW)

# Primary Frequency Response

- All generation in ERCOT is required to provide governor response with a 5% droop setting
- Wind farms were recently required to provide primary frequency response to frequency deviations from 60 Hz.



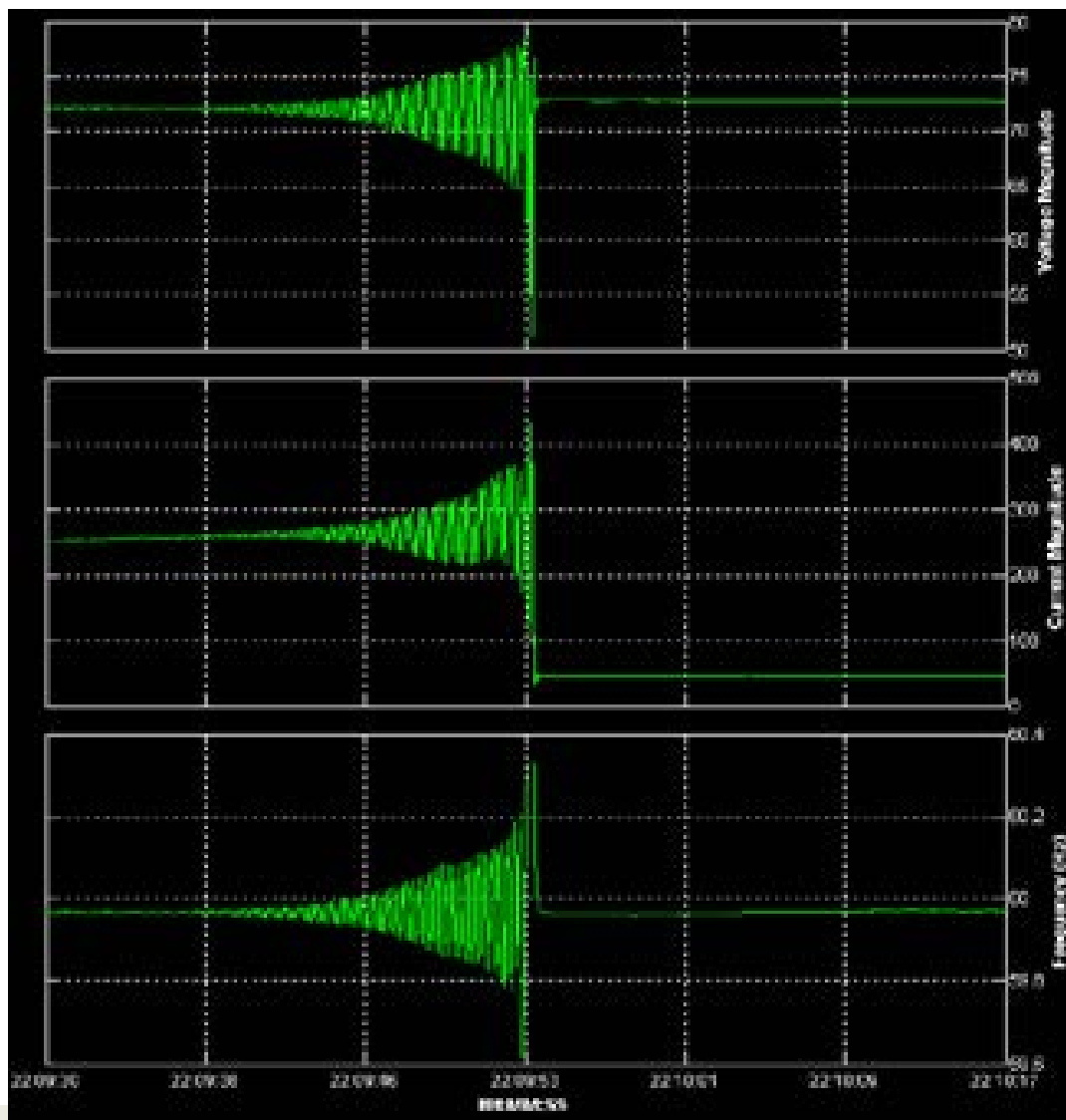
# Generation Ramps



# Interconnection-Related Requirements

- Inverter-connected resources may not fit with traditional technical requirements
- **Static and dynamic reactive capability**
- **Voltage-ride through capability**
- **Modeling**
  - Collector system and support device modeling
  - Dynamic model and parameters
- **Reactive coordination** in CREZ area
- **Voltage Oscillations** in low fault duty ratio areas
  - ERCOT has observed voltage oscillations driven by wind farm reactive controls in areas with low fault duty ratio.
- Operational Concerns – **Sub Synchronous Resonance** with Series Compensated Transmission lines

# ERCOT Synchrophasor observed voltage event near wind turbine



# Questions

