Overview of ERCOT: How ERCOT is Addressing Issues Associated with New Wind Development

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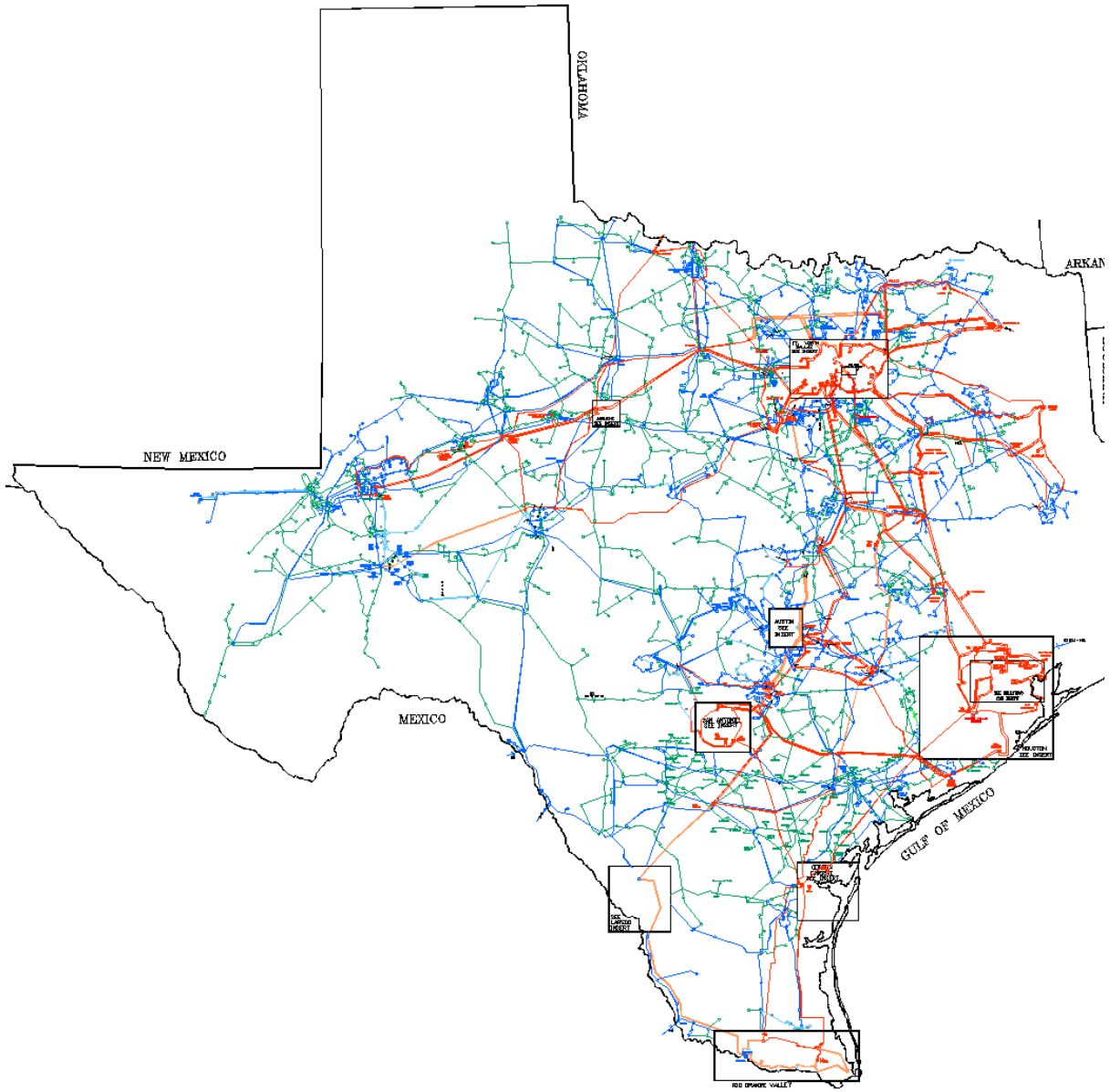
What is ERCOT?

The Electric Reliability Council Of Texas

- Independent, third party, not for profit organization
- In existence since 1941
- Public Utility Commission Of Texas (PUCT) jurisdictional
- A single point of control, intrastate electric interconnection
- NERC reliability authority
- 78,000 MW of active generation capacity
- 37,700 Circuit Miles of transmission
- 59,996 MW Peak Demand in 2003

THE ERCOT SYSTEM



- 200,000 Square Miles of Texas
- 8+ Million Customers (Meters Served)
- Over 500 generating units
- 8,100 + Circuit Miles of 345 kV Lines
- 18,200 + Circuit Miles of 138 kV Lines
- 11,500 Circuit Miles of 69 kV Lines

ERCOT

We are responsible for:

Wholesale Power System and Market Operations

Retail Operations

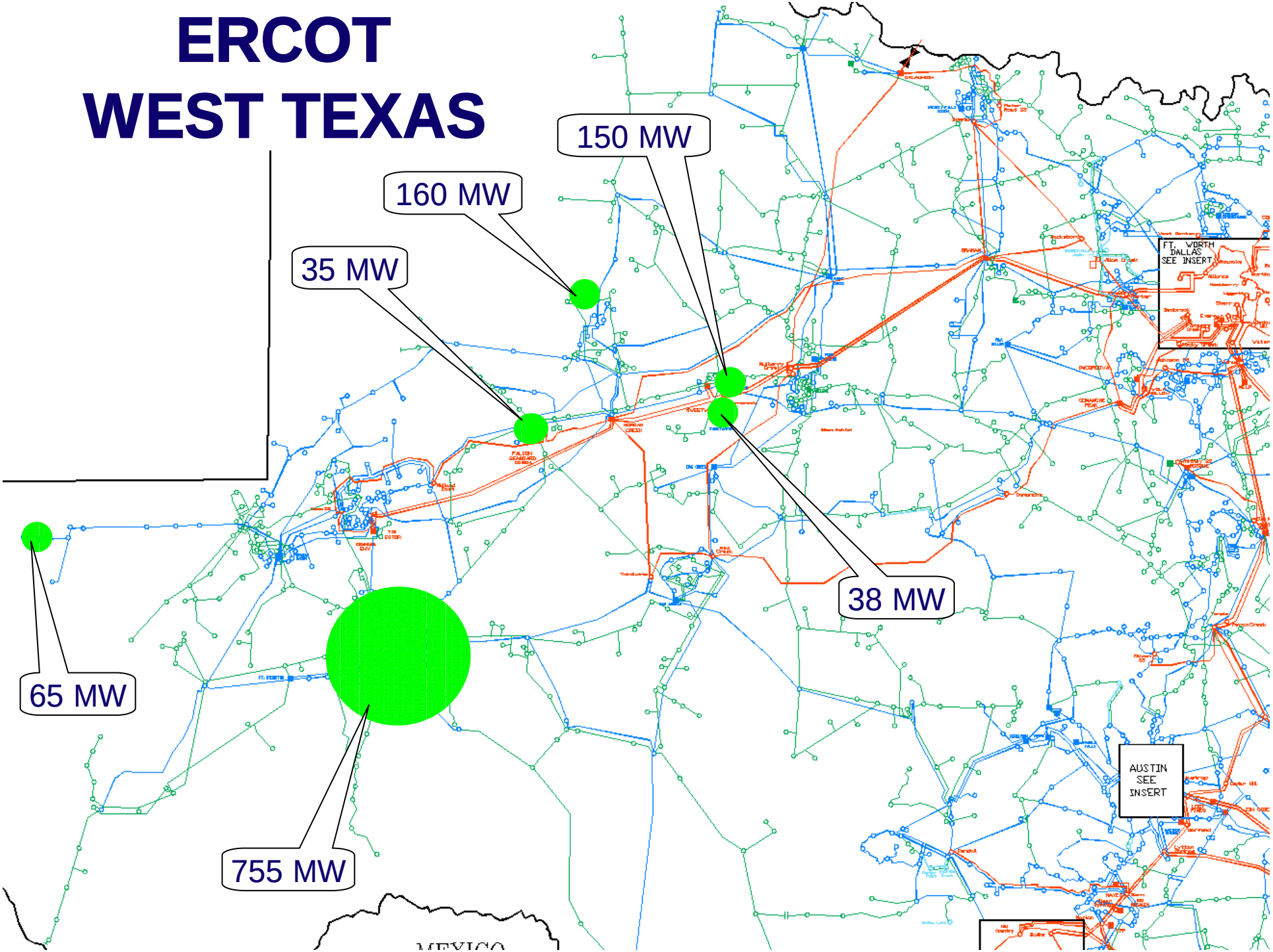
- Customer switching, Move in/Move outs
- Prevention of “slamming”
- Clearinghouse for meter reads

Transmission System Planning And Additions

- Coordinate 3 regional planning groups
- Determination on “need” for projects
- Present major projects for ERCOT Board endorsement

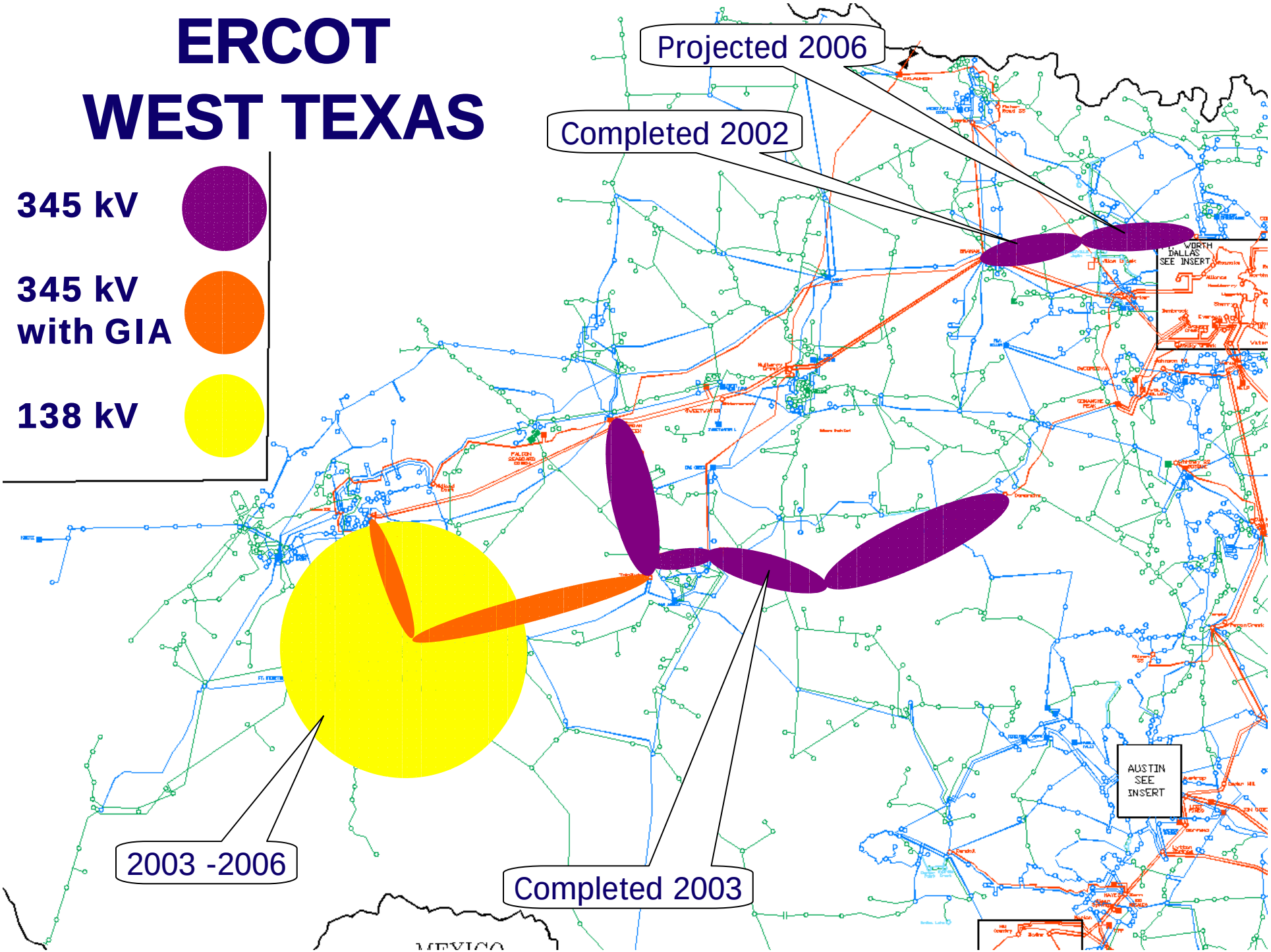
Transmission in ERCOT

- **ERCOT system is a “common carrier” for all wholesale transactions**
- **Not reserved for any particular transaction or schedule**
- **Paid for by Distribution Companies on a load ratio share basis**


ERCOT
WEST TEXAS
150 MW
160 MW
35 MW
38 MW
65 MW
755 MW
FT. WORTH
DALLAS
SEE INSERT
AUSTIN
SEE
INSERT
MEXICO

TYPES OF CONSTRAINTS

- **Goal to keep renewable sites in-service and optimize output**
- **Local constraints**
  - Transfers out of McCamey Area
  - Thermal limits
  - Voltage limits (high and low)
  - Construction and maintenance limits
- **Regional constraints**
  - Transfers out of West Texas to Dallas, Austin, Houston or San Antonio
  - Stability (transient and voltage) limits
    - Currently about 1,500 MW to 2,000 MW
    - Dependent on generation online (PB 6, Odessa & Morgan 6)
    - Wind models complete and in use by dynamics working group
  - Thermal limits
  - Voltage limits
    - High voltages problematic during light load conditions
    - Results in taking 345 kV circuit out of service


ERCOT
WEST TEXAS
345 kV
345 kV
with GIA
138 kV
Projected 2006
Completed 2002
2003 -2006
Completed 2003
WORTH
DALLAS
SEE INSERT
AUSTIN
SEE
INSERT
MEXICO

MAJOR CONCERNS

- **How much peak capacity?**
  - Seasonal production, diversity and time of day
  - Build in advance of known need
- **Stability affects**
  - May increase need for Regulation & Ancillary Services
- **Voltage control**
  - Implementation and compliance of reactive standards
  - May be critical for keeping renewable in-service
  - High voltage off peak a major concern
  - STATCOM, DVAR, Mini SVC Devices
  - Fault ride through capability may be a concern
- **Getting and maintaining data from turbine manufacturer's and owners**
- **Developing and maintaining stability models**
  - Utility Wind Interest Group (UWIG) effort
  - Coordination with other RTO/ISO's

Questions?