

# Lessons Learned From Integration of Renewables in ERCOT

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# Two Major Issues Arising From Large Scale Renewable Integration

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- ❑ Need to assure that reliability is maintained
- ❑ Need to assure market pricing and rules are non-discriminatory, transparent and efficient

# Competitive Renewable Energy Zones (CREZ) Implementation

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## □ Benefits:

- Supported the development and integration of remote wind resources to meet future renewable resource requirements through socialized interconnection costs
- Creates price signals for demand response

## □ Consequence:

- Created market and reliability challenges by failing to incent rational locational and resource diversity

# Operational Challenges

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- Wind resource ramping
- Reactive and voltage support
- Contingency planning for loss of renewable generation
- More sophisticated data needs, e.g. locational weather information
- Ensure interconnection standards maintained

# Market Challenges

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- ❑ Integrate renewables in a manner that ensures market signals continue to support:
  - resource adequacy
  - required ancillary services
- ❑ Not undermining least cost dispatch model
  - Security constrained economic dispatch

# Lessons Learned - Recommendations

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- ❑ Ramping in capability as output increases
- ❑ Examination of new technologies
  - Storage
  - Plug-in hybrid vehicles
- ❑ Cost benefit analysis
  - Need to look at all-in costs
    - Backbone
    - “off ramp” costs to connect to lower voltages
    - Sub-transmission/distribution cost
    - Interconnection costs
    - Costs of services necessary to provide reliability support to the grid

## Lessons Learned – Recommendations (cont'd)

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- ❑ Renewable generation needs appropriate support to make it a viable part of the grid
- ❑ Large scale renewable projects and supporting transmission need to be integrated into regional planning process
- ❑ Market rules and operating protocols need to incorporate integration of large scale renewables