



Golden Spread
Electric Cooperative, Inc.

A Touchstone Energy™ Cooperative 

Presentation for DOE Quadrennial Energy Review

Electricity: Generation to End Use

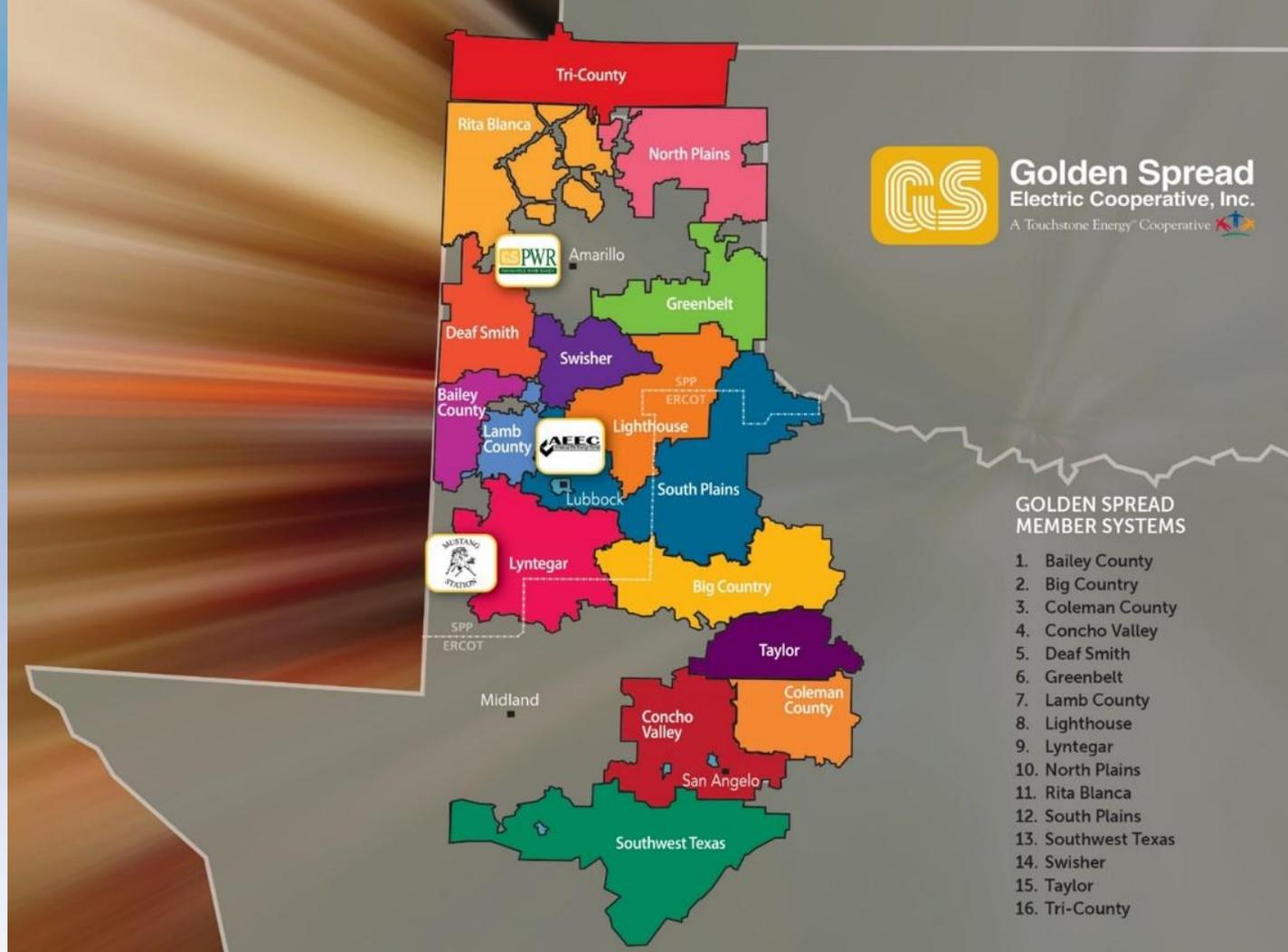
Integrating Renewable Generation: Price Formation in Organized Wholesale Markets

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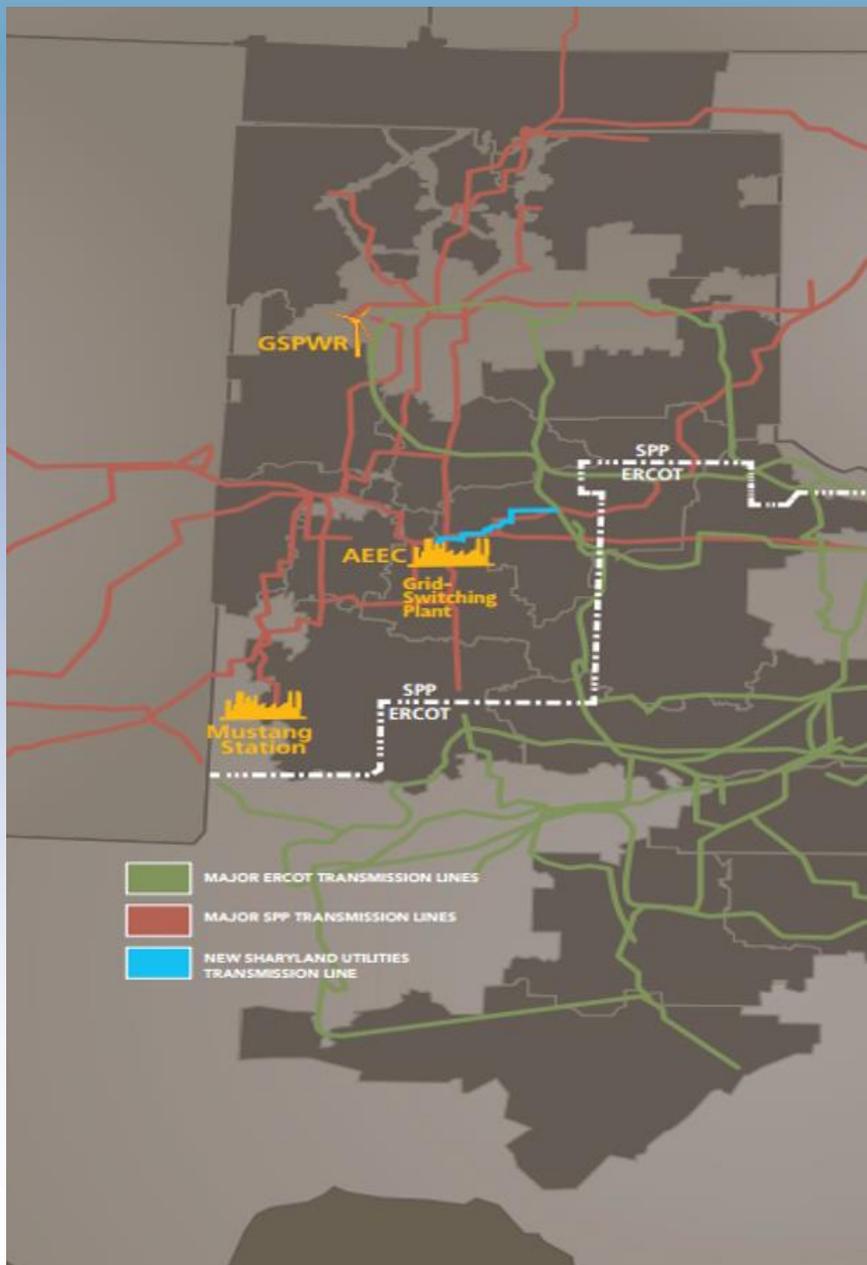
May 9, 2016



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- *16 Rural Distribution Cooperative Members*
- *Provide service to over 280,000 Member Electric Meters*
- *Territory covers 24% of the state of Texas, including Oklahoma Panhandle*

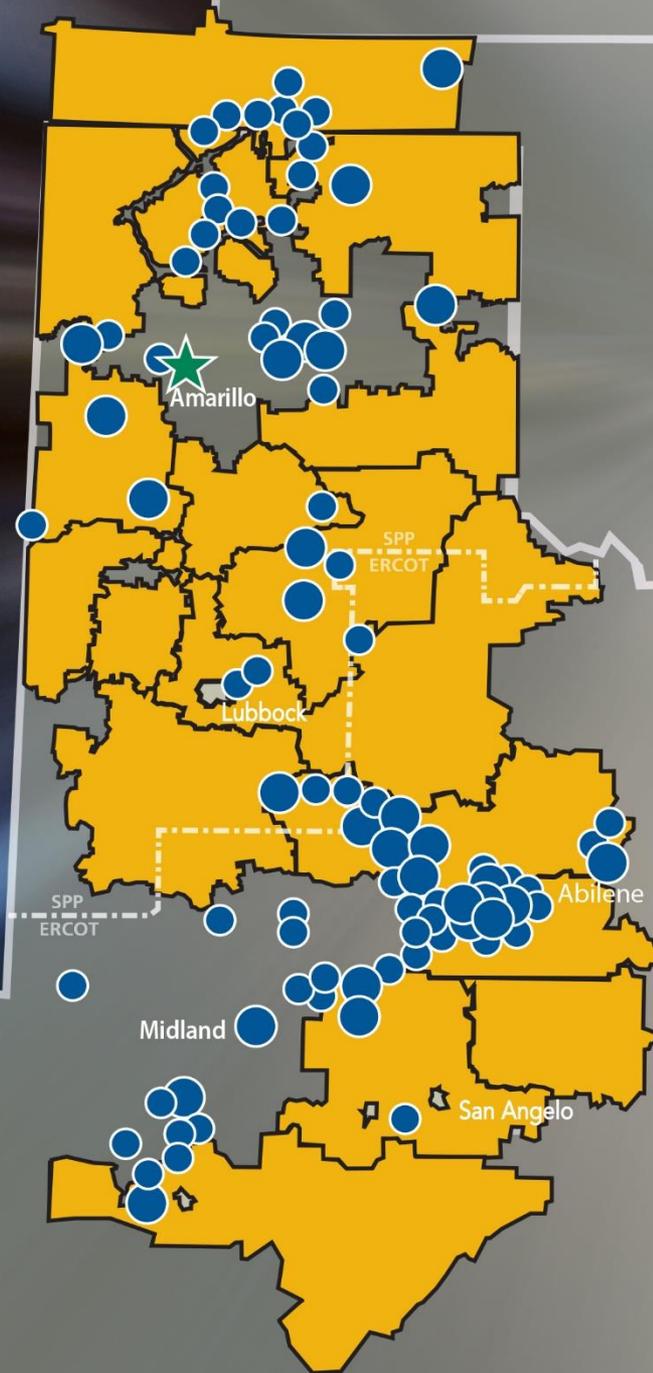


Additional Wind Capacity with ability to connect to the grid by the end of 2018:

- 15,180 MW

Additional Solar Capacity with ability to connect to the grid by the end of 2018:

- 2,228 MW



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- 175-781.5 MW
- 7.5-174 MW

Total Wind Capacity = 14,446 MW

A Matter of Balance



Intermittent, Variable Nature of Renewable Generation and Role of Organized Power Markets

- Wind and solar are intermittent
- Organized wholesale markets (RTO, ISO, Balancing Authorities) must ensure reliable and an efficient market
 - Monitor and balance power supply with demand
 - Maintain power quality (voltage, frequency , etc.)
- Variable energy resources must be integrated
 - Requires flexible fast response resources

Golden Spread Quick Start, Ramping Resources



Power Markets Must Send the Proper Price Signals to Incent Efficient Operation and Investment in Fast Start, Fast Ramping Resources

- To accommodate variable energy resources wholesale markets should ensure economically efficient price formation in energy and ancillary markets
- Why?
 - To ensure investment in quick start resources (including storage e.g., batteries)
 - To ensure renewables realize their full potential
- FERC has several investigations and rulemakings to improve price formation in energy and ancillary service markets. (Appendix Included)

The Goals of Efficient Market Prices

- So what should be done? This will be different for different markets.
 - Focus on proper pricing in energy and ancillary service markets
 - Adopt a shortage and scarcity pricing model like ERCOT, let the market provide appropriate price signals.
- FERC's stated goals of price formation:
 - Maximize market benefit for consumers and suppliers
 - Provide correct incentives for market participants so that efficient investments are made and reliability is maintained
 - Market transparency
 - Ensure suppliers receive cost recovery

Specific Improvements Are Needed

- Golden Spread supports FERC's position that market prices should reflect shortage conditions, including short duration events (remove market design features that restrict efficient price formation)
- Develop or fine tune ancillary service products (regulation up and down, spin and non-spin reserves)
- Markets should consider implementing a "ramping" product.
- Markets should limit out-of-market operator actions
- Markets should ensure that all resources are able to recover their full start-up costs

APPENDIX OF MAJOR FERC INITIATIVES TO IMPROVE PRICE FORMATION IN ENERGY AND ANCILLARY SERVICES MARKETS

- *Price Formation in Energy and Ancillary Services Markets Operated by Regional Transmission Organizations and Independent System Operators, Docket No. AD14-14-000*
- *Settlement Intervals and Shortage Pricing in Markets Operated by RTOs/ISOs, Docket No. RM15-24-000*
- *Offer Caps in Markets Operated by RTOs/ISOs, Docket No. RM16-5-000*
- *Essential Reliability Services and the Evolving Bulk-Power System—Primary Frequency Response, Docket No. RM16-6-000*
- *Reactive Supply (and Voltage Control) Compensation in Markets Operated by Regional Transmission Organizations and Independent System Operators, Docket No. AD16-17-000*
- *Electric Storage Participation in Regions with Organized Wholesale Electric Markets, Docket No. AD16-20-000*