THE WHOLESALE ELECTRIC MARKET IN ERCOT

2017
AECT COMPANIES WITHIN THE ERCOT COMPETITIVE MARKET

Retail Electric Providers
- Constellation
- Green Mountain Energy
- Reliant
- TXU Energy

Generation Companies
- Exelon Generation
- Luminant
- NextEra Energy Resources
- nrg

Total ERCOT Capacity: >77,000 MW
STEPS TO COMPETITION: WHOLESALE MARKET

Senate Bill No. 373 enacted in May 1995

- Required utilities to provide non-discriminatory open access transmission to support wholesale competition in ERCOT.
- Recognized new, unregulated participants in ERCOT wholesale market.
  - Exempt wholesale generators
  - Power marketers
- Allowed non-utility wholesale market participants to offer market-based prices in ERCOT.
- Deregulated electric cooperative distribution rates.

Note: Non-ERCOT areas are subject to FERC jurisdiction for wholesale services, including transmission services.
**ERCOT: By the Numbers**

- 90% of the electric load in Texas is in ERCOT
- 75% of ERCOT’s load is in the competitive market, including 24 million customers
- Over 550 generating units, providing 77,000 MW of generating capacity during peak demand
- 46,500 miles of high-voltage transmission

**ERCOT Responsibilities**

- System reliability – planning and operations
- Wholesale market settlement for electricity production and delivery
- Retail switching process for customer choice
- Open access to transmission

**OVERVIEW OF ERCOT**
• In competitive markets, consumers have multiple retail electric providers (REPs) and service plans to choose from.
• Wholesale and retail prices are set by competitive market forces, while the PUC sets transmission and distribution rates.
Competition Has Brought Greater Efficiency to the Wholesale Market

- Generators shoulder the risk of building new power plants, bringing efficient, cost-effective generation to consumers.
- New power plants produce more electricity per unit of fuel.
- Operational efficiency of a competitive market helps push wholesale prices downward.
- The competitive market will continue to bring forward the right mix of technology and fuel type based on environmental choices by policymakers.
INCREASED POPULATION DRIVES FUTURE ELECTRIC CONSUMPTION

Texas’ Projected Population Growth (millions) 1980-2040

14.2 million 17.0 million 20.9 million 25.1 million 28.9 million 32.9 million 37.0 million

Sources: U.S. Census, Texas State Data Center 0.5 scenario

To meet increases in electric load created by Texas’ rapid population and economic growth, Texas will require additional power, transmission and distribution, customer demand response and energy efficiency.
ERCOT GENERATION MIX: MORE NATURAL GAS THAN U.S. AVERAGE

Note: Oil-fired generation is negligible in ERCOT, accounting for less than 0.1% of ERCOT capacity and load; numbers may not add up to 100% due to rounding.

Sources: ERCOT (2015 data); EIA (2015 data)
Gas on the Margin in ERCOT Nearly Year-Round

TYPICAL AUGUST GENERATION OUTPUT IN ERCOT

- Nuclear and coal-fired power plants in ERCOT operate approximately 90 percent of the time
- Some natural gas-fired generation operates at nearly all times to meet demand
- Peaking natural gas-fired power plants are ramped on and off, depending upon demand
- Wind-generated electricity is only intermittently available, depending on wind conditions
ERCOT Wholesale Market Management

System Reliability

ERCOT oversees system reliability.
ERCOT is part of national reliability council.
ERCOT protocols, approved by PUC, mandate system reliability standards that all market participants must follow.

Statute and Rules Address “Market Power” and Generation Merger Issues

Independent Market Monitor oversees wholesale market operations.
Generating capacity owned and controlled by a Power Generation Company limited to 20% of installed generating capacity capable of delivering power to a power region.
Administrative penalties for market power abuse were reviewed and updated during the 79th Regular Session.
Mergers of Power Generation Companies subject to PUC review.

Market Design

ERCOT transitioned to a Nodal Market in 2009 as a result of PUC rulemaking.
The change is expected to bring cost-savings and additional efficiency to the market by enhancing market transparency and allocating costs more accurately to market participants.
KEY STATS IN THE COMPETITIVE WHOLESALE MARKET
This report does not include retirements of any coal-fired generation in its calculation of reserve margin.
DECLINING POWER PRICES OVER TIME

Average of real time power prices in ERCOT north zone, $/MWh

Source: ERCOT real time settlement data, north zone, 2008-2016

Since Q1 2015, average power prices have dropped from $26 to $17/MWh; trailing 12-month price averages $22/MWh
## VARIABLE COSTS DRIVE MARKET PRICING IN ERCOT

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<th>Fuel Type</th>
<th>Approx. Range for “Short-run” Variable Costs ($/MWh)</th>
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<td>Wind/Solar</td>
<td>(2.3) $0</td>
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<tr>
<td>Nuclear</td>
<td>8 $12</td>
</tr>
<tr>
<td>Coal</td>
<td>15 $31</td>
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<tr>
<td>Gas ‘CCGT’</td>
<td>13 $37</td>
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<tr>
<td>Gas Steam</td>
<td>23 $40+</td>
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<tr>
<td>Gas Turbine (‘CT’)</td>
<td>40+?</td>
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### Typical Dispatch Order
- 0 10 20 30 40 50

### At various gas prices ($/mmbtu)
- $2+
- $3+
- $4

### Recent 7x24 power prices:
- Q1 16: $17
- Last 12 mo.: $22

### Notes:
1. Effective negative cost reflects federal Production Tax Credit (PTC)
2. ERCOT 15-minute settlement data, north zone ($/MWh); “last 12 mo.” is through Q1 2016; Q1 2016 “5 x 16” (6am -10pm for 5 weekdays) = $20/MWh

### Observations:
- At low natural gas prices (~$2 / mmbtu) many CCGTs can operate cheaper than much of the ‘baseload’ coal fleet
- ~19 GW of renewables will bid zero or negative if needed to capture the PTC, displacing other generators. This can cause negative pricing.

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### Source:
Estimates based on typical range of plant fuel costs (gas starting at $1.75/mmbtu), heatrates, & variable O&M costs; CTs exclude startup costs
## EPA Regulations Impacting Fossil Fuel Generation

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<td><strong>Comply 2024+</strong></td>
<td><strong>Comply ~Dec 2018</strong></td>
<td><strong>Comply 2017+</strong></td>
<td><strong>Comply 2018+</strong></td>
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**Legend:**
- **Proposed**
- **Final**
- **Compliance**
- **Other**
**KEY TAKEAWAYS**

**Market Efficiency is a Hallmark of the Competitive Wholesale Market**

When electricity is priced by the market, cost-effective generation thrives

Power plants in Texas are relatively new, producing more electricity per unit of fuel

**More Power is Needed to Serve the Growing State of Texas**

Demand for electricity continues to rise along with population and economic development

The ERCOT market has strong fuel diversity, with greater use of natural gas than the national average

**Market Design Must Reflect Market Prices**

Wholesale power prices are declining, due to a mixture of low fuel costs (especially natural gas), market forces and regulatory decisions

All of these factors will impact what fuels are used for power

At the same time, we must be aware of the state’s need for new generation, as well as generation to replace older or uneconomic power plants
HOW TO REACH US

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