ERCOT Status and Issues

North Texas Renewable Energy Group

April 13, 2019
Agenda

• ERCOT Status and Issues

• Retail Choice / Power to Choose

• HVDC Transmission / “Supergrid”
ERCOT System
Transition to a Competitive Market

- Wholesale competition / open access in 1995
- Retail competition began in 2002 after approval by the legislature in 1999
- Energy only market with no price caps – at least initially
- Generation and retail sales deregulated
- Transmission and distribution regulated by the PUCT
ERCOT Responsibilities

• Responsible to the Public Utilities Commission
• Ensure reliability
• Ensure open access to transmission and distribution systems
• Manage the competitive market
• Ensure timely conveyance of information needed to support customer choice – retail switching
• Ensure accurate accounting for electricity production and delivery
Common Misconceptions About the ERCOT Market

• The Balancing Energy price is representative of the actual price for energy

• The majority of electricity is bought and sold in the daily market.

• There is no capacity market to incent the building of new capacity
Facts & Figures - 2012

- 200,000 Square Miles
- 40,500 miles of Transmission (2010)
- 73,492 MW Peak Capacity
- 10,035 MW of wind generation
  65 MW of utility solar
- 68,294 MW Peak Load (2011)
- 13.75% Target Reserve Margin
- 2011 Peak Reserve Margin 7.6%
- 4 DC Ties, 1100 MW (to Mexico and SPP)
- Stand alone system about the size of the UK
Facts & Figures - 2019

- 200,000 Square Miles
- 46,500 miles of Transmission (2019) + 15%
- 78,555 MW Peak Capacity + 7%
- 21,535 MW of wind generation + 116%
- 1,099 MW of utility solar + 630%
- 73,308 MW Peak Load (2018) + 7%
- 13.75% Target Reserve Margin
- 2018 Peak Reserve Margin 7.2% - 5%
- 6 DC Ties, 1250 MW (to Mexico and SPP) +14%
- Stand alone system about the size of the UK

Source: ERCOT
## Resource Mix by Capacity – 2011 / 2018

| Source: ERCOT, RBS Energy Consulting |

<table>
<thead>
<tr>
<th>Resource</th>
<th>2011</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>57%</td>
<td>54%</td>
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<tr>
<td>– Combined cycle</td>
<td>30%</td>
<td>35%</td>
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<tr>
<td>Coal</td>
<td>23%</td>
<td>14%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>Wind</td>
<td>13%</td>
<td>23%</td>
</tr>
<tr>
<td>Hydro / Other</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>Solar</td>
<td>0%</td>
<td>2%</td>
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</tbody>
</table>

Wind reliability capacity value: 8.7% → 15%/58%
Solar reliability capacity value: -  → 74%
## Resource Mix by Energy – 2011 / 2019

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>2011</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>40%</td>
<td>44%</td>
</tr>
<tr>
<td>Coal</td>
<td>39%</td>
<td>25%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>12%</td>
<td>11%</td>
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<tr>
<td>Wind</td>
<td>8%</td>
<td>19%</td>
</tr>
<tr>
<td>Hydro / Other</td>
<td>1%</td>
<td>1%</td>
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</tbody>
</table>

Source: ERCOT
ERCOT Capacity and Energy

**Installed Capacity 2018**
- Natural Gas: 54%
- Wind: 23%
- Coal: 15%
- Nuclear: 5%
- Solar: 2%
- Hydro, biomass, other: 1%

**Energy Produced 2018**
- Natural Gas: 44%
- Coal: 25%
- Wind: 19%
- Nuclear: 11%
- Hydro, biomass, other: 1%

**96.4 Gigawatts**

**376 TeraWatt-hours**

Source: ERCOT
ERCOT RESOURCE MIX

2018

Planned / Approved

Planned
## ERCOT Forecast
### December 2018

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
<th>2028</th>
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</thead>
<tbody>
<tr>
<td><strong>Load Forecast (MW)</strong></td>
<td>72674</td>
<td>74686</td>
<td>76664</td>
<td>78295</td>
<td>79942</td>
<td>81557</td>
<td>83167</td>
<td>84781</td>
<td>86348</td>
<td>87861</td>
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<tr>
<td><strong>Load Growth (MW)</strong></td>
<td>2012</td>
<td>1978</td>
<td>1631</td>
<td>1647</td>
<td>1615</td>
<td>1610</td>
<td>1614</td>
<td>1567</td>
<td>1513</td>
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<tr>
<td><strong>Load Growth Rate (%)</strong></td>
<td>2.8%</td>
<td>2.6%</td>
<td>2.1%</td>
<td>2.1%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>1.9%</td>
<td>1.8%</td>
<td>1.8%</td>
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<tr>
<td><strong>Resources (MW)</strong></td>
<td>78555</td>
<td>82652</td>
<td>86016</td>
<td>85958</td>
<td>85958</td>
<td>85948</td>
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<tr>
<td><strong>Resource Growth (MW)</strong></td>
<td>4097</td>
<td>3364</td>
<td>-58</td>
<td>0</td>
<td>-10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Resource Growth Rate (%)</strong></td>
<td>5.2%</td>
<td>4.1%</td>
<td>-0.1%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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</tr>
<tr>
<td><strong>Reserve Margin (%)</strong></td>
<td>8.1%</td>
<td>10.7%</td>
<td>12.2%</td>
<td>9.8%</td>
<td>7.5%</td>
<td>5.4%</td>
<td>3.3%</td>
<td>1.4%</td>
<td>-0.5%</td>
<td>-2.2%</td>
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</tbody>
</table>
ERCOT Reserve Margins
December 2018 Report

Percent by year

Target = 13.75%

Source: ERCOT
Energy Transmission

Big Changes in Power Flows
Coal Plants East of Load Centers

Power flows west and southwest to load centers
Wind/Solar West of Load Centers

Power flows East and Southeast to Load Centers
Current ERCOT Issues

• Will there be enough capacity?

• Managing wind and solar growth

• Moving energy to load
Retail Choice / Power to Choose

- PowertoChoose.org
  - 129 offers (75225) monthly to 36 months
  - Fixed, variable and indexed rates
- PUCT sponsored site
- **NOT** PowertoChoose.XXX.com
- Texas Legislator wants to eliminate the site.
  - Legislator director and electricity broker
  - My opinion: PowertoChoose will live on
- Some offers misleading/difficult to understand
- At least ten companies provide analyses - $$
PowertoChoose.org issues

• Are delivery charges included in offer?
• Does the energy charge vary with usage?
• Is there a cancellation fee?
• When to renew?
• What term to choose?
• Same offers as company website?
• % renewable
HVDC Transmission

“Supergrid”
U.S. Transmission
Concentrated on Coasts
U.S. Interconnections and Reliability Regions
HVDC versus HVAC

• Difficult to change voltages with direct current so most HV transmission is alternating current
• Eastern, Western and Texas Interconnection are AC systems and cannot be easily connected as they are not in phase
• Lower line losses with HVDC making it advantageous for long distance transmission
• HVDC less expensive beyond 300 miles
North American HVDC Facilities
Relatively Small HVDC Interconnections

- 1200 MW
- 154,000 MW
- 630,000 MW
- 70,000 MW
- 286 MW
- 820 MW
- Tres Amigas = 5,250 MW
### Existing HVDC Eastern / Western Interconnection Ties

- Stegall, Nebraska - 1977: 100 MW
- Eddy County, New Mexico - 1983: 200 MW
- Blackwater, New Mexico - 1984: 200 MW
- Miles City, Montana - 1985: 200 MW
- Sidney, Nebraska - 1988: 200 MW
- Rapid City, South Dakota - 2003: 200 MW
- Lamar, Colorado - 2005: 210 MW

**Total:** 1310 MW
Rapid City, SD 200 MW DC Tie
Supergrid Pros and Cons

• Pros
  – More efficient use of generation resources
  – Access to renewables for poor solar/wind region
  – Lower line losses with HVDC
  – Increased reliability across large areas

• Cons
  – HVDC more expensive less than ~ 400 miles
  – Decreased reliability for some regions (ERCOT)
  – Many large interconnections necessary
  – Voltage transformation more difficult
Summary

• ERCOT
  – Load is growing at a brisk pace
  – Can capacity keep up?
  – Wind and solar take center stage
  – Transmission issues need resolution

• Retail Choice
  – PowertoChoose.org under attack

• Supergrid
  – Will not be easy or cheap or soon