ERCOT Capacity Issues

North Texas Renewable Energy Group
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RBS Energy Consulting
ERCOT System
Facts & Figures

• 200,000 Square Miles
• 40,500 miles of Transmission (2010)
• 73,492 MW Peak Capacity
• 10,035 MW of wind generation
• 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

Source: ERCOT
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
ERCOT Capacity and Energy

**Installed Capacity 2011**
- Natural Gas: 56%
- Coal: 23%
- Wind: 13%
- Nuclear: 7%

**Energy Produced 2011**
- Natural Gas: 40%
- Coal: 39%
- Nuclear: 12%
- Wind: 9%
- Other: 1%

68,251 Megawatts

335,000 Megawatt-hours

Source: ERCOT
# Resource Mix by Capacity – 2010 / 2011

| Source: ERCOT, RBS Energy Consulting |

<table>
<thead>
<tr>
<th>Resource</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>57%</td>
<td>56%</td>
</tr>
<tr>
<td>– Combined cycle</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>Coal</td>
<td>23%</td>
<td>23%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>6%</td>
<td>7%</td>
</tr>
<tr>
<td>Wind</td>
<td>13%</td>
<td>12%</td>
</tr>
<tr>
<td>Hydro / Other</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Note: Wind is assigned a reliability capacity value of 8.7% of rated capacity.
## Resource Mix
by Energy – 2010 / 2011

<table>
<thead>
<tr>
<th>Energy</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>38%</td>
<td>40%</td>
</tr>
<tr>
<td>Coal</td>
<td>40%</td>
<td>39%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>13%</td>
<td>12%</td>
</tr>
<tr>
<td>Wind</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>Hydro / Other</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Source: ERCOT
# ERCOT Forecast

## June 2011

### Actual

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Load Forecast (MW)</td>
<td>62286</td>
<td>68294</td>
<td>63880</td>
<td>65790</td>
<td>68381</td>
<td>70231</td>
<td>71628</td>
<td>72576</td>
<td>73638</td>
<td>74612</td>
</tr>
<tr>
<td>Load Growth (MW)</td>
<td>1594</td>
<td>1910</td>
<td>2591</td>
<td>1850</td>
<td>1397</td>
<td>948</td>
<td>1062</td>
<td>974</td>
<td>1159</td>
<td></td>
</tr>
<tr>
<td>Load Growth Rate (%)</td>
<td>2.6%</td>
<td>3.0%</td>
<td>3.9%</td>
<td>2.7%</td>
<td>2.0%</td>
<td>1.3%</td>
<td>1.5%</td>
<td>1.3%</td>
<td>1.6%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Resources (MW)</td>
<td>73175</td>
<td>73175</td>
<td>75065</td>
<td>75152</td>
<td>75967</td>
<td>78144</td>
<td>78782</td>
<td>80379</td>
<td>80379</td>
<td>80379</td>
</tr>
<tr>
<td>Resource Growth (MW)</td>
<td>1890</td>
<td>87</td>
<td>815</td>
<td>2177</td>
<td>638</td>
<td>1597</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Reserve Margin (%)</td>
<td>17.5%</td>
<td>7.1%</td>
<td>17.5%</td>
<td>14.2%</td>
<td>11.1%</td>
<td>11.3%</td>
<td>10.0%</td>
<td>10.8%</td>
<td>9.2%</td>
<td>7.7%</td>
</tr>
</tbody>
</table>

### Notes:
1. **Total Resources include 8.7% of installed wind capacity**
2. **New resources during this period include 1845 MW coal, 3505 MW natural gas and 145 MW biomass**
3. **Does not include potential new wind resources or retirements (old gas)**

Source: ERCOT, RBS Energy Consulting
ERCOT Energy Only Market Key Features

- **System Wide Offer Cap**
  - $3000/MWh limit per PUCT rule
  - Price of energy set at $3000/MWh when ERCOT is out of competitive energy offers (scarcity)
  - Offer Cap reduced to $500/MWh if Peaker Net Margin reaches an accumulation $175,000 in a year (has not occurred thus far)

- **Ancillary Services**
  - Regulation Reserve (reserves deployed to maintain frequency)
  - Responsive Reserve (10 minute reserves)
    - 2300 MW now going to 2800 MW in April
    - Contingency reserves supplied by generation & up to 50% from load resources
  - Non-spinning reserves (30 minute reserves)

- **Emergency Interruptible Load Service**
Common Misconceptions About the ERCOT Market

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

• There is no capacity market to incent the building of new capacity

• Natural gas is the predominant fuel for producing electricity
Recent Design Changes

• Energy
  • Increase System Wide Offer Cap to $4500 / MWh August 1

• Ancillary Services
  • Move 500 MW of Non-Spinning Reserve Service to Responsive Reserves
  • Offer floors for Non-Spinning Reserve Resources
    – No less than $120 for Online Resources available for dispatch
    – No less than $180 for Offline Resources when deployed
  • Offer floors for Responsive Reserve & Reliability Unit Commitment Resources
    – Offer placed at the system wide offer Cap of $3000

• Evaluating methods to allow increased load participation
  – Demand response pilot – 150 MW

Source: ERCOT, PUCT, RBS Energy Consulting
Additional Measures to Address Resource Adequacy

• **Near Term**
  - Bring mothballed generation back into service on a temporary basis (10 units - 1984 MW)
  - PUCT Workshops

• **Longer Term**
  - PUCT/ERCOT Engaged the Brattle Group to study to recommend long term solutions
    - “A capacity market is not an option”
The Brattle Group Report – PUCT Options

• Energy only with market-based reserve margin
• Energy only with adders to support a target reserve margin
• Energy only with backstop procurement at minimum acceptable reliability
• Mandatory resource adequacy requirement for load serving entities
• Resource adequacy requirement with a centralized forward capacity market
# Electric Cost and Emissions Savings with Various Amounts of Solar PV in 2011

<table>
<thead>
<tr>
<th>Solar PV</th>
<th>CO2 Avoided (tons)</th>
<th>Energy Cost Benefit ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>323,000</td>
<td>167,900,000</td>
</tr>
<tr>
<td>2500</td>
<td>811,000</td>
<td>348,400,000</td>
</tr>
<tr>
<td>5000</td>
<td>1,612,000</td>
<td>520,300,000</td>
</tr>
</tbody>
</table>

*Source: The Brattle Group*
Where Do We Go From Here?

- PUCT Workshops / Deliberations / Rulemakings
- No real issue until 2014 with mothballed units in service and with normal summers
- 2013 Legislature likely to address the resource adequacy issue
- My opinion: A capacity market in some form is inevitable – an energy market will require patience