US Association for Energy Economics (USAAE)

Thad Hill
President and CEO, Calpine Corporation

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Calpine Corporation: National Integrated Competitive Power Company

- Geographically diversified portfolio: Scale in America’s most competitive power markets
- Largest owner/operator of natural gas-fired generation in America
- Largest operator of combined heat and power (cogeneration) technology in America
- Largest geothermal power producer in America

Figures reflect 2016 MWh.
“When companies don’t have confidence in their ability to recover cost through the market, they won’t invest – potentially impacting the reliability and increasing cost to customers.”

FERC Commissioner, Cheryl LaFleur

Indeed, Competitive Markets Have Worked

**Competitive markets have...**

**Encouraged new competitive investment**

- **% of Market Capacity Added**:
  - ERCOT: 29%
  - PJM: 11%
  - ISO-NE: 13%

**Benefited consumers**

- **% Reduction in LMP**:
  - ERCOT: 16%
  - PJM: 15%
  - ISO-NE: 40%

**And become more resilient...**

**New Capacity Since 2012 (MW)**

- ERCOT: Renewable Additions = 20,000 MW
- PJM: Renewable Additions = 15,000 MW
- ISO-NE: Renewable Additions = 5,000 MW

**Wholesale Power Price ($/MWh)**

- ERCOT: 2013 = $30, 2017 = $20
- PJM: 2013 = $40, 2017 = $30
- ISO-NE: 2013 = $50, 2017 = $40

Despite Market Success, Out-Of-Market Interventions Occurring
Current Mandated Solutions Very Expensive Compared to Market Signals

Implied Cost of CO2 Reduction

## Three Power Market Models When There Really Should be Two

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Competitive</th>
<th>Hybrid</th>
<th>Regulated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Long-Term Stability</strong></td>
<td>✔</td>
<td>✗</td>
<td>✔</td>
</tr>
<tr>
<td>Characteristics</td>
<td>Low wholesale and retail rates</td>
<td>Gap between low wholesale and rising retail rates</td>
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<tr>
<td></td>
<td>Investors bear risk</td>
<td>Investors lose confidence, ratepayer guarantees needed</td>
<td>Risky for ratepayers (Vogtle, Sumner, Kempner)</td>
</tr>
<tr>
<td><strong>Regions</strong></td>
<td>PJM, ISO-NE, ERCOT</td>
<td>NYISO</td>
<td>MISO</td>
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When Will a Competitive Market Collapse Under its Own Weight?

How many is too many out-of-market actions?

Cumulative Penetration of Out-of-Market Resources (% of Market)

Sustainable

Unsustainable

Subsidies for Out-of-Market Resources

Low % RPS
Low % NEM Solar
High % RPS + Increasing NEM
CCGT Contracts
• RMR (CA)
• Hughes Projects (PJM)
Rate-based Storage
Nuclear Bailouts
Reliability Payments to Coal Plants
Assuming Continued State/Federal Interference with Competition...

...Where do we go from here?

Option #1: Reregulate
- Provide rate of return/tariff compensation to newly reregulated assets
- Redefine Just and Reasonable rates given billions of dollars invested in last 5 years under a different market/regulatory compact

Option #2: Draw a hard line in the competitive market
- Absolute defense of capacity markets even if the mechanism is imperfect e.g. CASPR, Repricing + PFRR
- Leverage ability to price “attribute” as a constraint (e.g., winter fuel availability), but recognize limits to this approach... more than one “attribute” probably becomes too cumbersome
- Energy prices:
  - Some leakage may be ok – but must mitigate when out-of-market resources’ impact becomes significant
  - Leverage to send signals the most effective way e.g. Carbon pricing, Winter Fuel Reserves Market

Hybrid/Residual Market is not a viable option
Regulated T&D Adders Mask the Benefit of Lower Wholesale Power Prices

Retail prices remain high because of states environmental mandates and utility increased investment in transmission and distribution

Ohio

Wholesale Power Prices

Monthly Residential Bill

Source: Wholesale power prices are real time AEP Dayton Hub from 10/2004 to 12/5/2017 provided by Ventyx-Energy Velocity. Residential bill are for Ohio Edison based on 600 kWh and are provided by Energy Tariff Experts.