Capacity Markets

Lessons for New England from the First Decade

PRESENTED TO
Restructuring Roundtable
Capacity (and Energy) Market Design in New England

PRESENTED BY
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Disclaimer

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Agenda

- Why capacity markets?
- Regional overview/comparison
- Successes and challenges
- Takeaways for New England
Why Capacity Markets?

- Capacity markets help meet resource adequacy requirements in restructured markets, where resources are supplied by merchant investors rather than regulated entities.
  - Load serving entities must buy enough capacity to meet their peak load + reserve margin (often with the RTO procuring on their behalf).
  - Resources compete to provide that capacity at least cost.
  - Resources that “clear” are paid the capacity clearing price.

- The price needed to clear the market is positive because energy margins are typically insufficient to attract enough resources to meet the target reserve margin. **This “missing money” has two causes:**
  - Energy prices may be below the true marginal system cost.
  - Even if prices reflected the marginal system cost, an energy-only market would provide the economically optimal reserve margin, but this would likely be below the high levels mandated based on “1-in-10”; such high reserve margins depress energy prices, so an additional payment is needed.
**Why Capacity Markets?**

*Example: ERCOT Energy Margins vs. CC CONE*

![Graph showing CC Energy Margins and CONE ($/kW-yr) vs. Planning Reserve Margin (ICAP %). The graph illustrates the equilibrium at 11.5% RM and 1-in-10 LOLE at 14.1% RM. There is a point marked as 'Missing Money.'*
# Snapshot of U.S. Capacity Markets

<table>
<thead>
<tr>
<th></th>
<th>Forward Period</th>
<th>Procurement</th>
<th>Demand Curve</th>
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<tbody>
<tr>
<td><strong>California</strong></td>
<td></td>
<td>Bilateral</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>MISO (Previous)</strong></td>
<td></td>
<td>Bilateral + Voluntary Auction</td>
<td>n/a</td>
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<tr>
<td><strong>MISO (2013/14+)</strong></td>
<td></td>
<td>Bilateral + Mandatory Auction</td>
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<tr>
<td><strong>NYISO</strong></td>
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<td>Bilateral + Voluntary &amp; Mandatory Auctions</td>
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<tr>
<td><strong>PJM</strong></td>
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<td>Bilateral + Mandatory Auctions</td>
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<tr>
<td><strong>ISO-NE</strong></td>
<td></td>
<td>Bilateral + Mandatory Auctions</td>
<td>TBD soon</td>
</tr>
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</table>

*Note: Forward Commitment Period includes 4, 3, 2, and 1 years.*

*Source: brattle.com*
Summary of Successes

- Meeting resource adequacy objectives
  - All markets in surplus or balance (but started w/excess)
  - PJM forward market cleared sufficient supply despite 10% of the fleet retiring

- Competition among resource types has lowered the cost
  - Retention of existing capacity
  - Surprising amount of entry of DR, uprates, and imports
  - Need for costly new generation was deferred

- Proven ability to support merchant generation entry
  - Large amounts of new merchant CCs in PJM
  - Some merchant entry in NYISO and now ISO-NE
Response to Exceptional Scale of Retirements
- 10% of generation fleet retiring from MATS and NJ HEDD and low gas prices
- Impressive market response maintaining resource adequacy

Entry of Merchant Generation
- Approximately 9,300 UCAP MW of new gas CCs cleared over two years, representing a commitment to build (5,400 MW merchant)

High Reliance on DR
- DR at 9.9% of peak load in 2015/16, but then declining; next auction will restrict Limited DR
- Declining gen reserve margin, increased DR calls, and improved scarcity pricing should mean higher energy prices
- Implementation of scarcity pricing rules esp. when deploying DR is key

Sources: BRA results and parameters. Brattle 2011 RPM Review.
Summary of Challenges

- **Price Volatility**
- **Tension Between Planning and Markets**
- **Ongoing Refinements of Design Elements**
  - Demand curves
  - Performance incentives/penalties
  - Accommodating large amounts of DR: reliability value; relationship to scarcity prices
  - Transmission constraints
- **Fundamentals Challenges**
  - Fuel adequacy challenges: best to address through changes to energy and A/S markets or refinements to capacity market products?
  - Ongoing retirements
Price Volatility and Uncertainty are a Concern

- **Price volatility and uncertainty** are a big concern in restructured markets without substantial forward bilateral contracting.

- **Several contributing factors:**
  - Market Fundamentals – efficient result to have prices move with fundamentals, but the markets are structurally volatile due to steep supply and demand curves.
  - Rule Changes – one-time design changes contribute to volatility, but impacts not persistent.
  - Ongoing Administrative Uncertainties – uncertain administrative parameters are an ongoing concern (e.g., load forecast, Net CONE, transmission limits).

- **New England prices** were initially more stable only because of the price floor.

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### Capacity Prices Across RTOs

- **ISO-NE**
- **PJM**
- **Upstate NY**
- **MISO**
- **Eastern PJM**
- **Western PJM**

Annual UCAP Capacity Price ($/kW-y)

- 2004/05
- 2005/06
- 2006/07
- 2007/08
- 2010/11
- 2011/12
- 2012/13
- 2014/15
- 2015/16
- 2016/17
- 2017/18

- **Boston (FCM)**

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*brattle.com*
How can merchant entry co-exist with regulated planning?

In Eastern Markets:
- If merchant entry is needed for resource adequacy even after self-supply, prices will need to be at merchant Net CONE in long-run average
- Requires effective MOPR, but potential inefficiency if applied too broadly (e.g. merchants without incentive to manipulate prices)
- Recent DC Court rulings to cancel NJ and MD contracts may have broader implications (appeals may be pending)

In MISO and California:
- Bifurcated capacity markets where new units enter under long-term contracts (existing paid far less)
- Some options exist for enabling primarily-regulated regions to benefit from competition in capacity markets (e.g. to attract low-cost merchant DR & uprates), but strong opposition from state regulators

Demand Curves Can Reduce Volatility

**Notes:**

Other RTO curves are the system-wide curves drawn as a function of the 1-in-10 reliability requirement and Net CONE of their respective markets. PJM’s curve is drawn before the subtraction of the 2.5% deduction for short-term resource procurements.
## Status of Current Issues by Region

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<thead>
<tr>
<th></th>
<th>MISO</th>
<th>PJM</th>
<th>NYISO</th>
<th>ISO-NE</th>
<th>CAISO</th>
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<tbody>
<tr>
<td><strong>Demand Curves</strong></td>
<td>• IMM/merchants propose sloping</td>
<td>• Recent CONE dispute</td>
<td>• Recent dispute over reference technology</td>
<td>• Demand curve to be filed in April</td>
<td>• Not applicable</td>
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<tr>
<td></td>
<td>• Others oppose due to quantity risk</td>
<td>• Added safeguard to prevent price cap collapse</td>
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<td></td>
<td></td>
<td>• Triennial review</td>
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<td><strong>MOPR</strong></td>
<td>• No MOPR (FERC now re-reviewing in response to generator/IMM concerns)</td>
<td>• Effective MOPR but still tweaking (strict but narrowly targeted)</td>
<td>• Recent litigation</td>
<td></td>
<td>• Not applicable</td>
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<td></td>
<td></td>
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<td></td>
<td>• Concerns that it is too broadly applied (e.g. to renewables and small self-supply)</td>
<td>• MOPR is one reason CPUC and IOUs are wary of capacity market</td>
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<tr>
<td><strong>Demand Response and Scarcity Pricing</strong></td>
<td>• High reserve margins means fewer calls/scarcity events for now</td>
<td>• Multiple DR products; new cap on “Limited”</td>
<td>• Increasing DR calls highlighting importance of scarcity mechanism &amp; effective E&amp;A/S integration</td>
<td>• Strict DR energy offer rules (along with PI) may squeeze some DR out of FCM</td>
<td>• No mechanism for enabling merchant DR in capacity</td>
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<td></td>
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<td>• Increasing reliance on DR creating more calls, scarcity pricing being tested</td>
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<td><strong>Retirements</strong></td>
<td>• Large risks from MATS, but little forward transparency of price or quantity</td>
<td>• 25,000 MW of retirements from MATS and NJ HEDD (15% of fleet)</td>
<td>• Potential Indian Point retirement</td>
<td>• ~3,000 retiring</td>
<td>• 16,000 MW to retire or reinvest in next decade from once-through-cooling</td>
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<tr>
<td><strong>Other</strong></td>
<td>• Tension between IRP and market</td>
<td>• Worry about “non-firm” resources: imports, planned gen and DR</td>
<td>• New Hudson capacity zone</td>
<td>• Performance incentives; concerns about fuel adequacy</td>
<td>• Tension between IRP and market</td>
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<td></td>
<td></td>
<td></td>
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<td>• Flexible resource requirements</td>
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Takeaways for New England

- Demand curve will help reduce volatility, susceptibility to market power, and recognize some incremental value of capacity

- Performance incentives will have some effects similar to scarcity pricing in the E&AS markets, but fundamentally changes nature of capacity obligation

- Tension between regulated and merchant entry likely to continue; current question is about enabling exemptions for renewables
Additional Reading

Dr. Samuel Newell’s expertise is in the analysis and modeling of electricity markets, the transmission system, and RTO rules. He supports clients in regulatory, litigation, and business strategy matters involving wholesale market design, contract disputes, generation asset valuation and development, benefit-cost analysis of transmission enhancements, the development of demand response programs, and integrated resource planning. He frequently provides testimony and expert reports to RTOs, state regulatory commissions, and the FERC.

Dr. Newell earned a Ph.D. in technology management and policy from the Massachusetts Institute of Technology, an M.S. in materials science and engineering from Stanford University, and a B.A. in chemistry and physics from Harvard College.
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