Best Practices in Resource Adequacy

Presented at
PJM Long Term Capacity Issues Symposium

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January 27, 2010
Overview: Market Designs for Resource Adequacy

1. Energy-Only Markets
   - Examples of “Energy-only” Markets
   - Myths Around “Energy-only” Markets
   - Conditions for Workable Energy-Only Markets

2. Resource Adequacy Requirements (RAS)
   - Why Resource Adequacy Requirements?
   - Implications and Best Practices for Resource Adequacy
   - Setting Resource Adequacy Levels

3. Key Elements in Resource Adequacy Market Design
   - Short-term versus Forward Resource Adequacy Requirements
   - Bilateral-Only versus Centralized Capacity Markets
   - Voluntary versus Mandatory Centralized Capacity Markets

4. What Works and Doesn’t in Today’s Forward Capacity Markets
# Market Designs for Resource Adequacy

<table>
<thead>
<tr>
<th>Type of Centralized Capacity Market</th>
<th>Without Resource Adequacy Requirement</th>
<th>With Resource Adequacy Requirement</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Energy-Only Markets w/ Capacity Payments or PPAs</td>
<td>Short-term</td>
</tr>
<tr>
<td>None</td>
<td>ERCOT, AESO, Australia’s NEM, NordPool, Great Britain</td>
<td>Argentina, Chile, Colombia, Peru, Spain, South Korea, Ontario</td>
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<tr>
<td>Voluntary</td>
<td>Midwest ISO</td>
<td>NYISO, former PJM, Australia’s SWIS</td>
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<tr>
<td>Mandatory</td>
<td>NYISO, former PJM, Australia’s SWIS</td>
<td>PJM, ISO-NE, Brazil</td>
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</table>
Examples of “Energy-Only” Markets

♦ U.K. pool, ERCOT, and Alberta are examples of “energy-only” markets that work reasonably well today
  • But concerns exist in both U.K and ERCOT about whether capacity shortages can actually be avoided over next 3-5 years

♦ Many energy-only markets “work” because they started out with excess capacity
  • Ability to ensure the “right” level of resource adequacy untested
  • A number of academic studies find that “energy only” will produce too little reliability and too much volatility

♦ Significant out-of-market interventions in most so-called “energy-only” markets
  • Reliability-must-run contracts, capacity payments, long-term PPAs
  • Government ownership of existing or new generation
  • Regulated cost recovery in non-restructured states
  • Explicit or implicit planning reserve margin requirements
# Myths Around “Energy-Only” Markets

<table>
<thead>
<tr>
<th>Myth</th>
<th>Reality</th>
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<tbody>
<tr>
<td>“Energy-only” markets can have planning reserve requirements</td>
<td>Imposing any resource adequacy requirement creates a capacity market (at least bilaterally)</td>
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<tr>
<td>Energy-only markets avoid costly capacity payments</td>
<td>Same costs to achieve the same reliability. Energy-only markets require periodic price spikes high enough to pay for capacity</td>
</tr>
<tr>
<td>Energy-only markets avoid regulated solutions such as resource adequacy standards</td>
<td>Real-world energy-only markets all require significant market intervention (e.g., regulated scarcity pricing)</td>
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<tr>
<td></td>
<td>Out-of-market payments are common (reliability must run, government-owned generation, backstop procurement, regulated cost recovery)</td>
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Conditions for Workable Energy-Only Markets

✧ Abandon resource adequacy requirements; uncertainty about actually achieved level of reliability is acceptable politically

✧ Periodic severe price spikes and curtailments are acceptable
  • California power crisis levels every 5 to 10 years?
  • Market-based or effective administrative scarcity pricing that allows prices up to VOLL ($10,000/MWh?)

✧ Customers can be curtailed based on reliability level purchased (to avoid common-good/free-rider problem)

✧ Customers understand how much reliability they need

✧ Competitive energy markets that limit market power
  • Low concentration of generation; limited transmission constraints
  • Substantial amounts of price-responsive demand
  • Light-handed energy-market mitigation to avoid “missing money” problem
Why Resource Adequacy Standards?

♦ Resource adequacy standards offer several attractive benefits
  • Ensure adequate reliability, prevent curtailments
  • Address common good/free ridership problem
  • Reduce price volatility and investment risk premiums
  • Mitigate market power in spot energy markets

♦ Do reserve requirements distort markets?
  • Yes, but similar to requirements imposed in other markets
  • Examples: vehicle safety standards, building codes, appliance efficiency requirements

♦ Will RAS be able to fade away as demand response grows?
  • Not entirely, because DR (creating additional “non-firm” service) does not eliminate the need for reliability of serving residual (“firm”) load
  • Only if customers can choose to purchase higher reliability for their firm residual load (and the ISO can curtail others)
Setting Resource Adequacy Levels

♦ Current RA levels typically based on 1-day-in-10-year standard
  • Not updated for change in end-use applications in decades
  • Often do not consider magnitude of curtailments (MWh lost)
  • Not updated as control areas grow
  • Does not consider transmission and distribution reliability

♦ Determining the “right” level of RA should consider
  • Cost of incremental capacity
  • Value of additional reliability
  • Benefits of reduced price volatility (lower investment risk premium, customer value, and policy value)
  • Increased competition in short-term energy markets
Implications and Best Practices for RAS

♦ Imposing resource adequacy requirements means:
  • Creation of capacity market (at least bilateral)
  • Existing and new resources have equivalent capacity value

♦ Best-practice design elements for any market with resource adequacy requirements include:
  • Scarcity pricing in energy and ancillary services markets
  • Integrate DR resources (dispatchable, price responsive, efficiency)
  • Locational requirements in import-constrained locations
  • Setting the right level of resource adequacy

♦ Advantages of other design elements depend on market structure
  • Short-term vs. forward resource adequacy requirements
  • Enforcement and backstop procurement
  • Standardized capacity products
  • Voluntary or mandatory centralized market for residual capacity
## Short-Term versus Forward RAS

<table>
<thead>
<tr>
<th>Advantages of Short-Term</th>
<th>Advantages of Forward</th>
</tr>
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<tbody>
<tr>
<td>♦ Simpler, lower implementation costs</td>
<td>♦ Reduces capacity price volatility and investment risk premium</td>
</tr>
<tr>
<td>♦ Lower risk of inadvertent errors (e.g., peak load forecast) and ex-post challenges</td>
<td>♦ Facilitates entry by (and financing of) unregulated new plants and cap adds</td>
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<tr>
<td>♦ Allows for more flexibility in regulated planning processes of states and local jurisdictions</td>
<td>♦ Increases competition from new resources, mitigates market power</td>
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<td>♦ If inadequate reserves are discovered, there is sufficient time for backstop procurement (in markets without regulated resource planning)</td>
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**Examples:** SPP, former power pools, some Canadian markets; Some regions with centralized capacity markets (NYISO, MISO, former PJM, Australian SWIS)

**Examples:** CAISO; Some regions with centralized capacity markets (PJM, ISO-NE, Brazil)
Bilateral-Only vs. Centralized Capacity Markets

Advantages of Bilateral-Only

♦ Simpler, lower implementation costs
♦ Lower risk of design flaws; design parameters have less impact on market prices
♦ Lower political risks because capacity costs are less visible
♦ Allows for more flexibility in regulated planning processes of states and local jurisdictions

Examples: all markets with planning reserve requirements but no centralized capacity markets (SPP, former power pools, some Canadian markets, CAISO)

Advantages of Centralized

♦ Increases price transparency; lowers risks and transactions costs, particularly in markets with many small suppliers
♦ Supports retail competition by facilitating transactions to address load migration
♦ Facilitates integration of DR resources
♦ Provides transparent, market-based backstop procurement mechanism by system operator
♦ Facilitates monitoring and mitigation of market power

Examples: MISO, NYISO, Australia’s SWIS, PJM, ISO-NE, Brazil
## Voluntary vs. Mandatory Capacity Markets

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<th>Advantages of Voluntary</th>
<th>Advantages of Mandatory</th>
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<td>♦ Administrative parameters have less impact on centralized and bilateral market prices</td>
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<td>♦ Allows for more flexibility in regulated planning processes of states and local jurisdictions</td>
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<tr>
<td>♦ Improves liquidity and transparency</td>
<td></td>
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<td>♦ Facilitates market-based backstop procurement</td>
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<tr>
<td>♦ Better addresses load migration, particularly in markets with forward RAS and retail choice</td>
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<tr>
<td>♦ Allows for more comprehensive market monitoring and mitigation of market power</td>
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**Examples:** MISO  
**Examples:** PJM, ISO-NE, NYISO, Brazil
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<th>Working</th>
<th>Continuing Challenges</th>
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<td>♦ Attracted and retained large amounts of capacity, even at market prices lower than net CONE</td>
<td>♦ Local reliability; continued reliance on RMRs in some markets</td>
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<td>♦ RPM and FCM have attracted large amounts of low-cost demand response</td>
<td>♦ Treatment of planned transmission</td>
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<td>♦ Buyer market power</td>
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<td>♦ Contentious administrative determinations (load forecasting, reliability targets, Net CONE)</td>
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<td>♦ Tension in accommodating short lead-time resources (mostly DR) and long lead-time projects (baseload generation, transmission)</td>
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<td>♦ RPM and FCM have attracted large amounts of low-cost demand response</td>
<td>♦ New market design elements (e.g., scarcity pricing, price responsive DR)</td>
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<td>♦ Perceptions (“not yet reliable”) and transition issues (“rate shock”)</td>
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- PJM’s RPM attracted/retained a net of 7,210 MW of capacity in sixth auction alone, after a net capacity addition/retention of more than 14,000 MW in the first five auctions
- ISO-NE’s FCM attracted 900 MW capacity in the 1st auction, and 3,134 MW of new capacity in the 2nd auction


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Incentive Regulation  Transmission

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