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Best Practices in Resource Adequacy

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Contents

Market Designs for Resource Adequacy

<table>
<tr><th rowspan="2">Type of <u>Centralized</u> Capacity Market</th><th colspan="2"><u>Without</u> Resource Adequacy Requirement</th><th colspan="2"><u>With</u> Resource Adequacy Requirement</th></tr>
<tr><th>Energy-Only Markets</th><th>w/ Capacity Payments or PPAs</th><th>Short-term</th><th>Forward</th></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><td>SPP, former power pools (NYPP, PJM, NEPOOL)</td><td>CAISO</td></tr>
<tr><td>Voluntary</td><td colspan="2" rowspan="2"></td><td>Midwest ISO</td><td></td></tr>
<tr><td>Mandatory</td><td>NYISO, former PJM, Australia’s SWIS</td><td>PJM, ISO-NE, Brazil</td></tr>
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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

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

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

Advantages of Short-Term

- Simpler, lower implementation costs
- Lower risk of inadvertent errors (e.g., peak load forecast) and ex-post challenges
- Allows for more flexibility in regulated planning processes of states and local jurisdictions

Examples: SPP, former power pools, some Canadian markets; Some regions with centralized capacity markets (NYISO, MISO, former PJM, Australian SWIS)

Advantages of Forward

- Reduces capacity price volatility and investment risk premium
- Facilitates entry by (and financing of) unregulated new plants and cap adds
- Increases competition from new resources, mitigates market power
- If inadequate reserves are discovered, there is sufficient time for backstop procurement (in markets without regulated resource planning)

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

Advantages of Voluntary

- Administrative parameters have less impact on centralized and bilateral market prices
- Allows for more flexibility in regulated planning processes of states and local jurisdictions

Examples: MISO

Advantages of Mandatory

- Improves liquidity and transparency
- Facilitates market-based backstop procurement
- Better addresses load migration, particularly in markets with forward RAS and retail choice
- Allows for more comprehensive market monitoring and mitigation of market power

Examples: PJM, ISO-NE, NYISO, Brazil

What Works and Doesn't in Forward Capacity Markets

Working

- Attracted and retained large amounts of capacity, even at market prices lower than net CONE
  - 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
- RPM and FCM have attracted large amounts of low-cost demand response

Continuing Challenges

- Local reliability; continued reliance on RMRs in some markets
- Treatment of planned transmission
- Buyer market power
- Contentious administrative determinations (load forecasting, reliability targets, Net CONE)
- Tension in accommodating short lead-time resources (mostly DR) and long lead-time projects (baseload generation, transmission)
- New market design elements (e.g., scarcity pricing, price responsive DR)
- Perceptions ("not yet reliable") and transition issues ("rate shock")

Additional Reading

Pfeifenberger, Spees, Schumacher, "*A Comparison of PJM's RPM with Alternative Energy and Capacity Market Designs*," The Brattle Group, September 2009.

Pfeifenberger, Newell, Earle, Hajos, Geronimo, *"Review of PJM's Reliability Pricing Model (RPM)*," The Brattle Group, June 30, 2008.

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Newell, Bhattacharyya, Madjarov, "*Cost-Benefit Analysis of Replacing the NYISO's Existing ICAP Market with a Forward Capacity Market*," The Brattle Group, June 15, 2009.

LaPlante, Chao, Newell, Celebi, Hajos, "*Internal Market Monitoring Unit Review of the Forward Capacity Market Auction Results and Design Elements*," ISO New England and The Brattle Group, June 5, 2009.f

Reitzes, Pfeifenberger, Fox-Penner, Basheda, Garcia, Newell, Schumacher, "*Review of PJM's Market Power Mitigation Practices in Comparison to Other Organized Electricity Markets*," The Brattle Group, September 2007.

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