Insights from RFF and R Street Institute Workshop on Economic Approaches to Understanding and Addressing Resilience

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High Level Insights

• Participants offered a variety of perspectives on the definition of resilience and the distinctions between reliability and resilience.
  • Inevitableness of outages and strategies for recovery are important aspects of the resilience concept.
• The existing electricity generation system is quite resilient.
• Market incentive to generators to deliver power in periods of shortage are strong.
Spot Price Signals are Strong

<table>
<thead>
<tr>
<th>Market</th>
<th>Offer Cap(^1) ($/MWh)</th>
<th>Max Shortage Adder(^2) ($/MWh)</th>
<th>Capacity Performance ($/MWh)</th>
<th>Max Signal in Severe Shortage ($/MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO-NE</td>
<td>$2,000</td>
<td>$3,050</td>
<td>$3,500(^3)</td>
<td>$8,500</td>
</tr>
<tr>
<td>PJM</td>
<td>$2,000</td>
<td>$1,700</td>
<td>$3,500(^4)</td>
<td>$7,200</td>
</tr>
<tr>
<td>MISO</td>
<td>$2,000</td>
<td>$1,500</td>
<td>N/A</td>
<td>$3,500</td>
</tr>
<tr>
<td>NYISO</td>
<td>$2,000</td>
<td>$3,250</td>
<td>N/A</td>
<td>$5,250</td>
</tr>
<tr>
<td>ERCOT</td>
<td>$9,000</td>
<td>$9,000</td>
<td>N/A</td>
<td>$14,000(^5)</td>
</tr>
</tbody>
</table>

Notes:
1. Offers up $1,000/MWh normally, or $2,000/MWh w/case-specific review, except ERCOT.
2. Sum of Reserve Constraint Penalty Factors in ISO-NE, PJM, MISO, and NYISO.
4. In effect for the RTO in 2020-21; range is $2,200 to $4,000 across the LDAs.
5. ERCOT high offer cap is for “small fish.” “Max signal” reflects marginal energy offers + ORDC adder but is capped at $9,000, except to the extent transmission constraint penalty factors are binding (adds up to $5,000).
High Level Insights (cont’d).

• The customer perspective is the one that matters most.
• Most disruptions in service are in the distribution system.
• Value of lost load (VOLL) is an important concept for setting targets and evaluating resilience enhancing measures.
  • Lots of uncertainty about VOLL and how it varies with location, length and scope of outage; No economic justification for 1 in 10 standard
  • Research is needed.
  • Introducing demand side into electricity markets (price responsive demand) could reveal how customers value reliable service.
• Addressing resilience generally falls outside of commodity markets and responses may be best arrived at in local or state settings.
Lessons for Policy Makers

• Avoid ad hoc, impulsive interventions in electricity markets.
• Establish performance expectations & provide incentives.
• Improve VOLL estimates and incorporate them in administrative demand curves used for scarcity pricing.
• Find ways to promote price-responsive demand in markets.
• Consider more robust resource adequacy measures but beware of unintended consequences.
• Use caution in making prescriptions with limited information/high uncertainty to avoid government failure > market failure.
• Focus on T&D systems as they are most vulnerable.
Thank you.

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