TOO MUCH MONEY?
TOO LITTLE MONEY?
ENERGY MARKET CYCLES
MARKET INTERVENTION

Harvard Energy Policy Group
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Market Monitoring Unit
• Market cycles
  – Fundamentals
  – Prices
Average PJM Region Aggregate Supply Curve (June - September)
## PJM Load-Weighted Average LMP
($/MWh)

<table>
<thead>
<tr>
<th>Year</th>
<th>Average LMP ($/MWh)</th>
<th>Median LMP ($/MWh)</th>
<th>Standard Deviation</th>
<th>Average Year-to-Year Percent Change</th>
<th>Median Year-to-Year Percent Change</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>$31.60</td>
<td>$23.41</td>
<td>26.74</td>
<td>-13.8%</td>
<td>-6.7%</td>
<td>-53.3%</td>
</tr>
<tr>
<td>2001</td>
<td>$36.65</td>
<td>$25.08</td>
<td>57.26</td>
<td>19.3%</td>
<td>22.3%</td>
<td>101.8%</td>
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<tr>
<td>2000</td>
<td>$30.72</td>
<td>$20.51</td>
<td>28.38</td>
<td>-9.8%</td>
<td>7.8%</td>
<td>-69.0%</td>
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<tr>
<td>1999</td>
<td>$34.06</td>
<td>$19.02</td>
<td>91.49</td>
<td>41.0%</td>
<td>8.1%</td>
<td>132.9%</td>
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<tr>
<td>1998</td>
<td>$24.16</td>
<td>$17.60</td>
<td>39.29</td>
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</tbody>
</table>
PJM Price Duration Curves - Real-Time Market
Hours Above the 95th Percentile

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PJM East Daily and Monthly Capacity Credit Market Performance from Inception of CCM

- Volume of Credits Transacted (Unforced MW)
- Weighted Average Capacity Clearing Price ($/MW-day)

Graph shows monthly performance with bars and lines indicating daily and monthly CCM volumes and weighted average prices for MW and MW-day.
• Market results:
  – Profitability
  – New investment
# Net Revenues in 2002 by Marginal Cost of Unit

<table>
<thead>
<tr>
<th>Unit Marginal Cost ($/MWh)</th>
<th>Net Revenue Sources ($/MW-year)</th>
<th>Ancillary Services</th>
<th>Operating Reserves</th>
<th>Total Net Revenue: 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy</td>
<td>Capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$10</td>
<td>$161,427</td>
<td>$11,601</td>
<td>$2,822</td>
<td>$2,875</td>
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<tr>
<td>$20</td>
<td>$90,015</td>
<td>$11,601</td>
<td>$2,822</td>
<td>$2,875</td>
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<td>$54,536</td>
<td>$11,601</td>
<td>$2,822</td>
<td>$2,875</td>
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<td>$40</td>
<td>$33,258</td>
<td>$11,601</td>
<td>$2,822</td>
<td>$2,875</td>
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<tr>
<td>$50</td>
<td>$20,781</td>
<td>$11,601</td>
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<td>$2,875</td>
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<td>$120</td>
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<td>$140</td>
<td>$2,628</td>
<td>$11,601</td>
<td>$2,822</td>
<td>$2,875</td>
</tr>
</tbody>
</table>
Net Revenues in 2001 by Marginal Cost of Unit

- CT at $50/MWh
  - 2001: $44,386/MW-year from energy market
  - 2001: $36,700/MW-year from capacity market
  - 2001: $7,126/MW-year from ancillary services and operating reserves
  - 2001 Total: $88,212/MW-year
Dynamics

• Unrealistic expectations at introduction of power markets
• High price expectations:
  – High forward curve for energy – 1999/2000
  – Capitalized in asset prices
  – Justification for new construction
  – Animal spirits
  – Due diligence?
  – Expectations of market power?
• Low price expectations:
  – Competition will reduce prices
• Prices rose: 1999
• Prices declined: 2002
• Prices will rise again
High Prices - Rule Changes

• Rule limiting effective price to $1,000/MWh - 1999
  – Operating reserve game
• High capacity market prices – 2000
  – Fundamentals – No action
• High capacity market prices – 2001
  – Market power - Rules changes
• In PJM - No aggregate generator offer limits
  – Overall $1,000 offer cap
• In PJM – No intervention to reduce prices
High Prices - Rule Changes

• Proposed interventions to limit high prices
  – Eliminate capacity market

• Who pays high prices?
  – In PJM most retail customers do not yet face wholesale prices
  – Retail competitors (LSEs) pay both wholesale energy and capacity prices
Low Prices - Rule Changes

• Rule letting CTs set price in day ahead market
• Local market power mitigation
  – Increase level of compensation
  – Pressure to remove market risk
  – Proxy method
• Capacity market redesign
  – Pressure to design high prices
  – Pressure to create stable revenue source
  – Locational capacity markets
• In PJM – No intervention to increase prices
Low Prices - Rule Changes

• Proposed interventions to increase prices/net revenues
  – Generators face lower net revenues
  – Generators need to cover high fixed costs
  – Regulators not used to relying on markets

• Proposed interventions
  – Reduce exposure to markets
  – Increase fixed/regulated revenues
  – Increase prices
  – Limit role of DSM
Conclusions

• Demands for market intervention clearly a function of energy market cycles
• Loads/LSEs want lower prices
• Generators want higher/more stable prices/revenues
• Regulators may respond to both
• Focus on good market design
  – Limit market power
  – Ensure prices reflect market conditions
• Resist cyclical efforts to modify prices