Demand Side Response -
What Price Efficiency?

Harvard Electricity Policy Group
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An Apology

To Dr. Hogan, and others, whose council and warnings I ignored while I contributed to the opening of wholesale electricity markets up to retail customers.
Elocution

• Knowingly and earnestly worked to develop and defend load as a resource programs
• Employed the market oft used transformation excuse
• Used economic dogma to rationalize market intervention
• Guilty of
  – Irrational exuberance
  – Paternalistic liberalism
  – 70’s crusading zeal
  – Boneheadnesses
The Result – Focused on Load as a Resource, Instead of Self-Interest Consumerism

- Wholesale – Load as a Resource
  - Reliability
  - Capacity
  - Emergency
  - Ancillary Services
  - Energy Bids
  - Day Ahead
  - Real Time

- Demand Response

- Energy Efficiency
  - Dynamic Pricing
    - Time-of-Use Schedule
    - Streaming Prices
    - Call Options
  - Fully Hedged
    - Uniform Price
    - Step Rates
    - Fixed Energy
I Should Have Known Better

• TOU works
• Retail RTP is an established way to involve customers in magical cost pricing
  – 20 years of C&I experience
  – Promising residential experience
• Hedging instruments make these elements into a complete and comprehensive portfolio of energy plan choices

Figure ES-2. Distribution of Customers by their Substitution Elasticity Estimates
Retail Price Response Success Stories

• Proven viability
  – NMPC RTP
  – Georgia Power RTP portfolio
  – Public Service OK/BC Hydro Flexible TOU
  – Residential Direct Load Control — FL, MN, CA, others

• Promising
  – California 20/20
  – Retail-focused CPP/VPP

• Prospective
  – Priority service
  – Dynamic TOU
The Alluding Song of Supply Schedule

- Newly opened eastern LMPs seemed to be imitating their California cousins
- High level of anxiety by regulators, utilities
- Retail choice turned out to be no choice
- FERC eager to help
- No shortage of special interest push
- ISO becomes default dynamic pricing provider
The Menace of Price Volatility

Jan 1999 PJM DA LMPs

Under $100/MWH

Days of the month

Hours of the Day
July

July 1999 PJM DA LMPs

$500/MWH and higher
NYISO DA LMPs Summer 2000
Loads Seemed to be Nicely Correlated with High LMS
The Smell of Welfare Gains in the Heat of a Summer Day

• Consumers were paying uniform, average cost rates
• Hourly supply costs were varying wildly
• Econ 101- welfare maximization rules the day
Social Welfare in Dis-Equilibrium

- Customers facing flat-rate tariff (T) do not allow market to clear at equilibrium, consuming at higher load and wholesale market clears at higher LMP.
- Out of equilibrium, the marginal cost to supply is greater than the marginal value to consumer.
- **Consumer Surplus**: Dark Area + Hatched Area
- **Producer Surplus**: Light Area + Hatched Area
- **Generator Revenue** = LMP * L = Cost to LSE
- **Customer Cost** = T * L < LMP * L
Social Welfare Improvements of Price Response

- Having customers see and react to contemporaneous prices results in more efficient use of resources
- Social welfare is improved

\[ \Delta CS: -(G + H + I) \]
\[ \Delta PS: -(B + C + D) \]
\[ \Delta Payments: (B + C + D + E + F + G + H + I) \]
\[ \Delta NSW: \Delta CS + \Delta PS + \Delta Payments = E + F \]

$E + F$ represents the deadweight loss associated with hedged service that is removed by having customers face time-differentiated prices
What’s Wrong with Consumers Acting as Wholesale Market Day Traders?

• Moral Hazard
• Adverse Selection
• Opportunistic Bidding
• Attractive Nuisance

Table III-1. Number of entities offering time-based rates

<table>
<thead>
<tr>
<th>Time-based Rate</th>
<th>Number of Entities (2006 Survey)</th>
<th>Number of Entities (2008 Survey)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time-of-Use Rates</td>
<td>366</td>
<td>315</td>
</tr>
<tr>
<td>Real-time Pricing</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>Critical Peak Pricing</td>
<td>36</td>
<td>88</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>462</strong></td>
<td><strong>503</strong></td>
</tr>
</tbody>
</table>

Source: 2006 FERC Survey and 2008 FERC Survey

Over 2,000 utilities reporting
Atonement

• I will pay rapt attention to the voices of reason and wisdom
  – Drs. Hogan, Chao, Wilson
  – Drs. Ruth and Phil

• Vigorously promote for fundamental changes in regulatory rate policies

• Promote consumerism-based price response
Questions

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