Smart Pricing: Because Time Matters

Center for Strategic and International Studies

Presented by Richard Sedano
Introducing RAP and Rich

• RAP is a non-profit organization providing technical and educational assistance to government officials on energy and environmental issues. RAP staff have extensive utility regulatory experience. RAP technical assistance to states is supported by US DOE, US EPA and foundations.

  – Richard Sedano directs RAP’s US Program. He was commissioner of the Vermont Department of Public Service from 1991-2001 and is an engineer.
Time-Varying Rates

- Sound principles
- Changed market conditions
- Enabling technology
- Experience
- Renewable Integration
Principles for Modern Rate Design

Universal Service: A customer should be able to connect to the grid for no more than the cost of connecting to the grid.

Time-Varying: Customers should pay for grid services and power supply in proportion to how much they use and when they use it.

Fair Compensation: Customers supplying power to the grid should be compensated fairly for the value of the power they supply.
A Flat Rate

<table>
<thead>
<tr>
<th>Rate Element</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge $/month</td>
<td>$5.00</td>
</tr>
<tr>
<td>Energy Charge $/kWh</td>
<td>$0.10</td>
</tr>
</tbody>
</table>

• On site generation
  – Prices to deploy are trending down
  – Electricity users value choice
    • To secure prices over years
    • To assure zero emissions, to do their part
    • To cooperate with neighbors
    • To be cool

• Automation (comms, smart systems, stds) keeps it simple while chasing value
Consumer Perspective

• Rates are **Prices**
• Prices represent a **message to consumers**
• Utility Prices **signal system value**
• Consumers have **new choices**
  – respond to value
Objectives you may have

- Encourage wise use of energy
- Encourage wise investment in energy capital
- Reduce cost-intensive peak use
- Properly allocate costs
- Strategically deploy grid resources
- Address climate change
- Provide customers with choices
- Enable new grid resources
- Ensure fairness, social justice
- Reasonably ensure utility revenue adequacy
- Project an aura of progress
Objectives You May Have

• Cost and Resource Management

• Success with other Social Objectives
Grid Value from DG – Differentiate by

• **Time**
  – Peaks and managing predictable solar, CHP patterns

• **Location**
  – High marginal cost places

• **Attribute**
  – Unbundled energy, capacity, ancillary
Cross-Subsidies...

- Subsidies are endemic in utility rates
- Averages smooth out distinctions among customers
- **Rough justice** coupled with some **intentional bias** is the norm
- Explicit, appropriate subsidies are fine
- New conditions enable some to go away
A Fixed TOU Rate in Use

• **On-Peak**
  Summer: weekdays 10 a.m. - 8 p.m.
  Winter: weekdays 7 a.m. - 11 a.m. and 5 p.m. - 9 p.m.

• **Intermediate-Peak**
  Summer: weekdays 7 a.m. - 10 a.m. and 8 p.m. - 11 p.m.
  Winter: weekdays 11 a.m. - 5 p.m.

• **Off-Peak**
  Summer: weekdays 11 p.m. - 7 a.m.
  Winter: weekdays 9 p.m. - 7 a.m., Saturday, Sunday, holidays
Sample Time of Use with Critical Peak:

<table>
<thead>
<tr>
<th>Rate Element</th>
<th>Based On the Cost Of</th>
<th>Illustrative Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge</td>
<td>Customer-Specific Costs Only</td>
<td>$7.00/month</td>
</tr>
<tr>
<td>Off-Peak Energy</td>
<td>Baseload Resources + transmission and distribution</td>
<td>$.08/kWh</td>
</tr>
<tr>
<td>Mid-Peak Energy</td>
<td>Baseload + Intermediate Resources + T&amp;D</td>
<td>$.11/kWh</td>
</tr>
<tr>
<td>On-Peak Energy</td>
<td>Baseload, Intermediate, and Peaking Resources + T&amp;D</td>
<td>$.15/kWh</td>
</tr>
<tr>
<td>Critical Peak Energy (or PTR)</td>
<td>Demand Response Resources</td>
<td>$.75/kWh</td>
</tr>
</tbody>
</table>
A Peak Time Rebate in Use

• Delaware Delmarva Power and Light (DPL) has a critical peak rebate program for residential customers.

• Customers receive a $1.25 credit for every kWh they reduce their usage below a baseline during an event.

• Customers get this credit automatically; they do not have to enroll in the program.

• DP&L: http://www.delmarva.com/Peak-Energy-Savings-Credit.aspx
Opt In

• Why would a customer choose an unfamiliar rate design?
  – Demonstrated savings
    • Shadow bill
    • Opportunity/Control “Smart Home Rate” (NY)
    • “stick it to the man, beat the system”
  – Low/no risk (PTR in MD)
  – Trusted Validators (Elevate Energy in IL)
• Opt in rates have a weak track record
Is “Opt in” a stop on the way to mandatory/”opt out?”

• Findings from ARRA Smart Grid Projects
  – Many interesting experiences
  – Customers are “sticky”

• CA and MA have declared they will have mandatory time-varying rates with opt out
### Typical and Smart Rate Design Alternative for Commercial Customers

<table>
<thead>
<tr>
<th>Conventional Rate Design</th>
<th>Smart Rate Design Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge</td>
<td>$10/month</td>
</tr>
<tr>
<td>Demand</td>
<td>$10/kW</td>
</tr>
<tr>
<td>Energy</td>
<td>$0.10/kW</td>
</tr>
<tr>
<td>All Hours</td>
<td>$0.10/kW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Customer Charge</th>
<th>$10/month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>$2/kW</td>
</tr>
<tr>
<td>Energy</td>
<td></td>
</tr>
<tr>
<td>7-10 AM</td>
<td>$0.15/kW</td>
</tr>
<tr>
<td>4-9 PM</td>
<td>$0.20/kW</td>
</tr>
<tr>
<td>All Other Hours</td>
<td>$0.10/kW</td>
</tr>
</tbody>
</table>

### Conventional and Recommended Smart Utility Rate Designs for Water Systems and Irrigation Pumps

<table>
<thead>
<tr>
<th>Conventional Rate Design for Water Pumping</th>
<th>Smart Rate Design Alternative for Water Pumping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>$10/kW</td>
</tr>
<tr>
<td>Energy</td>
<td></td>
</tr>
<tr>
<td>All Hours</td>
<td>$0.10/kW</td>
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<td></td>
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From RAP, Teaching the “Duck” to Fly – 2nd Edition
The Duck: The California ISO’s Flexibility Curve

Source: the ISO’s *Building a Sustainable Energy Future; 2014-2016 Strategic Plan*
Teaching the “Duck” to Fly:
10 strategies to control generation, manage demand, & flatten the Duck Curve

Rate Design
Focus pricing on crucial hours. Replace flat rates & demand charge rate forms with time-of-use rates. Avoid high fixed charges. 1 2 3
Figure 3: Bi-Directional Flows Measured by a Smart Meter
### Directional Pricing Example

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge</td>
<td>Billing and Collection</td>
<td>$5.00/month</td>
</tr>
<tr>
<td>Distribution Charge</td>
<td>All Delivery Costs</td>
<td>$0.05/kWh</td>
</tr>
<tr>
<td><strong>Power Supply (either direction)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• On-Peak</td>
<td>Peak and Baseload</td>
<td>$0.15/kWh</td>
</tr>
<tr>
<td>• Off-Peak</td>
<td>Baseload Only</td>
<td>$0.08/kWh</td>
</tr>
</tbody>
</table>
Rate Design Principles for DG Users

• DG users should not experience discrimination
• Time-varying rates are appropriate in both directions
• PV user should be able to connect to the grid for no more than the cost to connect
• PV user should be able to avoid the retail rate for all on-site consumption of on-site power
• PV user should pay for T&D service at non-discriminatory rates for all power received from the grid
• Recognize “value of solar” to the grid when establishing fair rates and compensation for DG users
Resources

• **Smart Rate Design for A Smart Future**
  – With appendices:
    • Cost allocation
    • Rate Design Primer
    • Retail Competition
    • Monopoly Power
Resources

• Designing Distributed Generation Tariffs Well
Resources

- **Teaching the “Duck” to Fly – Second Edition**
About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power sector. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

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