Topics on Electric Utility Regulation: A Workshop

New Jersey Board of Public Utilities

Presented by Richard Sedano

December 3 and 4, 2015
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.
  – David Littell is a principal in RAP’s US Program. He was a Maine PUC Commissioner and Environment Commissioner and is an attorney.
Workshop Topics

• **Rate Design Opportunities**
  – Presentation and discussion

• **Clean Energy Administration**
  – Presentation and discussion

• **Technology Deployment and Data Management and Access**
  – Presentation and discussion

• **Utility Performance and Redefining the Utility Role**
  – Presentation and discussion
# Rate Design Segment

## Simple Residential Tariff

<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>
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 in NJ
Objectives You May Have

• Cost and Resource Management

• Success with other Social Objectives
Costs Continue to Decline

Average PV System Price

- LBNL "Tracking the Sun IV"
- SEIA/GTM Research

Energy solutions
for a changing world
Distributed Generation is Growing

New U.S. PV Installations

+ 30% per year
Since 2001
Cumulative: 11+ GW

Installed Capacity (MW)
A Decentralized Grid Rising

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

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

• Rates are **Prices**
• Prices represent a **message to consumers**
• Utility Prices **signal system value**

• Consumers have **new choices**, 
  – Is there **alignment** between customer value and grid value?
Grid **Value** from DER – 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
  - No more (hidden or unintentional shifts)
Embedded Cost of Service

- Functionalization
- Classification
- Allocation
Flat Rates

• Flat delivery rates communicate little useful to customers
  – Even though usage at particular times drives capital investment (and upward pressure)
  – Even though price differentiation can drive important customer/system operations resources like demand response, customer generation, and storage as well as energy efficiency
RAP Resources

• **Smart Rate Design for A Smart Future**
  – With appendices:
    • Cost allocation
    • **Rate Design Primer**
    • Retail Competition
    • Monopoly Power
Rate Design Options for a Modern Grid

from RAP paper: Smart Rate Design for a Smart Future

- **Time of Use (with critical peak)**
- Demand charge
- Net metering
- Minimum bills
- High Customer Charges
- Cost driven Customer Charge, DG & large houses
- Subscription demand charges
- Bidirectional rates
- Value of solar
- Fees imposed on DG users
- Feed-in-tariffs
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., Sat., Sun., holidays
  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 (CNT real time rate 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 ones
  – Customers are “sticky”

• CA and MA have declared they will have mandatory time-varying rates with opt out
Rate Design Options

- Time of Use (with critical peak)
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- Value of solar
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Revenue Assurance: Monthly Charge Increase or Minimum Bill

• Raising assured monthly collection from customers in order to reduce risk of revenue erosion from customer resources

• Monthly charge increase - risks:
  – Lower usage rate below long run marginal cost adds demand, raises overall costs
  – Motivating consumers to bypass, or
  – Only partially solving revenue adequacy leaves problem in place

• There are other solutions to revenue erosion
## Price Elasticity at Work

<table>
<thead>
<tr>
<th>Customer Charge</th>
<th>$5.00</th>
<th>$20.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Charge</td>
<td>$0.12</td>
<td>$0.09</td>
</tr>
<tr>
<td>Change in Price/kWh</td>
<td>-25%</td>
<td></td>
</tr>
<tr>
<td>Predicted Change in Usage</td>
<td>+5%</td>
<td></td>
</tr>
<tr>
<td>kWh</td>
<td>Low Customer Charge</td>
<td>High Customer Charge</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Customer Charge</td>
<td>$5.00</td>
<td>$20.00</td>
</tr>
<tr>
<td>Minimum Bill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per-kWh Charge</td>
<td>$0.10</td>
<td>$0.085</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>10 kWh</th>
<th>100 kWh</th>
<th>200 kWh</th>
<th>500 kWh</th>
<th>1,000 kWh</th>
<th>1,500 kWh</th>
<th>2,000 kWh</th>
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</thead>
<tbody>
<tr>
<td>$20 Minimum Bill*</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>$6.00</td>
<td>$20.85</td>
<td>$28.50</td>
<td>$37.00</td>
<td>$62.50</td>
<td>$105.00</td>
<td>$147.50</td>
<td>$190.00</td>
</tr>
<tr>
<td>$20.00</td>
<td></td>
<td></td>
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<tr>
<td>$15.00</td>
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<tr>
<td>$37.00</td>
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<tr>
<td>$25.00</td>
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<tr>
<td>$55.00</td>
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<tr>
<td>$105.00</td>
<td></td>
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<tr>
<td>$54.50</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

*The minimum bill will only apply when customer’s usage is so low that their bill falls below $20.*
Customer Specific Costs Appropriate for the Monthly Customer Charge

- Billing
- Collections
- Share of transformer and service drop
Straight Fixed / Variable:

100% of Distribution System Classified as Customer-related
Rate Design Options

• Time of Use (with critical peak)
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Nearly Every State Authorizing Net Metering

Solar service industry growing

• Making use of **declining material cost**
• Making use of favorable federal **fiscal policy**
  - Some states supplement the deal
• “**Soft costs**” declining
• **Lease** business model removes first cost barrier
Net metering growth

Number of net metered customers in the U.S.
Maturing Solar: Changes Ahead for Net Metering?

• Compensation method suited for infant industry
  – Emphasis of **Simple** compensation and interconnection
  – Rough compensation “**close enough**” at smaller numbers
  – **When higher numbers** create a financial effect on the utility, a more rigorous compensation method can be considered
Value of Solar Studies: Utility Economic Values Only

- Maine Short-Run: $0.090
- Maine Long-Run: $0.138
- Minnesota: $0.135
- Austin: $0.107
- Average per-kWh Rate: $0.115
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 power received from the grid
- Recognize “value of solar” to the grid when establishing fair rates and compensation for DG users
Resources

• Designing Distributed Generation Tariffs Well
Vulnerable Customers

• Foundation: base rates are fair
  – Rough justice without bias
  – Explicit subsidies can depart from this

• Compliment existing support system
  – LIHEAP, Weatherization
  – Defines target population (manageability)

• Avoid high customer charge

• BGS to assure default supply
Lifeline Rates Can Maintain a Consumption Price Signal

### Seattle City Light Residential and Low-Income Discount

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th>Low-Income</th>
<th>Discount %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge</td>
<td>$3.50</td>
<td>$1.75</td>
<td>50%</td>
</tr>
<tr>
<td>First 300 kWh Summer</td>
<td>$0.046</td>
<td>$0.019</td>
<td>58%</td>
</tr>
<tr>
<td>Over 300 kWh Summer</td>
<td>$0.096</td>
<td>$0.036</td>
<td>63%</td>
</tr>
<tr>
<td>First 480 kWh Winter</td>
<td>$0.046</td>
<td>$0.019</td>
<td>58%</td>
</tr>
<tr>
<td>Over 480 kWh Winter</td>
<td>$0.096</td>
<td>$0.036</td>
<td>63%</td>
</tr>
</tbody>
</table>

Some states use a percentage of income cap, which can promote consumption.
Explicit Subsidies Can Address Vulnerable Customers

- **Percentage of Income (on delivery)**
  - Caps amount a family pays
  - Requires income information
  - Can lead to “free” electricity

- **% discount (on delivery)**
  - Each unit costs something
  - Build in energy efficiency programs

- Aggregated commodity if BGS goes away
Vulnerable Customer Issues
(aside from rate level)

• Pre-paid meters
  – Strong views on all sides
  – Degraded service
  – Customer dilemma or control?
  – Reduced uncollectables

• Technology
  – AMI benefits can show when customer can save
Complementary Policies

- **Distribution planning** to establish locational and time values
- **Decoupling** to remove throughput incentives and address revenue adequacy and stability
  - With **minimum bill** if PUC judges it needed
- **Outcome-based regulation** to promote most valuable utility activity
- **Technology** when business case informed by value is compelling
- **Bill simplicity** so customers (or their agent) can understand the value of choices
Distribution Planning

- Largely done today outside the view of the regulator
- Keep depreciation line steady
  - Fill in urgent projects to fill budget
- In most places, still a one-way system
  - But signs of change are evident
  - Can distribution planning drive distributed resource deployment? And vice versa?
California and New York

• California PUC has directed its utilities to open up the distribution planning process
  – Use DG and DR as primary resources
• NY PSC in its Reforming the Energy Vision process has set its utilities on a similar path
  – Anticipates avoiding significant grid costs from typical solutions
  – Note transfer of cost from utility to customers choosing to deploy DG and DR
Decoupling

• A way to address revenue assurance without affecting rate design
### Periodic Decoupling Calculation

<table>
<thead>
<tr>
<th>From the Rate Case</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Revenues</td>
<td>$10,000,000</td>
</tr>
<tr>
<td>Test Year Unit Sales</td>
<td>100,000,000</td>
</tr>
<tr>
<td>Price</td>
<td>$0.10000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post Rate Case Calculation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Unit Sales</td>
<td>99,500,000</td>
</tr>
<tr>
<td>Required Total Price</td>
<td>$0.1005025</td>
</tr>
<tr>
<td>Decoupling Price &quot;Adjustment&quot;</td>
<td>$0.0005025</td>
</tr>
</tbody>
</table>
Outcome-Based Regulation

• Used for isolated
  – EE, reliability, customer service

• Could be more significant in driving utility behavior, performance, and earnings

• Stay tuned to Friday’s discussion
The System We Grew Up With

Transmission Lines 765, 500, 345, 230, and 138kV

138 or 230 kV
Technology

• What will motivate technology on utility side of the meter?
• What will motivate new meter technology?
• What will motivate efficient, responsive and producing technology on the customer side of the meter?
Investment Incentives for All Emerge from Regulation

• Planning to produce information
• Prices to convey information
• Earnings to drive behavior

• It is not just operating the pieces we have better
  – It is driving efficient investment that manages costs for decades
A Simple Bill

Coupled with an opportunity to get one’s own usage information history and convey it to an agent or service provider to enable informed choice.
Riders mask prices consumers see

And do all these need to be outside cost of service?

### Figure 22

<table>
<thead>
<tr>
<th>Comparison of “Itemized” and “Rolled Up” Bill</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Your Usage:</strong> 1,266 kWh</td>
</tr>
<tr>
<td><strong>Base Rate</strong></td>
</tr>
<tr>
<td>Customer Charge</td>
</tr>
<tr>
<td>First 500 kWh</td>
</tr>
<tr>
<td>Next 500 kWh</td>
</tr>
<tr>
<td>Over 1,000 kWh</td>
</tr>
<tr>
<td>Fuel Adjustment Charge</td>
</tr>
<tr>
<td>Infrastructure Tracker</td>
</tr>
<tr>
<td>Decoupling Adjustments</td>
</tr>
<tr>
<td>Conservation Program Charge</td>
</tr>
<tr>
<td>Nuclear Decommissioning</td>
</tr>
<tr>
<td><strong>Subtotal:</strong></td>
</tr>
<tr>
<td>State Tax</td>
</tr>
<tr>
<td>City Tax</td>
</tr>
<tr>
<td><strong>Total Due:</strong></td>
</tr>
</tbody>
</table>

### Effective Rate Including All Adjustments

| Base Rate | **Rate** | **Usage** | **Amount** |
| Customer Charge | $5.565 | 1 | $5.57 |
| First 500 kWh | $0.09291 | 500 | $46.46 |
| Next 500 kWh | $0.11517 | 500 | $57.59 |
| Over 1,000 kWh | $0.13743 | 266 | $146.17 |
Trends are Clear

• More automation
• More valuable choices for individuals
  – Potential for more consumer interest for services
  – What happens if storage becomes more accessible to consumers?
• What will utilities and their regulators do?
What are your concerns about rate design challenges facing the BPU in the next 3 years?
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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