Rate Design 101 (and some 201)

Industrial Coordinating Committee

Jessica Shipley
Associate
The Regulatory Assistance Project

Washington, DC
United States

jshipley@raponline.org
503-816-2639
www.raponline.org
Introductions

The Regulatory Assistance Project (RAP) is a global NGO providing technical and policy assistance to government officials, agency staff, and others on energy and environmental issues.

- Foundation-funded; some contracts
- Non-advocacy; no interventions
Outline

1. Steps in Utility Ratemaking
2. Components of Retail Rates
3. Smart Rate Design Principles
4. Current Problems with Non-Residential Rate Design and Some Solutions
5. Examples
1 – Steps in Utility Ratemaking

Revenue Requirement

Functionalization
- Assign cost to appropriate utility function

Classification
- Classify functionalized costs to demand, energy, customer

Allocation
- Assign cost responsibility among customer classes

Rate Design
- Develop pricing method for recovering assigned costs
2 – Components of Retail Rates
Retail Rate Design

- Retail rate can consist of separate lines for:
  - Customer charge ($/month)
  - Volumetric energy charges (¢/kWh)
  - Demand charges ($/kW)
    - Usually for commercial/industrial customers only
  - Other charges (e.g., taxes)
Basic Rate Design Terminology

- **Customer Charge**: A monthly charge that applies independent of consumption. Also called a Basic, Standing, Meter, or Fixed Charge.
- **Energy Charge**: A price per kWh; may be in more than one time period, or more than one block. May be seasonal, or time-varying.
Basic Rate Design Terminology

- **Demand Charge**: A monthly fee based on the highest instantaneous usage rate (usually highest hour) during the month or year.
  - Common for commercial and industrial customer classes, rare for residential class
- **CP: Coincident Peak** - Usage at the time of the system peak demand
- **NCP: Non-Coincident Peak** - Highest usage by the customer at any time during the month
Customer Charge Elements

- Historically NOT Controversial
  - Service drop
  - Meters
  - Meter reading
  - Billing and collection
  - Customer service
- Controversial
  - Distribution circuit costs
  - Transformers
Demand Charge Options

- Bill on Coincident Peak (CP) Demand: An individual customer’s usage at the time(s) of systemwide maximum usage
- Bill on Non-Coincident Peak (NCP) Demand: An individual customer’s highest usage at any time during the billing period
- NO demand charge – recover demand-related costs via volumetric energy (or customer) charges
Energy Costs and Energy Charges

- Minimum: Fuel and variable portion of purchased power
- Often: Portion of generation, transmission, and distribution plant costs
- Vary by season
- Vary by time of day
- A single fuel charge melds these
3 – Smart Rate Design Principles

Smart Rate Design
For a Smart Future

Authors
Jim Lazar and Wilson Gonzalez

July 2015
Smart Rate Design Principles

• **Principle #1**: A customer should be allowed to connect to the grid for no more than the cost of connecting to the grid.

• **Principle #2**: Customers should pay for power supply and the grid in proportion to how much they use, and when they use it.

• **Principle #3**: Customers delivering power to the grid should receive full and fair value — no more and no less.
Report prepared at the request of the California PUC

Proposes 7 Principles for Smart NR Rate Design
Rate design should make the choices the customer makes to minimize their own bill consistent with the choices they would make to minimize system costs.
What’s The Problem?

Actual utility’s rate schedule for very large customers

• Customer Charges
  • Secondary Delivery Voltage: $11.59 / month
  • Primary Delivery Voltage: $146.56 / month
  • Transmission Delivery Voltage: $722.90 / month

• Demand Charge: $9.91 / kW

Not Linked to System Peak

• Energy Charge: $.025 / kWh

Not Time-Differentiated
4 – Non-Residential Rate Design Problems… & Some Solutions

**Problem #1**: Most rates do not align customer rates with system costs

**Problem #2**: Technological change and the emergence of DERs make improvement necessary

-----------------------------------

**Solution #1**: Non-Coincident Peak Demand Charges only for site infrastructure costs

**Solution #2**: Time-of-Use Rate Design reflects system costs more effectively than coincident peak demand charges
Solution #1: NCP Demand Charges Should Be Lower

• Service drop, metering, and billing costs should be recovered in a customer fixed charge

• Final transformer is a customer-specific charge, should be recovered in a NCP demand charge
Costs that Vary with Customer NCP: Final Line Transformer and Service Drop
Demand Charges Fail to Reward Diversity and Load Shape

• Many customers use system capacity at different times and can share system capacity.
• Some pre-empt capacity continuously.
• And some have the ability to be flexible in their use, contributing to diversity (if given the right price signals).
Solution #2: Time-of-Use Rates Better Reflect System Costs Than Demand Charges
The System Peak Is What Matters

None of the customers peak at the time of the system peak.
Costs that Vary with System TOU Loads: Generation and Bulk Transmission
Costs that Vary with Nodal TOU Loads: Network Transmission and Distribution
Reasons to Consider TOU Rates

- More equitable cost recovery
- Reduce peak demand
- Provide price signal for beneficial use of the grid and distributed/on-site resources
  - EV charging during off-peak and shoulder hours
  - Air conditioning controls or ice storage
  - Use of on-site storage
  - Energy efficiency that reduces system peaks
- Note – TOU may be mandatory, and in most places it is at least offered to the largest customers
5 – Examples

Our “problem” example from earlier (a real utility in the U.S.)

<table>
<thead>
<tr>
<th>Customer Charge</th>
<th>$/month</th>
<th>$ 723.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand Charge</td>
<td>$/kW</td>
<td>$ 9.91</td>
</tr>
<tr>
<td>Energy Charge</td>
<td>$/kWh</td>
<td>$ 0.025</td>
</tr>
</tbody>
</table>

- Demand charge is based on NCP demand.
- Energy Charge is not time-differentiated
## 5 – Examples

Same utility; Optional TOU

<table>
<thead>
<tr>
<th>Charge Type</th>
<th>Description</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge</td>
<td>$/month</td>
<td>$ 730.00</td>
</tr>
<tr>
<td>Demand Charge – Base</td>
<td>$/kW</td>
<td>$ 5.94</td>
</tr>
<tr>
<td>Demand Charge – On Peak</td>
<td>$/kW</td>
<td>$ 3.91</td>
</tr>
<tr>
<td>Energy Charge – On Peak</td>
<td>$/kWh</td>
<td>$ 0.053</td>
</tr>
<tr>
<td>Energy Charge – off peak</td>
<td>$/kWh</td>
<td>$ 0.01</td>
</tr>
</tbody>
</table>
## Georgia Power TOU-GS-10

- Higher coincident-peak demand charge.
- Steep TOU energy rate.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer Charge</strong></td>
<td>$/Month</td>
<td>$ 209.00</td>
</tr>
<tr>
<td><strong>Demand Charge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-Peak</td>
<td>$/kW</td>
<td>$ 15.66</td>
</tr>
<tr>
<td>Maximum Peak</td>
<td>$/kW</td>
<td>$ 5.23</td>
</tr>
<tr>
<td><strong>Energy Charge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-Peak</td>
<td>$/kWh</td>
<td>$ 0.122</td>
</tr>
<tr>
<td>Shoulder Peak</td>
<td>$/kWh</td>
<td>$ 0.063</td>
</tr>
<tr>
<td>Off-Peak</td>
<td>$/kWh</td>
<td>$ 0.024</td>
</tr>
</tbody>
</table>
Georgia Power Baseline-Referenced RTP Rate

Four key features:

1. Customer baseline established
2. Baseline usage priced through COS regulation
3. Customer notified of day-ahead pricing
4. Deviations from baseline charged or credited at real-time price
### SMUD Large General Service Rate: “Best in Class”

<table>
<thead>
<tr>
<th>Sacramento Municipal Utility District</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed Charge</strong></td>
</tr>
<tr>
<td><strong>Demand Charges</strong></td>
</tr>
<tr>
<td><strong>Distribution Capacity</strong></td>
</tr>
<tr>
<td><strong>2PM - 8 PM Surcharge</strong></td>
</tr>
<tr>
<td><strong>Energy Charges</strong></td>
</tr>
<tr>
<td><strong>Super-Peak 2 - 8 PM</strong></td>
</tr>
<tr>
<td><strong>On-Peak</strong></td>
</tr>
<tr>
<td><strong>Off-Peak</strong></td>
</tr>
</tbody>
</table>
## RAP Illustrative Smart Non-Residential Rate Design

### Table ES-1. Proposed Illustrative Rate Design for Non-Residential Consumers

<table>
<thead>
<tr>
<th></th>
<th>Production</th>
<th>Transmission</th>
<th>Distribution</th>
<th>Total</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Metering, Billing</strong></td>
<td></td>
<td></td>
<td>$100.00</td>
<td>$100.00</td>
<td>Month</td>
</tr>
<tr>
<td><strong>Site Infrastructure Charge</strong></td>
<td></td>
<td></td>
<td>$2/kW</td>
<td>$2/kW</td>
<td>kW</td>
</tr>
<tr>
<td><strong>Summer On-Peak</strong></td>
<td>$0.140</td>
<td>$0.020</td>
<td>$0.040</td>
<td>$0.20</td>
<td>kWh</td>
</tr>
<tr>
<td><strong>Summer/Winter Mid-Peak</strong></td>
<td>$0.100</td>
<td>$0.015</td>
<td>$0.035</td>
<td>$0.15</td>
<td>kWh</td>
</tr>
<tr>
<td><strong>Summer/Winter Off-Peak</strong></td>
<td>$0.070</td>
<td>$0.010</td>
<td>$0.020</td>
<td>$0.10</td>
<td>kWh</td>
</tr>
<tr>
<td><strong>Super Off-Peak</strong></td>
<td>$0.030</td>
<td>$0.010</td>
<td>$0.010</td>
<td>$0.05</td>
<td>kWh</td>
</tr>
<tr>
<td><strong>Critical Peak</strong></td>
<td></td>
<td></td>
<td></td>
<td>$0.75</td>
<td>kWh</td>
</tr>
</tbody>
</table>

Maximum 50 hours per year
Rate design should make the choices the customer makes to minimize their own bill consistent with the choices they would make to minimize system costs.
Standby Charges

• A whole other important topic!
• Some of RAP’s recommendations for standby rates closely mirror those I have talked about today
Resources from RAP

- Smart Rate Design for a Smart Future
- Smart Non-Residential Rate Design
- Standby Rates for Combined Heat and Power Systems
- Designing Tariffs for Distributed Generation Customers
- Designing Distributed Generation Tariffs Well
- Rate Design Where Advanced Metering Infrastructure Has Not Been Fully Deployed
- Time-Varying and Dynamic Rate Design
- Use Great Caution in the Design of Residential Demand Charges
About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

Contact Jessica at: jshipley@raponline.org