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Electricity Pricing: Policies, Practices and Pitfalls

Financial Research Institute Advanced Seminar

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Rate design should make the choices the customer makes to optimize their own bill consistent with the choices they would make to minimize system costs.
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The Basics: Smart Rate Design
RAP has described how technological change and the emergence of DERs affect residential rate design.
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 the grid and the power supply in proportion to how much they use and when they use it.
Principle #2

Customers should pay for the grid and the power supply in proportion to how much they use and when they use it.
Principle #3

Customers delivering services to the grid should receive the full and fair value – no more and no less.
Examples of Smart Rate Design

How do we maintain smart incentives in a subscription?

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th>Large C&amp;I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Charge ($/mo.)</td>
<td>$4</td>
<td>$100</td>
</tr>
<tr>
<td>Site Infrastructure ($/kW)</td>
<td>$1</td>
<td>$2</td>
</tr>
<tr>
<td>Off-peak (cents per kWh)</td>
<td>7 cents</td>
<td>5 cents</td>
</tr>
<tr>
<td>Mid-peak (cents/kWh)</td>
<td>9 cents</td>
<td>10 cents</td>
</tr>
<tr>
<td>On-peak (cents/kWh)</td>
<td>14 cents</td>
<td>15 cents</td>
</tr>
<tr>
<td>Critical peak (cents/kWh)</td>
<td>75 cents</td>
<td>75 cents</td>
</tr>
</tbody>
</table>
Pitfall: Most Commercial Rate Design does not Align Pricing with System Costs
Non-Res Problems & Solutions

Problem #1: Most non-residential rates do not align customer rates with system costs

Solution #1: Non-Coincident Peak (NCP) Demand Charges should be lower

Problem #2: Technological change and the emergence of DERs (including ZEVs) make improvement necessary

Solution #2: Time-of-Use Rate Design reflects system costs better than non-coincident (NCP) and coincident peak (CP) demand charges
A Typical Rate for Large NR Customers (Generic)

Customer Charge: $100/month

Demand Charge: $10/kW

Energy Charge: $0.12/kWh
What’s the problem?

Customer Charge: $100/month

Demand Charge: $10/kW

Not Linked To System Peak

Energy Charge: $0.12/kWh

Not Time-Differentiated
3 Pitfall: Dynamic Pricing has Potential but is Not Optimal for a Default Tariff Yet
Dynamic Pricing can be Effective If:

- LMP and CRR exist down to the feeder
- Free entry and exit on the distribution system
- Utility has the opportunity to be revenue adequate
- Political tolerance for scarcity pricing exists
Dynamic Pricing is not yet Optimal Because:

- Distribution system over-built (analog tech)
- Structural change massive (digital tech)
- Barriers to entry on the distribution system
- Embedded cost recovery
- Political tolerance for scarcity pricing low in many places
4 Pitfall: Subscription Pricing can be done Poorly
Some Questions to ask about Subscription Tariffs

• Does the subscription tariff hide price signals that will discourage conservation and discourage efficient customer choice and use of DERs?
• Is the tariff from a competitive provider or subject to competitive pressure from competitive offerings?
• Does the tariff promote or deter competitive innovation?
Policies Make Pricing even more Important
Consider the Bipartisan Governors’ Accord

- Diversify into clean energy and efficiency
- Promote cost effectiveness
- Promote reliability and resilience
- Support innovative American Companies
- Empower and engage customers
- Encourage American Energy Independence and Competitiveness
- Work with other States
Policy Example Pitfall: Poor Rate Design can Deter EV Adoption
Residential: TOU rates with a CPP encourage beneficial charging

- Sends price signals for all hours, with a strong signal deterring use in highest stress hours (may be peak, may be ramping)
- Encourages electric vehicle charging during off-peak and shoulder hours
- Flat rates and high non-coincident demand charges make EV charging artificially expensive and do not align individual choice with system benefits
What about Today’s Typical Non-Residential Rate Design?

- 6.6 kW @ $12/kW = $66
- 250 kWh @ $.010/kWh = $30

- Total Cost: $96
- Cost/kWh: $96/250 = $.38/kWh
- FLUNKS “cheaper than gasoline” test
- Demand Charge is 68% of total bill
Typical System Load Profile (without solar)

Source: LBNL
Workplace and Home Charging and the Duck Curve
# Comparison of Three Rates: Consequences for NR EV Adoption

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<th>Coincident Peak Demand Charge</th>
<th>Smart Rate</th>
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<td><strong>Demand Charge</strong></td>
<td>$10/kW</td>
<td>$10/kW</td>
<td>$2/kW</td>
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<tr>
<td><strong>Demand Measurement</strong></td>
<td>NCP</td>
<td>4 PM - 8 PM</td>
<td>Site Infrastructure</td>
</tr>
<tr>
<td><strong>Energy</strong></td>
<td>$0.12/kWh</td>
<td>$0.12/kWh</td>
<td>$.05 - $.75/kWh</td>
</tr>
<tr>
<td><strong>Energy Measurement</strong></td>
<td>No TOU</td>
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# Smart Rate => Workplace EV Charging

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## Electric Vehicle Charging Cost Per Month

**6.6 kW**  
**250 kWh**

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<tr>
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<th>NCP Demand</th>
<th>CP Demand</th>
<th>Energy</th>
<th>Total</th>
<th>Average $/kWh</th>
</tr>
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<tbody>
<tr>
<td><strong>$</strong></td>
<td>$66.00</td>
<td>$</td>
<td>$30.00</td>
<td>$96.00</td>
<td>$0.384</td>
</tr>
<tr>
<td><strong>$</strong></td>
<td>$13.20</td>
<td>$</td>
<td>$30.00</td>
<td>$25.70</td>
<td>$0.103</td>
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Average $/kWh
Takeaway
Rate design should make the choices the customer makes to optimize their own bill consistent with the choices they would make to minimize system costs.
About RAP & Carl

- The Regulatory Assistance Project (RAP) is an independent, non-partisan, NGO dedicated to accelerating the transition to a clean, reliable efficient energy future.
- Carl is a Principal with RAP & lives in Davis, CA
  - Focused on market design, pricing and resource planning
  - Former PUC Commissioner and Energy/Economic Advisor to Governor Guinn (NV)
  - Serving on EIM Governing Body (Chair)
  - PhD Economics (Carolina), BA Math (UC Davis)
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Learn more about our work at raponline.org

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