Residential Demand Charges: Good or Bad Idea??

Steven Nadel
American Council for an Energy-Efficient Economy (ACEEE)
2015 Harvard Electric Policy Group Conference
The American Council for an Energy-Efficient Economy (ACEEE)

• ACEEE is a nonprofit 501(c)(3) that acts as a catalyst to advance energy efficiency policies, programs, technologies, investments & behaviors
• About 50 staff based in Washington, D.C.
• Focus on end-use efficiency in industry, buildings, utilities & transportation
• Other research in economic analysis; behavior; national, state, & local policy
• Funding:
  ◦ Foundation Grants (52%)
  ◦ Contract Work & Gov. Grants (20%)
  ◦ Conferences and Publications (20%)
  ◦ Contributions and Other (8%)

www.aceee.org
Electricity Sales Declining

- Australian GDP
- Australian electricity production
- U.S. GDP
- U.S. electricity sales
- German GDP
- German electricity consumption

Contributions in Medium-High Change Case

Source: ACEEE analysis
Net load - March 31

Megawatts

28,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0

12am 3am 6am 9am 12pm 3pm 6pm 9pm

2012 (actual)
2013 (actual)
2014
2015
2016
2017
2018

need
4,000 MW
three hours

overgo

Quack!
Utility Cost Components

1. Energy (variable)
2. Capacity/demand (generation and T&D) (variable in long-term)
3. Customer (e.g., meter and billing) (fixed)
Options that Have Been Proposed for Recovering Capacity and T/D Costs

1. Traditional volumetric kWh charge
2. Fixed customer charges
3. Demand charge
4. Time of use rates (including CPP)
Demand Charges

• Smart meters make demand charges feasible for smaller customers
• Consumers generally will not understand
  • Will require extensive education
• Another key question is the definition of “kW of demand” and which definition is fairest
Options for Determining Demand

• Customer non-coincident peak (NCP)
• Customer NCP during peak hours
• Customer coincident peak
• Maximum or average of 3-5 peaks?

** For fairness and politics, will need to be only coincident or during peak hours and will need to be based on some average
Demand Charges: Obsolete Concept

Commercial demand charges are a relic of the era when we could not do interval metering. Customer NCD used as a proxy for contribution to peak.

Source: Regulatory Assistance Project
Which Parts of the System Are Designed Based on NCP Demand?

Only the line transformer and service drop must handle the customer NCP.
Individual Load Shapes Vary

Customer 1: 36% Load Factor

Customer 2: 44% Load Factor

Customer 3: 38% Load Factor

Source: Regulatory Assistance Project
Lots of Diversity at the Transformer 26-Unit Apartment Complex, L.A. Area

Source: Regulatory Assistance Project
Residential Customer Load Research Data (SCE 2012 data)
Time of Use Rates – A Better Option

- Can incorporate demand charge into peak period rate
- Many customers understand time-of-use pricing, so less education needed
  - But still significant
- With TOU also have option for more than two periods but for residential, keep simple (perhaps 3 but not more)
### A Simple Cost-Based Rate Design

#### Customer-Specific Charges

<table>
<thead>
<tr>
<th>Customer Charge</th>
<th>$/Month</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer:</td>
<td>$/kVA/Mo</td>
<td>1.00</td>
</tr>
<tr>
<td>Customer Charge</td>
<td>$/Month</td>
<td>3.00</td>
</tr>
</tbody>
</table>

#### Bi-Directional Energy Charges

<table>
<thead>
<tr>
<th>Peak Level</th>
<th>$/kWh</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-Peak</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Mid-Peak</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>On-Peak</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>Critical Peak</td>
<td>0.75</td>
<td></td>
</tr>
</tbody>
</table>

Source: Regulatory Assistance Project
Phase-In for Either kW or TOU

1. Start with highest users and perhaps DG customers; include opt-in for other customers
2. Proceed to medium-sized customers, probably allow opt-out
3. Last or never do the smallest customers, perhaps with opt-out

Plan for extensive education efforts!
Problems with High Fixed Customer Charges

1. Reduces volumetric price signal and therefore reduces value of energy efficiency savings

2. Penalizes low users; more likely to be elderly and/or poor
Study for Kansas Corp. Commission

Monthly fixed charge of $20-26, varying by utility

Table 5.1: Percentage Changes in Usage by Season and Utility, SFV

<table>
<thead>
<tr>
<th>Utility</th>
<th>Summer</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>KCP&amp;L</td>
<td>+3.0%</td>
<td>+1.1%</td>
</tr>
<tr>
<td>Westar</td>
<td>+6.8%</td>
<td>+2.5%</td>
</tr>
<tr>
<td>Midwest</td>
<td>+4.5%</td>
<td>+2.6%</td>
</tr>
</tbody>
</table>

Source: 2012 study by Christenson Assoc.
Decoupling

• If the issue is fixed cost recovery when sales decline, decoupling can address this without a major rate redesign
• Buys time to study and gradually implement more substantial changes
Decoupling & Lost Revenue Adjustment Mechanisms

LRAM or Decoupling for both Gas and Electric

Source: 2014 State Energy Efficiency Scorecard with additional updates

* Includes decoupling/LRAM that has been authorized but not implemented

See new ACEEE reports for more info:
http://aceee.org/blog/2015/06/how-make-utility-future-energy
Conclusions

- Utility industry is changing and utilities and regulators will need to change
- Rate design will need to change so that capacity and T/D charges can be fairly recovered even if sales don’t increase
- Other policies also important
- Because energy efficiency is in the public interest, in general, principles of rate design should encourage efficient use of energy through usage-based price signals.
Conclusions (continued)

• For residential customers TOU rate may be the best option
  • Demand charges another option but have some problems
• Any major change in rates will need to be phased in and require extensive customer education
Contact Information

Steven Nadel
snadel@aceee.org
202-507-4011