California’s Statewide Pricing Pilot
Lessons Learned

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California’s Statewide Pricing Pilot (SPP) was designed to answer several key policy questions:

- Will customers shift or reduce load in response to time-varying price signals?
- What is the price elasticity of demand for electricity by time period?
- Does price responsiveness vary by rate type, climate zone and customer characteristics?
- Will customers accept time-varying and dynamic rates?
- Answers to these questions are being used to provide input to the overriding policy question:

Are the benefits from reductions in energy use and coincident peak demand from more economically efficient pricing sufficiently large to off-set the net metering, billing and other infrastructure costs required to implement rate reform?
The SPP tested several pricing concepts

• **Time-of-Use (TOU)**
  – Traditional two-part TOU rate
  – Peak period from 2 pm to 7 pm
  – Rates vary seasonally

• **Critical Peak Pricing-Fixed (CPP-F)**
  – TOU rate 350 days a year
  – Much higher price during peak period on up to 15 days a year (referred to as CPP days), the timing of which is unknown
  – Day ahead notification

• **Critical Peak Pricing-Variable (CPP-V)**
  – Similar to CPP-F except notification can be as short as 4 hours ahead
  – Critical peak period can vary in length from 1 to 5 hours between 2 pm and 7 pm
  – Consumers were offered enabling technology to automate response

• The above prices were layered on top of very complex, five-tier, increasing block tariffs
Population, central air conditioning (CAC) saturations, and weather vary significantly across California’s diverse climate zones. The SPP sample was segmented across four climate zones.

Average Peak-Period Temperature
July Through September 2003/2004

- **Zone 1**: 12% of Pop, CAC Sat = 7%
- **Zone 2**: 48% of Pop, CAC Sat = 29%
- **Zone 3**: 30% of Pop, CAC Sat = 69%
- **Zone 4**: 10% of Pop, CAC Sat = 73%

![Bar chart showing average temperatures by zone with critical days and normal weekdays distinguished.](image-url)
The SPP showed that significant reductions in peak energy use can be achieved by residential customers through critical peak pricing.

Percent Change in Residential Peak-Period Energy Use
(Avg CPP-F Prices/Avg 2003/2004 Weather)

<table>
<thead>
<tr>
<th>Zone</th>
<th>Critical Weekdays</th>
<th>Normal Weekdays</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1</td>
<td>-7.6</td>
<td>-2.2</td>
</tr>
<tr>
<td>Zone 2</td>
<td>-10.1</td>
<td>-3.3</td>
</tr>
<tr>
<td>Zone 3</td>
<td>-14.8</td>
<td>-5.6</td>
</tr>
<tr>
<td>Zone 4</td>
<td>-15.8</td>
<td>-6.5</td>
</tr>
<tr>
<td>All</td>
<td>-13.1</td>
<td>-4.7</td>
</tr>
</tbody>
</table>
There were statistically significant differences in response across hours within the peak period
Models developed from the CA pricing experiment can be used to predict demand response to various prices after adjusting for differences in characteristics and prices.

Similar responses could be obtained at lower CPP prices if the default rate was also lower, as impacts are driven by the ratio of prices before and after the new rate goes into effect.

Percent Reduction in Peak-Period Energy Use on Critical Days
Average Summer, 2003/04

Percent Impact (kWh/Hour)

Peak Price ($/kWh)

SPP average price = 59 ¢/kWh
30% of residential customers provided 80% of demand response

- **High Responders**
  - Monthly kWh: 775
  - CAC Saturation: 66%
  - 75% single family
  - High price elasticity

- **Low Responders**
  - Monthly kWh: 453
  - CAC Saturation: 29%
  - 52% single family
  - Low price elasticity
Other key findings for the CPP-F rate include

• Peak-period impacts on critical days stayed largely constant across the two summers

• Peak-period impacts did not drop on the 2\textsuperscript{nd} or 3\textsuperscript{rd} days of multi-day critical events (such as might occur during a heat wave)

• Critical-day impacts were greater during the hot summer months (-14.4\%) than during the cooler shoulder months (-8.1\%)

• Demand response was significantly less in the winter than in the summer

• The CPP-F tariff did not have a measurable effect on overall annual energy use
The TOU rate produced a statewide reduction in peak-period demand of around 6 percent in 2003

- Unfortunately, in 2004, the TOU rate impact dropped to near 0
- That is, TOU customers failed to sustain their demand response behavior across the two summer periods
- Small sample sizes and other complexities suggest that the TOU results should be taken with a “grain of salt”
- We recommended using the CPP-F impacts on normal weekdays as an alternative to using the TOU results
The CPP-V rate was tested among two groups of customers

- About 80% of Track A customers had central air conditioners and about two-thirds had some form of automated control technology
- All Track C customers had central air conditioning and all had smart thermostats
- Peak-period reductions for Track A customers on critical days were around 16 percent
- Peak-period reductions for Track C customers were around 27 percent
- Roughly two-thirds of the Track C reductions can be attributed to the smart thermostat technology, the remainder to behavioral changes
Satisfaction among SPP participants was high and nearly all customers felt that the rates were “fair”

Overall Satisfaction
(9/10 on 10 point scale)

- Total: 42%
- TOU: 40%
- CPP-F: 45%
- CPP-V: 33%

% Saying Program 'Is Fair'

- Total: 87%
- TOU: 89%
- CPP-F: 89%
- CPP-V: 82%
Most customers said they would prefer to continue on the new rate after the pilot, and roughly 65% are still on a time-varying rate after one year even though the participation incentive was discontinued and they are now paying a monthly meter charge of $3 to $5.

Percent of Customers Who Would Prefer to Continue on Pricing Plan

<table>
<thead>
<tr>
<th></th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPP-F</td>
<td>82.0</td>
</tr>
<tr>
<td>TOU</td>
<td>76.0</td>
</tr>
<tr>
<td>CPP-V</td>
<td>72.0</td>
</tr>
<tr>
<td>Total</td>
<td>80.0</td>
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</table>
What surprised some people?

• Price matters

• That customer’s responded at all, in light of 25 years of DSM, the energy crises of 2000/2001, increasing block rates with tail prices above 20 cents/kWh, some of the highest average prices in the country, etc. etc. etc.
  – There was still more to give

• People understood the rates enough to respond (in spite of their incredible complexity)
  – Never underestimate the value of refrigerator magnets

• Impacts persisted across years and especially across multi-day critical events
  – People do not cash it in on the third day of a heat wave
What surprised some people?

• Impacts from standard TOU rates were not sustained across two summers

• When offered an enabling technology for free, not everyone will take it

• Significant impacts are achievable in the absence of enabling technology, but impacts are larger with enabling technology

• Most customers liked the rates and, when given an opportunity to continue on a time-varying rate (even in the absence of incentives and with the requirement to pay for the metering), most have chosen to stay