

# **Strategies for Improving Customer Response to CPP Price Signals**

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## **ABSTRACT**

Among the options used by California's investor owned utilities (PG&E, SDG&E, SCE) to encourage customers to manage load and costs are dynamic pricing rates with higher rates during times of high load (critical events) and lower rates at other times. The Critical Peak Pricing (CPP) rate is designed to encourage customers to respond to the higher price signal by reducing or shifting energy use during critical events. Customers can benefit financially from the lower rates for electricity use outside of the events and when they reduce their usage during the events. The primary goal of this research was to better understand why certain customers respond to the CPP price signal better than others, as exemplified by their load impacts during events.

The success of the research and the approach taken provides reliable program feedback for utility program administrators on how to develop and implement dynamic pricing programs that effectively encourage participating customers to respond to critical peak price signals and achieve cost effective load impacts.

## **Introduction**

EnerNOC Utility Solutions conducted research to investigate the price responsiveness of customers participating in California's statewide Critical Peak Pricing (CPP) rate program in order to identify best practices for encouraging load response. This research was conducted under the guidance of the California Demand Response Measurement and Evaluation Committee (DRMEC). The DRMEC is comprised of representatives from California's three IOUs, the California Energy Commission (CEC), and the California Public Utilities Commission (CPUC).

The CPP rate is an opt-out rate, meaning that customers in specific rate classes were automatically defaulted to the CPP rate, and have the ability to opt-out and choose a different applicable rate, but must take action to do so. When the CPP rate was introduced many customers were eligible for bill protection for an initial period, typically the first 12 months on the rate. Customers are notified of a CPP event through a variety of methods: phone, email, fax, text, page (notification method can vary slightly by utility). Customers can also proactively look on the utility website for event announcements.

The objectives of this research were to improve the DRMEC's understanding of why certain customers respond to the CPP price signal better than others as exemplified by their load impacts during events; to identify key actions, strategies and enabling technologies that customers may take or use to improve load reductions; to isolate the challenges faced by customers who are less able to reduce load; and to identify statewide best practices of specific actions that may be taken to increase load reductions.

## Methodology

EnerNOC designed the research to collect qualitative data that enabled insights about the ability and willingness of different customers participating in California's statewide CPP program to change their load in response to price. First, interviews were conducted with each utility's program staff to gain a full understanding of each IOU's program design and how it is implemented. The knowledge gained from the program staff interviews was used to develop structured CPP participant interview guides that were designed to understand and explore how customers have and have not been able to respond in the past, and what they believe they may be able and are willing to do in the future.

Structured interviews were conducted with high and low performing CPP statewide participants and with CPP customers also participating in technology assistance incentive programs.

## Sampling Plan

In order to ensure the project's success, the sample and data collection process was designed to support actionable insights for each IOU. The sample included three target groups, specifically the top 10% of responders, the bottom 10%, and a sample of technology-enabled CPP customers participating in a technology assistance program.<sup>1</sup> The first two groups included only the top and bottom responders among customers who are not technology-enabled, thereby making these three groups separate and distinct. In order to ensure that we interviewed as many of the very top and very bottom responders, we also specifically targeted the top 2% and the bottom 2% of responders. The original goal was to complete a total of 300 customer interviews for this project, including interviews with customers across all three utilities and for each of the three target groups.

The sample design reflects the goals of including customers from each utility, balancing the proportion of CPP customers in each with the need to have a reasonable sample from each. As a result, SCE has more sample points than the other two utilities, since they have more CPP customers, but the representation is not exactly proportional to the number of participants.

The sample is based on the customer-specific regression models that Freeman Sullivan & Co. (FSC) used to estimate the load reduction across the events for each year (2010 and 2011) as part of the 2011 California Statewide Non-Residential Critical Peak Pricing Evaluation. The FSC model was the basis of the definition of price responsiveness for determining the top 10% and the bottom 10%.

To determine the top and bottom 10% for price responsiveness, two measures were used, both from the dataset provided by FSC with the results of the customer-specific regression models. The primary determinate was the estimated average hourly load reduction during events in 2011. Accounts with larger (or smaller) average hourly load reductions were more (or less) price responsive. However, the standard error of that estimate was also checked, to provide a sense of the confidence in that estimate. Only those with statistically significant changes in energy use during events were included in the sample. This ensured that the customers interviewed really were highly price responsive, or not price responsive.

FSC also provided the average hourly load reduction during events for 2010 for those customers who were on the rate for both years. This was used to determine the consistency of the level of load reduction. During the sample selection, customers who had higher load reduction in both years were

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<sup>1</sup> The top and bottom 10% were based on the percent reduction, not on the total kW reduction, of each CPP participant

favored. The fact that the top and bottom 10% was based on the percent reduction, not on the total kW reduction, helped to ensure that the sample did not consist entirely of larger customers.

**Table 1. Targeted Number of Completed Interviews**

Strata	PG&E	SCE	SDG&E
Top Responders	40	55	43
Bottom Responders	40	55	27
Technology-Enabled	10	20	10
Total	90	130	80

In order to achieve the sample sizes in Table 1, longer lists of candidates were selected to contact, since not all customers would be willing to participate in interviews. The list was initially based on the more strict criteria listed above in the definition of high and low responders, but that list was exhausted without meeting the quotas for completed interviews. As a result, the secondary criteria (consistent load response in both years, more focus on the top 2%) was relaxed, and the list simply included all of those in the top or bottom 10% for load response in 2011.

Another important factor in the sample design is the fact that the FSC data was based on utility account, not on individual customers. Therefore, once the sample was selected, many duplicate contacts existed because the same customer had more than one meter at their location, or the customer had several locations but the same contact was listed for each location. This greatly reduced the available sample of customers to interview and resulted in fewer completed interviews than originally designed in the sample plan. This was a particular challenge with the technology-enabled customers.

**Table 2. Completed Interviews by Utility and Strata**

Completed Interviews	PG&E	SCE	SDG&E
Top Responders	55	58	39
Bottom Responders	29	62	26
Technology-Enabled	1	10	5
Total Completes	85	130	70

## Results

### Comparison of Top and Bottom Responders

Across the three utilities the main difference between top and bottom responders is that many top responders are able to shut down production or stop major energy using processes during CPP events, while most bottom responders have a business need that makes it more difficult for them to fully respond. In addition there are several similarities between top and bottom responders at all three utilities:

- Most think their ability to respond will stay the same in 2012.

- The correct person is being notified of events for both groups of customers.
- Notification method does not appear to impact response.
- Most top and bottom responders do not automate their response.
- Most have a basic understanding of how the rate works.

Although the majority of CPP customers do not have a high level of understanding of the rate, most understand the rate reasonably well and have the ability to describe the main parts of the rate plan, including having to pay more during events, receiving a discounted rate during non-event periods, and having the ability to opt-out of the rate.

Opinions about the rate vary – some participants really like the rate, while others have negative opinions of the rate. This is true of both top and bottom responders. There are top responders who don't like the rate, and bottom responders who think the rate is great.

## Characteristics of Top Responders

Most top responders at all three utilities feel that controlling energy costs is of high importance and are knowledgeable about ways to reduce their load during events (Table 3). Smaller proportions have had a CPP audit, and less than half who have had an audit have made the recommended changes. Few top responders who haven't had an audit are interested in one; mainly because they feel they already know what to do to respond. Although one SCE top responder was unhappy that he was not eligible for the Technical Assistance program because he responded well to events.

**Table 3. Top Responders Energy Use Characteristics**

Characteristic	PG&E N = 55	SCE N = 58	SDG&E N = 39
Controlling energy costs of high importance	85%	59%	74%
Energy manager onsite	38%	16%	59%
Knowledgeable of ways to reduce	80%	72%	62%
Had a CPP/PDP audit	22%	28%	36%
Made changes recommended in audit <sup>2</sup>	33%	50%	43%
Interested in having an audit <sup>3</sup>	9%	19%	20%
Have a Building Management System (BMS)	20%	10%	54%
Made energy efficiency improvements in last year	55%	33%	62%

Table 4 below summarizes the number of top responders for each utility that responded in specific ways to events

<sup>2</sup> This question was only asked of respondents who said they had an audit performed.

<sup>3</sup> This question was only asked of respondents who did not already have an audit performed.

**Table 4. Response Characteristics of Top Responders**

Characteristic	PG&E N = 55	SCE N =58	SDG&E N = 39
Formal plan in place to respond	89%	90%	69%
Shift hours of operation	55%	71%	36%
Stop processes	47%	38%	56%
Shut down HVAC	13%	14%	8%
Raise thermostat/pre-cool	22%	19%	33%
Reduce lighting	27%	24%	26%
Turn off office equipment	7%	3%	8%
Turn off non-essential end uses (fountains, elevators, etc.)	15%	3%	15%
Use back up generation	7%	3%	10%
Do very little to respond	2%	3%	5%
Do not respond	2%	2%	8%
Automate response	18%	12%	21%
Responding adversely affects business	5%	7%	0%
Save money on the rate	89%	84%	85%
Multiple events hinders response	40%	41%	33%
Less likely to respond in future	5%	9%	8%

Across the three utilities top responders tend to fall into one of three main categories:

1. **Have the ability to easily shift operations or major processes.** The majority of top responders have operations or major energy uses that they are able to stop or shift to another time period. While most of these top responders feel participating is fairly easy, a small subset of this group said making these changes adversely affects their business.
2. **Make several small changes.** Several top responders are able to do several smaller changes during events such as increasing the thermostat temperature, reducing lighting, and/or turning off non-essential equipment such as fountains, a second bank of elevators, ice machines, etc.
3. **Use back-up generation.** A few top responders are able to shift to another back-up fuel source during event periods.

Overall top responders tend to feel that the CPP rate is mutually beneficial for both them and the utility. Many top responders report bill savings with several saying the savings are substantial

A small number of top responders say they do very little to respond indicating that they only take simple actions such as emailing building occupants asking them to conserve, or raising the

temperature a few degrees. A handful of top responders reported taking no action during events. This is difficult to interpret. It may be that unbeknownst to the interviewee, others at the facility are taking action, and that results in load reductions. Alternatively, it could be that in some cases, by chance, these customers just happen to use less energy on some of the event days, not because they intentionally took action, but just because their production schedule (and thus their load shape and usage patterns) fit well with the called events and the event window. With nearly 300 customers contacted, we can expect that a handful would appear to show a load response, simply by random chance.

More than a third of top responders say that having multiple events in a short time frame hinders their response. This is interesting because several years of load impact research has shown that CPP response remains constant when multiple events are called within a short time frame. It may be that customers continue to respond when there are multiple events, but it is a much greater hardship for them. Some top responders said having management on board helped improve their response and get cooperation from all departments.

There was some indication that responding may be more difficult in the future. A few PG&E top responders indicated the program was not onerous because their production schedule was manageable due to the slow economy. If the economy improves it may be more difficult for these customers to continue to respond at their current level. Some SDG&E customers reported having only a few events in prior years. If the number of events increases it may be more difficult for them to respond.

## Characteristics of Bottom Responders

When asked how important energy costs are in relation to other overhead expenses most SCE and SDG&E bottom responders feel that controlling energy costs is of high importance (Table 5), but less than half of PG&E responders feel the same. More than half of PG&E bottom responders say they are knowledgeable about ways to reduce their load during events, but much smaller proportions of SCE and SDG&E customers feel they have that knowledge.

**Table 5. Bottom Responders Energy Use Characteristics**

Characteristic	PG&E N = 29	SCE N = 62	SDG&E N = 26
Controlling energy costs of high importance	45%	52%	73%
Energy manager onsite	76%	27%	46%
Knowledgeable of ways to reduce	52%	19%	35%
Had a CPP/PDP audit	28%	24%	15%
Made changes recommended in audit <sup>4</sup>	75%	67%	25%
Interested in having an audit <sup>5</sup>	43%	43%	9%
Have a BMS	62%	27%	27%
Made energy efficiency improvements in last year	48%	56%	65%

<sup>4</sup> This question was only asked of respondents who said they had an audit performed.

<sup>5</sup> This question was only asked of respondents who did not already have an audit performed.

Some bottom responders have had an energy audit to identify areas where they can decrease load during events and most of the PG&E and SCE participants who had an audit said they made the recommended changes. Only 1 of the 4 SDG&E customers who had an audit, made the recommended changes. A little less than half of PG&E and SCE bottom responders are interested in having an audit.

Bottom responders vary greatly and fall into several different categories. While all three utilities have bottom responders in most categories, the proportion varies by utility (Table 5). Table 6 below summarizes the number of bottom responders for each utility that responded in specific ways to events

**Table 6. Response Characteristics of Bottom Responders**

Characteristic	PG&E N = 29	SCE N =62	SDG&E N = 26
Are responding to events	76%	47%	77%
Formal plan in place to respond	72%	31%	58%
Shift hours of operation	0%	10%	19%
Stop processes	10%	10%	23%
Shut down HVAC	0%	2%	4%
Raise thermostat/pre-cool	66%	24%	50%
Reduce lighting	48%	32%	42%
Turn off office equipment	14%	3%	19%
Turn off non-essential end uses (fountains, elevators, etc.)	28%	10%	12%
Automate response	31%	15%	0%
Multiple events hinders response	24%	24%	27%
More likely to respond in future	7%	15%	8%

Most PG&E and SDG&E bottom responders say they are responding to events and have a formal plan in place to respond. This is true of a sizeable portion of SCE customers as well. While they are responding, they may not be doing enough, or their savings may not be enough to overcome other large loads (like cooling, or production changes) that increase during event periods. While small numbers of these customers are responding by shifting hours of operation or stopping major processes, most are doing smaller things such as raising the thermostat and reducing lighting. The majority of bottom responders do not currently use technology to automate response and are unaware of options in this area. Technology is a solution that is not on their radar.

Table 7 below summarizes why bottom responders said they stayed on the rate instead of opting-out.

**Table 7. Bottom Responder Reasons for Staying on the Rate**

Characteristic	PG&E N = 29	SCE N = 62	SDG&E N = 26
Are saving money on the rate	62%	23%	54%
Are not adversely affected by the rate	3%	15%	19%
Feel they are contributing to the greater good	28%	8%	19%
Feel there is nothing they can do	0%	16%	8%
Do not know how to opt out or say they are unable to opt out	0%	8%	0%
Don't have a good enough understanding of the other rate options	17%	16%	23%
Plan to improve response	7%	10%	4%
Are opting out of the rate	10%	18%	0%
Do not know they are on the rate and don't remember receiving event notifications	0%	5%	0%

Bottom responders cited several reasons for staying on the rate. The largest group of bottom responders for all three utilities said they stayed on the rate because they saved money – although for SCE this group represents less than a quarter of their bottom responders. In some cases, bottom responders said they would pay more if they were on a different rate, and this is how CPP saved them money. A few of the SDG&E participants in this group claimed to know exactly how many events they could endure in order to break even on CPP. In the past the number of events has been below that threshold, but the summer of 2012 was hot and several events were called during the period of times that these interviews were conducted. These customers are concerned that they are going to pay more than they would on an alternative rate and may end up opting out in 2013.

Sizeable groups of SCE bottom responders are in the process or plan to opt out of the rate, feel there is nothing they can do about the rate, or don't understand the other rate options enough to make an informed decision. A few bottom responders from PG&E and SDG&E fall into these categories as well. Small groups of customers from all 3 utilities feel the rate is not adversely affecting them, are happy to participate to benefit the greater good, or plan to improve in the future. A few SCE customers did not know they were on the CPP rate, were not aware of events, didn't know they could opt out or tried opting out and were unsuccessful.

## Characteristics of Technology Enabled Customers

Due to the limited population available only 16 technology-enabled customers were interviewed, the majority are SCE customers. Technology-enabled customers tend to fall into one of two categories; about half say the technology is crucial to their response and the other half say they would have stayed on the CPP rate without the technology, it provides little or no incremental impacts. Four of these



customers do not use the technology that was installed through the program; although all but one respond to events. Two of these customers say that although the technology has not increased their response it has made responding much easier.

Technology-enabled customers tend to be engaged energy users. Most technology-enabled customers have an energy manager at their facility and controlling energy costs is very important to them. They have a high level of awareness of the outreach conducted by the utilities, have a good understanding of the CPP rate and are knowledgeable about ways to reduce. All but one has an energy plan in place to respond to events.

## **Barriers to Response**

The main barrier to response, the lack of ability to reduce large amounts of load because of the needs of the business, is the most difficult to overcome. Several bottom responders said they could not respond or were limited in their response because doing so would negatively impact their business activities. These businesses cited several unique reasons why they could not respond such as needing to maintain a constant temperature because produce would rot, animals would suffer, sensitive equipment would be harmed, or lab experiments would be jeopardized. They also cited more basic reasons such as having to meet production deadlines, keep their staff comfortable, or having tenants that would not respond.

Related to that barrier is the lack of knowledge about how to reduce load. Many bottom responders said they couldn't reduce significant load without hurting their business. Most don't think that this is due to lack of education or technology, but rather a basic fact of their business operations. A few customers did say they looked into improving their response, but in the end were unable to make significant changes.

In addition to these two main barriers, bottom responders identified the following additional barriers to response:

- Lack of knowledge/information related to the program.
- Difficulty in processing information provided from the utility.
- Lack of enabling technology that could help identify specific load reduction options with minimum impact on the core business function.
- Organizational barriers- difficulty coordinating response across different departments.
- The low priority of energy related issues compared to other job duties/responsibilities.
- Confusion among customers with multiple buildings on multiple rates. Customers do not always know which buildings/meters are on CPP.
- Reliance on human behavior modification to respond.

## **Conclusions**

Encouraging customers to improve their response to the CPP price signal will be an interesting challenge for the utilities because this research found that many low responding customers say they are 1) already responding, 2) benefitting from the rate even though their response is minimal or 3) not adversely affected by the rate even though they don't respond. It is not unexpected that many bottom responders feel they are benefiting from the rate. This group is self-selected – the program is opt-out

and customers who did not benefit have generally left the rate. Those that are left are going to have a higher likelihood of being natural winners—customers whose operational patterns and electricity usage happen to fit well with the CPP rate.

The majority of top responders find it fairly easy to respond by shifting their processes or shutting down major energy using equipment. For customers who do not have these options available, response becomes more complicated and difficult to achieve.

Technology is at least part of the answer, but many customers are not yet convinced. The majority of top responders are doing so without the help of technology and bottom responders in general do not see the value of using technology to improve their response. Education and information along with technology are likely what is needed to encourage greater customer response.

## **Best Practices for Improving Response**

**Show customers the results of their actions.** Most bottom responders either think they are responding already, or do not think they have the ability to respond. Create case studies by facility type that show what similar types of customers are doing to respond successfully. Program staff interviewed for this research suggested contacting customers after events to talk specifically about how they responded and what they could do to improve their response – this is already done to some extent at the IOUs.

Addresses: Lack of knowledge about how to reduce load, difficulty in processing information from the utility

**Provide customers with clear, easy to understand information in a variety of formats.** Most participants don't fully understand the rate and many bottom responders complained about not understanding the information provided by the utility. Some bottom responders did not realize they were on the rate or didn't know which of their buildings were on CPP and which were not. When sending information to customers specify the address of the account. Conduct focus groups where customers review current information to find out what works and what doesn't. Experiment with different formats such as videos or social media to explain the rate and what customers can do to respond.

Addresses: Lack of knowledge/information about the program, difficulty in processing information provided from the utility and confusion among customers with multiple buildings on multiple rates.

**Create a check list of building specific demand response actions.** Many bottom responders don't know what actions they can take to respond, and what responses save more energy than others. Create lists of things that customers can do to respond by facility type and provide estimates of how much load they can shed. Program staff also suggested sharing non-conventional ways that other customers are shedding load. For instance, some customers in this research said they turned equipment off at the circuit breaker. This saved time and eliminated reliance on human behavior. Include non-conventional options on the checklist.

Addresses: Lack of knowledge about how to reduce load

**Illustrate the value of technology.** Automation can go a long way to helping overcome the barrier of not being able to respond because of business need. Many DR strategies that use technology to automate response have little or no negative impact on a business. These include strategies such as turning off every third light in a group of lights, pre-cooling, and raising the temperature on chilled

water systems. Create case studies of how customers have used technology to improve response and save money on the CPP rate without adversely affecting business. Use this information to market enabling technology programs.

Addresses: Reliance on human behavior modification to respond, lack of ability to reduce load because of the needs of the business and lack of enabling technology.

**Educate and engage upper management.** When upper level managers are interested in energy costs, more focus and effort is put into managing energy use. One top responder commented that having the CPP rate as a default got the top managers attention. Another top responder reported that responding was going to become more difficult this year because his new manager was not supportive. Several demand response strategies require support, both financially and politically, from upper management.

Addresses: Organizational barriers and low priority of energy related issues

**Limit multiple events in a short time frame.** – This research has shown that multiple events in a short time frame are difficult for many top responders. This difficulty with multiple events was less prevalent among bottom responders because they are not taking actions that threaten their core business. Although several years of load impact evaluations have shown that customer response to multi-day events hold constant, customers in this research said that multi-day events hinder their response. Portfolio fatigue is also a challenge for many DR programs that EnerNOC is involved in. Utilities could limit the number of events called per week, or in a row, or consider the every other option that PG&E uses in their program to ensure that the base of highly responsive customers does not deteriorate.

Addresses: Lack of ability to reduce load

## Staff and Customer Recommendations

In addition to the best practices identified above, utility program staff and participating customers had several suggestions for improving customer response to the CPP price signal:

- **Increase the time of notification.** This was the most often cited option listed by CPP customers and program staff suggested it as well. While it may be difficult to predict an event with more notice, it might be possible to let customers know when an event is likely. Customers said that knowing an event is likely with a couple of days notice, even if it does not materialize, is better than an absolute notification 24 hours ahead.

Addresses: Lack of ability to reduce load.

- **Simplify the technology rebate eligibility requirements.** Some customers changed their energy use to benefit from the rate are now not eligible for technology incentives because they don't have a high enough peak load. This is frustrating for both customers and program staff because the reason customers reduced their peak was because of the CPP program and now that they want to make responding to the program easier and/or improve their response, the utility incentives are not available to them.

Addresses: Lack of enabling technology

- **Change it to an opt-in rate.** The default aspect of the program has created some dissatisfaction among customers. Program staff also noted that CPP customers have reported feeling like unwilling subjects of the program rather participants with a choice. Opt-in programs encourage customer buy-in and improve word of mouth advertising. Many customers feel they are being

penalized by the rate, if they proactively joined the program it would be conscious decision on their part and they would be more likely to respond.

Addresses: Organization barriers, confusion of multiple buildings owners, and the low priority of energy.

- **Consistently follow up with customers about their rate options.** Some customers said they received regular rate analysis reports from their utility, while others had no idea how the CPP rate compared to the alternatives. Provide rate analysis to all CPP customers on a regular basis and follow up with a phone call or visit.

Addresses: Lack of knowledge/information about the program, difficulty in processing information provided from the utility

- **Work with labor groups.** Some businesses with union employees are restricted by employee contracts and cannot easily change shifts to accommodate events. The utilities could work with the unions to accommodate this program, so employers would have more flexibility in restructuring the workday.

Addresses: Lack of ability to reduce load.

- **Provide bill protection for technology-enabled participants.** Many customers liked bill protection and felt it gave them time to try demand response strategies. Providing bill protection for customers committed to make technological changes may increase interest in these programs.

Addresses: Lack of enabling technology.