Customer Preferences Market Research (CPMR) – C&I

A Market Assessment of Time-Differentiated Rates among Small / Medium Commercial & Industrial Customers in California

Research Conducted

May – July 2004

Prepared for:

Prepared by:

Momentum Market Intelligence

220 NW 2nd Ave., Suite 600

Portland, OR 97209

Table of Contents

Executive Summary

Background

The Small / Medium Commercial & Industrial Customer Preferences Market Research (CPMR) study was conducted as part of the Statewide Pricing Pilot (SPP). The focus of the C&I CPMR was on understanding the preferences that business customers have for the various specific features that might be combined to create new time-differentiated (TD) electricity pricing options, and on understanding how those preferences might translate into the number or share of business premises selecting different pricing options that might be made available to them. While other activities conducted as part of the SPP experiment were designed to provide estimates of the way customers actually change their use of electricity when placed on a time-varying rate, the CPMR research was designed to estimate how business customers might respond if offered the opportunity to sign up for one or more time-varying rates.

More specifically, this research was designed to answer the following questions:

- If one or more time-differentiated (TD) electricity options are offered in the marketplace, how many business premises might reasonably be expected to adopt each of those options? Additionally, if a flat rate bill option were offered, how many business premises might adopt this option?
    - How will adoption rates differ depending on how the specific options are constructed?
    - How will adoption rates differ depending on how the portfolio of options made available to customers is constructed?
    - How will adoption rates differ depending on the starting condition to which customers are assigned (opt-in or opt-out)?
    - Which customers are more likely to acquire which options?

- If, in order to facilitate the ability to respond to time-varying prices, equipment controls systems are offered in the marketplace, how many customers might be expected to adopt these systems?
    - How does this differ depending on the cost and functionality of the control system offered?
    - Which customers are more likely to acquire which options?

Of course, in developing these responses it is important to recognize that this research is constrained by the fact that ultimately it is customer research and not a real market environment. As a result the responses customers offer to the research questions may not map exactly to the responses they would exhibit in a “real” environment.

A “real” environment in which time-differentiated rates might be offered to customers might involve different rates than those tested here, would certainly involve a different set of educational activities, and would require that customers be prepared to actually deal with the consequences of their expressed preferences. All of this means that the preferences that customers express in any research setting will not map exactly to the preferences they are likely to express in the “real world.” Having said that, however, the goal of research is to design a test environment that allows us to estimate as best as possible the choices that customers will actually make when they have the opportunity to do so.

Methodology

One of the complications in testing potential marketplace response to new product offerings comes in dealing with new products that have many variable features. It is relatively easy to test customer response to a product, for example, that can only differ by size and price. In such cases, it is easy to test customer response to all possible combinations of the product. For more complicated products, however, this is not possible, and this description applies to the time-differentiated electricity pricing options tested in this research.

Each of the pricing options tested in this work could differ along several dimensions (i.e., the amount of savings, whether there were Critical Peak periods or not, whether every day had a peak price, what the on-peak hours were, etc.) and there were several design options for every dimension (i.e., for the on-peak hour dimension there were multiple options including 12-5 pm, 12-6 pm, 12-7 pm, 1-6 pm, etc.).

Besides being complicated, however, it is important to understand that the pricing products tested with customers were unfamiliar to most of them. Most business small / medium customers have little or no experience with time-differentiated rates, and as a result, had to become familiar with a whole new set of product features, as well as with the logic for why such rates might be offered.

There is a well established survey methodology available to deal with the product complexity inherent in situations like this one, if not with the product familiarity problem[1]. A technique called discrete choice makes it possible to estimate how individual survey respondents would evaluate all of the different ways that a product might be constructed, even when there are too many product combinations to test individually.

Discrete choice works by essentially providing survey respondents with a sample of all of the possible product combinations in sets of three and then asking the respondent to indicate which of the three proposed options they would select, given a choice among them (respondents can also say that they would want to choose none of the options). If the product combinations are constructed and grouped randomly, it is possible to use each respondent's evaluations of a series of such choices to estimate the relative value that each respondent would attach to each feature of the products tested (in this case, the different pricing products), and the degree to which they find each feature to be important in determining whether or not they would want to adopt such an option.

While this analytic technique "works" from a technical perspective, it is worth noting that some questions remain about its relationship to customer choices in "real" markets. While a good deal could be written on this subject, the bottom line here is that discrete choice – like almost any research context – works by asking customers to indicate what choices they would make under certain constraining conditions. Whether or not those are the choices customers would make under real conditions (that is that they have to live with the consequences of their choices), and whether or not the constraining conditions assumed in the research either accurately represent the key features of real markets, or do not affect customer choices ultimately, are all factors that can affect the inherent validity of the data collected through discrete choice analysis.

[1] The team attempted to deal with the familiarity problem by providing a good deal of education for respondents within the context of the survey, and by providing several opportunities for respondents to think about the way that time-differentiated rates might work for their business and about how they might choose to respond (or not respond to those rates). The fact that typical responses were consistent and sensible suggests that this education was reasonably effective, though no independent measure of this effectiveness is available.

This analysis presumes that – while not an exact representation of the choices customers might make in an actual marketplace – discrete choice analysis allows us to understand the general shape of customer preferences (what things they value more versus less and which differences are large versus small) and to develop estimates of likely behavior that are likely to at least be in the right ballpark.

The analytical approach used in this research further presupposes that it is possible to estimate how much value individual survey respondents would assign to a new TD rate or appliance control product that can be defined by the features tested in the survey. Since we know how each respondent assigns value to each specific program feature, we can essentially add up the value each respondent would attach to the group of features that make up a specifically tested option. The sum of the individual values that each respondent would assign to a given pricing product is called the "total utility" for that product for that respondent (this total utility value is, essentially, a summary quantitative measure of the total value the customer would assign to that product).

Given a choice among rate options, the analysis assumes that we can estimate how customers would go about making a choice by comparing the "total utility" values they would assign to each of the tested options. Customers are assumed to be more likely to prefer the option that has the higher calculated total utility. The analysis assumes that customers rarely prefer one option to the exclusion of all others. That is, they may like one option more than the others (though sometimes there will be ties), but they usually like each option to some degree.

As a result, the analysis distributes a given respondent's "preference" proportionally across the available options based on a logistic regression equation. For any given set of rate options, then, the logistic regression analysis yields an estimate of the share (or proportion) of a given respondent's preference that would be allocated to each option (as an example, a given respondent might have an 80% preference for Option 1 and a 20% preference for Option 2). The analysis then treats the estimates of share of preference, once they have been weighted and aggregated across all customers as an estimate of the way that customer's "share of preference" is distributed across the options. However, to say that Option A has a 50% share of preference does not mean that 50% of all customers would choose that option in a "live" environment.

It is widely recognized that customers do not always act on their preferences. While customers may say, and even mean, that they would rather be on a new TOU rate rather than their current rate, they may not go to the trouble of making this change for a variety of reasons:

- Simple inertia (the fact that it is always easier to do nothing) may overcome their marginal preference for a new option.
- The perceived transaction costs are high (or uncertain); or stated otherwise, customers might assume that going through the process of changing rates is difficult and time-consuming, or at least that it is not clear at the start how difficult and/or time consuming it will be.
- While on the face of it a new rate might be appealing, because it is new, it is also likely to be viewed as risky, and those customers who tend to be very risk averse may choose to "wait and see" rather than acting to select an option they might otherwise define as attractive.
- A lack of awareness of the existence of such a rate may prevent them from acting simply because they do not know about the possibility of changing.

In order to reflect the existence of customer inertia and risk avoidance, and to recognize the fact that these elements differ in the degree to which they affect each customer, the team used the core survey questionnaire to estimate the impact of these two factors on each survey respondent. Index scores were calculated for inertia and risk aversion for each respondent and applied to each respondent's stated share of preference. These scores were used to adjust each respondent's stated preferences so that their expressed preference better accounted for the fact that they may tend to "stick to the tried and true," and / or avoid potentially risky options. A more detailed explanation of the creation and application of these indices can be found in the methodology section of this report.

In short, however, the adjustments operate so that customers with high inertia scores are defined as being more likely to stay with the default condition in a given scenario, regardless of which rate option is the default, while customers with a high risk avoidance score are assumed to be more likely to choose the rate they are on today (since they have experience with it and know what to expect in terms of bills), regardless of whether or not such a rate is the default choice[2]

Note that in addition to the adjustments for inertia and risk avoidance, the estimates of likely market response have also been adjusted to take into account customer awareness of alternative rate options. While it is common, and easy, to assume for purposes of customer modeling that awareness of new options will be 100%, this is almost never the case. For this reason, estimates of market response that account for the fact that some, but not all, customers are likely to be aware that they have other than their default condition options available to them have been provided.

Since it is not possible to estimate awareness on a respondent-by-respondent basis, and since awareness will vary depending on the scale and effectiveness of the communication efforts made, we have provided estimates for "High Awareness" (70% aware), "Moderate Awareness" (50%), and "Low Awareness" (30%) conditions.

How Customers Value Specific Rate Program Features

As we noted above, the data used as the basis for answering this research's key question (how many business premises might be reasonably be expected to adopt a variety of different TD electricity rates?) are generated from discrete choice analysis and these calculated values are called "utilities." A "utility" value is simply an arithmetic representation of the relative value that respondents place on each level of a feature. While these utility values do not have a direct application or interpretation in the "real world" they are directly interpretable as indicators of the relative value that business customers assign to different rate program features.

Before reporting the market share simulations which use these utilities as their basis, it is instructive to examine the comparative value expressed by respondents for each of the program features via these utilities. Table 1.1 below reports average utility values for the savings levels tested for scenarios in which customers make maximum, some and no

[2] Please note that a companion calculation tool provided as one of the deliverables of this analysis is a market simulation tool that can provide estimates of potential market response across a wide variety of potential market scenarios. The final version of the simulator used for this report is version 1.3.

adjustments[3]. These results have been weighted to represent all business premises in the eligible customer universe. Larger, positive values indicate feature levels that customers more highly value[4]. Note that within a feature, the utility values sum to zero and this is an artifact of the analysis. In comparing the utility values across the different bill impact adjustment levels, several conclusions can be drawn.

Table 1.1 – Utility Values for Bill Impacts across Adjustment Levels

Bill impact with Maximum **adjustments**	Savings Level	Utility
	20%	.66
	15%	.21
	10%	-.23
	5%	-.65
Bill impact with **Some** adjustments	10%	.75
	7.5%	.49
	5%	.24
	2.5%	-.01
	0%	-.25
	2.5% increase	-.49
	5% increase	-.72
Bill impact with **No** adjustments	5%	1.41
	0%	.67
	5% increase	-.03
	10% increase	-.70
	15% increase	-1.35

1) Customers appear to worry more about having to make adjustments to electricity usage and about bill increases that might occur under a new TD pricing program than they care about any savings they might experience. This difference in concern is indicated by the relative size of the extreme utility values for maximum, some, and no adjustments. For maximum adjustments the highest positive utility is .66, while for some adjustments, the equivalent value is .75. While this may not appear to be a large difference, it represents a 14% difference in relative "value" to customers. This means that customers attach more value to

[3] As part of the discrete choice design, customers were told that how much they saved on a given time-differentiated rate would depend on how they responded by changing their usage. Different scenarios were described that involved making no adjustments in the way they used energy during peak periods, making "some" adjustments, and making "maximum" adjustments, and these scenarios were varied depending on respondent energy usage. As a result, when customers evaluated a given rate offering, they could respond recognizing that they might save (or incur higher energy bills) different amounts depending on how they responded to each rate.

[4] Please note that approximately 20% of customers that never chose one of the TD rates in the discrete choice analysis (that is, they always chose "I would not choose any of these options") are not included in this data since the focus here is on understanding the relative preference that customers have for different features. Of course, while this group is not included here, their preferences are accounted for when estimating market share. It is worth noting that this strong preference by a not insignificant proportion of the sample for their current rate has the effect of flattening or dampening the effect of modifications of the various program feature levels on customer response, resulting in changes that will have a smaller impact on market share than one might otherwise expect.

the highest savings they can get by making some adjustments than they attach to the highest savings they can get by making maximum adjustments, and this is true even though the savings levels specified are 20% for maximum adjustments vs. only 10% for some adjustments.

This trend continues when we look at the highest positive utility for no adjustments which is even larger at 1.41, even though the specified savings level is only 5%. Thus, moving from some adjustments to no adjustments represents an *88% difference in relative value*. If we were to compare the highest positive utility value for maximum adjustments to that of no adjustments we see that the difference between the two represents an even larger relative value to customers – 114%!

The implication of this difference is that while customers care about – and value – the savings they can realize, they value even more the possibility of having to make fewer changes in the way they use energy. Savings are good, in other words, but lower savings with fewer changes are better than more savings that require more changes in energy use.

2) Customers do not weigh what might appear to be equivalent economic outcomes the same. Implicit in what we said above is the finding that customers attach more value to a potential "loss" of 5% (moving from a 5% savings to a 0% savings on their bill) than a potential "gain" of 5% (moving from a 5% savings to a 10% savings on their bill). Simplistic economics might suggest that customers would be expected to attach a positive value to a potential 5% savings gain that is at least equal to the negative value they attach to a potential 5% loss. This is not the case, however.

   Furthermore, adding to this seeming incongruence, we find that customers attach more value to the potential "loss" of 5% when making no adjustments (moving from a 5% savings to a 0% savings on their bill) than the same potential "loss" of 5% (moving from a 5% savings to a 0% savings on their bill) when making some adjustments.

The way in which the savings potential of each rate option was expressed to respondents allows us to investigate another bit of complexity in the pattern of responses to potential bill impacts. In the choices that customers evaluated in the survey, they did not actually see descriptions of percentage bill impacts. Instead, customers were shown absolute dollar value bill impacts that mapped – in percentage terms – appropriately to their actual bills.

This allowed the team to explore the question of the degree to which the total "value" that respondents attach to each amount of potential savings was driven by: 1) the percentage value and 2) the size of their own electric bill. Table 1.2 disaggregates the total utility values into the portion that is accounted for by the percentage savings statements and the portion that is accounted for by the absolute size of the respondent's bill (reported as the dollar-metric values).

The results in the table indicate that most of the value associated with "bill impact with maximum adjustments" comes from the percentage statement of the savings (20%, 15%, 10%, 5%). In addition, however, a small amount of additional value is attached to the higher savings values by those people with higher bills. For a 20% potential bill savings, the raw percentage savings contributes +.61 out of the total of +.66 total utility, but another +0.06 (or around 9% of the total utility) is contributed by the dollar-metric component. This

means that the higher a respondent's current electric bill, the more they tend to like higher savings levels, and that on balance, the size of a respondent's electric bill contributes around 9% to the total value they attribute to a given savings level. Similar results were found when examining this disaggregation for bill impacts for some and no adjustments levels.

Table 1.2 – Utility Values for Bill Impacts Given MAXIMUM Adjustments Accounting for Dollar-metric Contribution

Total **Bill Impact**	Savings Level	Utility
	20%	.66
	15%	.21
	10%	-.23
	5%	-.65
Percentage Bill Impact	20%	.61
	15%	.19
	10%	-.21
	5%	-.59
Dollar-metric Bill Impact	20%	.06
	15%	.02
	10%	-.02
	5%	-.06

The different values that survey respondents attached to the other six TD pricing program features are reported in Table 1.3 below. Please note that the "Billing Type" attribute was not a program feature seen by respondents. This attribute was actually embedded in the specification of the other five program building blocks. Thus, for example, a flat billing type would be specified by designing a rate that never has on-peak periods, has no critical peak days (and thus no critical peak day notice), and no automated equipment controls. For analysis purposes, the billing type has been teased out of these other five attributes in order that we may more easily understand customer response to the two possible billing types (time-differentiated pricing and flat pricing). An examination of this table tells us several things, including that:

- Of these six non-price-related attributes, billing type is the most important (since it is the program feature with the greatest positive and negative utility values among this group). Within this feature, customers most prefer the flat rate billing option.

- The number of critical peak days is also an important attribute. Within this feature, customers most prefer the option for 0 critical peak days, representing a TOU only rate option.

- How often critical peak days occur (whether they are every day or only on critical days) is also an important issue for respondents, though less so than critical peak days and billing type. Most customers prefer for peak periods to occur only on critical peak days, despite the contradictory desire for 0 critical peak days as noted in the bullet above.

- "Duration of on-peak periods" is relatively less important than some of the other program features. Within this feature, customers most prefer the 2-6pm on peak

period, which was the shortest tested at a duration of 4 hours. The two second most preferred on-peak periods were 1-6pm and 12-5pm, at a duration of 5 hours.

- The provision of an automated equipment control system is somewhat important, with most preferring that no control system is provided.

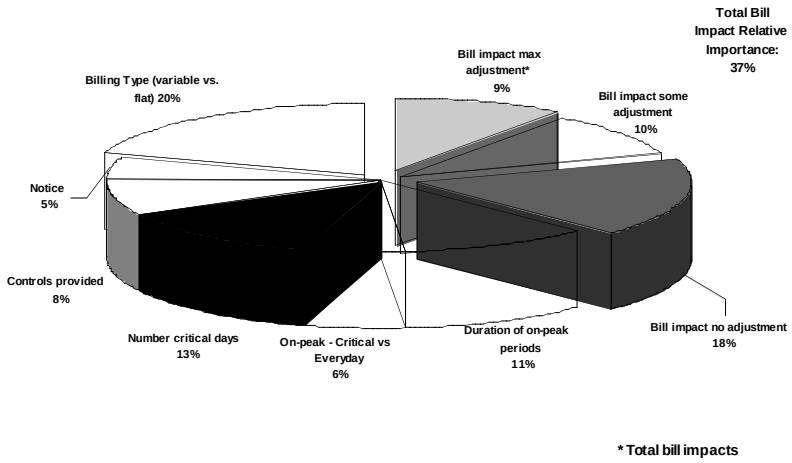
- Issues of whether or not automated controls are provided and the amount of advanced notice of a critical peak event appear to be less important than other issues.

Table 1.3– Utility Values for Non-Price Program Features

Program Feature	Level	Utility
Billing Type	Time Differentiated	-.83
	Flat	.83
Duration of on-peak periods	12-5pm	.05
	12-6pm	-.09
	12-7pm	-.23
	1-6pm	.06
	1-7pm	-.04
	2-6pm	.22
	Varies (typically 12-6pm, but could be shorter)	.02
How often on-peak periods occur	Every weekday	-.33
	Only on Critical Peak days	.33
Number of critical peak days	0	.79
	5	.10
	10	-.19
	15	-.33
	20	-.38
Automated equipment control system provided	No	.28
	Yes	-.28
Notice of critical peak day provided	Day before	.09
	That morning	-.09

Chart 1.1 provides an integrated summary of the relative importance of each of the pricing program features tested for predicting customer preference for particular rate option. A customer's conclusion about how much they prefer a given rate option might be described as being driven proportionally by the different building blocks that go into defining that option. The reported results say that 20% of a given preference is driven by the billing type and that 18% of that preference is driven by the bill impact with no adjustments, with the other building blocks contributing as indicated. This means that a change in the way a given rate option is constructed that involves billing type or bill impact for no adjustments should have a much greater effect on overall customer preference than might a change in the timing with which critical peak notice is provided.

Chart 1.1 – Relative Importance of Pricing Features



It is worth noting that the three savings-related program building blocks, taken together, drive 37% of customer preference for a given program design – a significant amount, but less than half. Alternatively, the program building blocks that have to do with if, when and how often on-peak periods and critical peak days occur, taken together, drive 50% of customer preference for a given program option, surpassing the contribution of the savings potentials.

Sensitivity to Rate Program Design

In order to summarize the sensitivity analysis across the various features that can be used to construct a new time-differentiated pricing option, the team calculated share of preference estimates for each of several products that help to define the maximum and minimum preference shares that are possible for the time-differentiated rates tested in this work.

Chart 1.2 reports share of preference values for each of four different pricing options that, taken together, provide a sense for how much variability in share of preference can be created by considering the most extreme differences in product features:

- The "worst possible TD[5]" rate is defined as the pricing option that has the least valued level on every product feature
- The "best other TD features/worst price" rate has the least attractive bill impact/savings values, but the most valued levels for a TD product on all of the non-price features
- The "best price/worst other TD features" rate has the highest savings levels across the board, but the least preferred levels on each of the other features

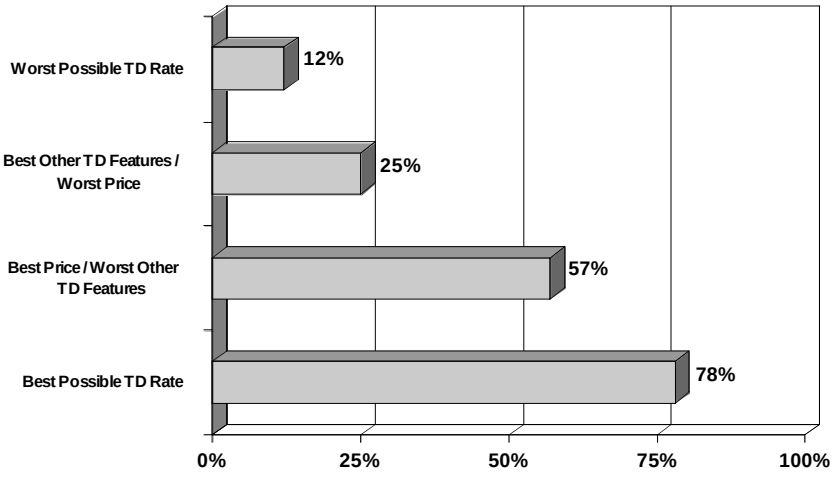
[5] Because of the interest in time differentiated rates only for the purpose of this report, the "best" possible features / rates in this chart only look at the best possible TD rates / features.

- The "best possible TD" rate has the most desired levels on every product feature for a TD rate

The key takeaway from this analysis is that:

- When considering TD rate programs only, price / savings level is the most obvious way to affect customer preference. When price is favorable, this works to capture most of the share possible, leaving the other features to have little impact on moving share. Including other favorable non-price features can have some impact on customer response but much less so than price / savings.

Chart 1.2 – Sensitivity to "Best" and "Worst" Pricing Product Options



Summary of Findings – Understanding Likely Response to TD Pricing Options

While the analytic approach used in this work makes it possible to model literally hundreds of pricing options and thousands of different market scenarios, the analysis reported here makes use of only the eleven pricing options listed in Table 1.4 on the following page.

The three rates labeled as "SPP" were chosen because they map as closely as it was possible to do so to the pricing options currently being used in the C&I SPP. Two other rates without a TOU component (Pure CPP-F and CPP-V) were chosen as potentially interesting for investigation by the project team. Several other rates labeled as "best savings" were included for analytical purposes only. They are identical to their companion SPP or Pure CPP rate with the exception that they have been specified with the best possible savings (20% savings for maximum adjustments, 10% savings for some adjustments, and 5% savings for no adjustments). The last rate is, of course, the customers' current rate, which could include TOU rate, a fixed rate without a demand charge, and a fixed rate with a demand charge.

The pricing options described on the next page were evaluated for market response by using a market simulation tool developed from the data collected in this survey, of which the utilities generated from the discrete choice analysis described earlier are its basis. The market simulation tool makes it possible to construct different market scenarios in which alternative pricing options are available to customers, with different assumptions made about which option is the default (or starting point) condition.

Table 1.4 – Base Pricing Options for Market Share Analysis

Rate Option	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9	Option 10	Option 11
Rate Type	**CPP-F (SPP)**	**CPP-F (Best savings)**	**TOU (SPP)**	**TOU (Best Savings)**	**CPP-V (SPP)**	**CPP-V (Best Savings)**	**Pure CPP-V**	**Pure CPP-V (Best Savings)**	**Pure CPP-F**	**Pure CPP-F (Best Savings)**	**Current Rate (TOU, Demand, Non-Demand)**
Bill Impact max adj. (20% - 5% savings) *	10%	20%	10%	20%	10%	20%	10%	20%	10%	20%	
Bill impact some adj. (10% savings – 5% higher bill) *	2.5%	10%	2.5%	10%	2.5%	10%	5%	10%	5%	10%	
Bill impact no adj. (5% savings – 15% higher bill) *	0%	5%	0%	5%	0%	5%	5% higher	5%	5% higher	5%	
On peak period (12-5, 12-6, 12-7, 1-6, 1-7, 2-6, Varies; none)	12-6	12-6	12-6	12-6	Varies	Varies	Varies	Varies	12-6	12-6	
On peak periods occur (Every weekday, Only on critical days, N/A)	Every weekday	Every weekday	Every weekday	Every weekday	Every weekday	Every weekday	Only on critical days	Only on critical days	Only on critical days	Only on critical days	
Number of critical days (0, 5, 10, 15, 20)	15	15	0	0	15	15	15	15	15	15	
Controls provided (Yes, No, N/A)	No	No	No	No	Yes	Yes	Yes	Yes	No	No	
Notice of critical days provided (N/A, day before, that morning)	Day before	Day before	N/A	N/A	That morning	That morning	That morning	That morning	Day before	Day before	

The first set of market scenarios presented in Table 1.5 below assume that customers begin on their current rate and are allowed to opt-in to one of the TD rates if they choose to do so. Table 1.5 provides summary results for each of the TD rates investigated, with columns for share of preference adjusted for risk avoidance, inertia, and awareness at 70%, 50%, and 30% levels and central AC use.

Please note that in a market scenario in which a customer's current rate is the starting or default condition, we would expect that decreases in awareness will result in reduced share for each of the TD rates.

Table 1.5 suggests that in situations where customers start with a default condition under which they can choose to stay with their current rate (and do so by "doing nothing"), but could choose to move to one of these time-differentiated rates roughly resembling the SPP rates, we would expect any one of these rates to attract roughly 17-24% of all customers (assuming all customers were eligible), as a real world estimate under reasonable awareness levels (50-70%), with the remaining customers opting to stay with the current rate.

Under the assumption that awareness of TD options was 100%, the proportion opting to select one of these TD rates might reach one-third of all customers (again, assuming all customers were eligible). Modifying these alternatives to a "pure" CPP-F or CPP-V option or modifying it to the best savings potential possible does not significantly modify customer response.

A Note About Confidence Intervals

It is important to recall that the market share estimates provided in Table 1.6 below and in similar tables that follow are not actually point estimates, but are rather, point estimates with an associated range or confidence interval. That is, the 34% share estimate in the first row of the table, while represented there as a point estimate, is actually an estimate that has a 95% confidence interval of +/- 9.0%. Confidence intervals for other example percentages are as follows:

90% +/- 5.6%
80% +/- 7.4%
70% +/- 8.5%
60% +/- 9.1%
50% +/- 9.3%
40% +/- 9.1%
30% +/- 8.5%
20% +/- 7.4%
10% +/- 5.6%

These confidence intervals are not provided within each relevant table and graphic simply because many of these graphics and tables are already quite dense, and the addition of information about the confidence intervals associated with every estimate would make them substantially more difficult to read.

Table 1.5 – Market Scenarios with Starting (Opt-in) Condition Set as Current Rate

Starting / Default Condition	Opt-in Condition	Share for T.D. Rate (Adjusted for Risk Avoidance and Inertia)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 70% Awareness)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 50% Awareness)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 30% Awareness)
Current Rate (CR)	CPP-F (SPP)	CPP-F - 34%[6] CR - 66%	CPP-F - 24% CR -76%	CPP-F -17% CR -83%	CPP-F -10% CR - 90%
CR	CPP-F (Best Savings)	CPP-F -39% CR - 61%	CPP-F - 27% CR - 73%	CPP-F - 19% CR - 81%	CPP-F - 12% CR - 88%
CR	CPP-V (SPP)	CPP - 34% CR - 66%	CPP-V - 24% CR - 76%	CPP-V - 17% CR - 83%	CPP-V - 10% CR - 90%
CR	CPP-V (SPP-*assumes available only to those with CAC*)	CPP-V - 24% CR - 76%	CPP-V - 17% CR - 83%	CPP-V 12% CR- 88%	CPP-V - 7% CR - 93%
CR	CPP-V (Best Savings)	CPP-V - 37% CR - 63%)	CPP-V -26% CR - 74%	CPP-V - 19% CR - 81%	CPP-V - 11% CR - 89%
CR	CPP-V (Best Savings – *assumes available only to those with CAC*)	CPP-V - 27% CR - 73%	CPP-V - 19% CR - 81%	CPP-V - 14% CR - 86%	CPP-V - 8% CR - 92%
CR	Pure CPP-F	Pure CPP-F - 36% CR - 64%	Pure CPP-F - 25% CR - 75%	Pure CPP-F - 18% CR - 82%	Pure CPP-F - 11% CR - 89%
CR	Pure CPP-V	Pure CPP-V -35% CR - 65%	Pure CPP-V - 24% CR - 76%	Pure CPP-V - 17% CR - 83%	Pure CPP-V - 10% CR - 90%
CR	Pure CPP-V (*Assumes available only to those with CAC*)	Pure CPP-V - 25% CR - 75%	Pure CPP-V - 18% CR - 82%	Pure CPP-V - 13% CR - 87%	Pure CPP-V - 8% CR - 92%

[6] Please note that the percentages represented in this table are not actually point estimates, but have an associated confidence interval. See the note on the prior page for information about these confidence intervals.

The second set of market scenarios presented in Table 1.6 on the following page assumes that customers are placed on a TD rate roughly resembling one of the SPP pilot rates but allowed to opt out of the rate to go back on to their current rate if they so choose.

From Table 1.6 we can see that we would expect roughly two-thirds to three-quarters of all customers to remain on a TD rate similar to the SPP rates under reasonable expectations about awareness (at 50-70%), with the remainder deciding to opt-out of such a rate, back on to their current rate. Even larger numbers of customers could potentially stay on a TD rate if an even more attractive rate were constructed, such as the "best savings" rates tested here.

The third set of market scenarios presented in Table 1.7 (provided on page 19) assumes that customers are placed on a TD rate roughly resembling one of the SPP pilot rates but they are *not* allowed to opt out of the rate to go back on to their current rate, but rather they have the option of opting-in to another TD rate. In all of these scenarios the number of customers on a TD rate would, obviously, be 100% under all scenarios. However, the proportion on each of the TD rates will differ depending on the specific rates offered and which one is used as the default condition.

The results in Table 1.7 suggest that the number of customers (at most) that we could expect to stay on their default rate is 88-91% (assuming 100% awareness) when the default rate is the TOU SPP rate. If the TOU rate could be constructed with better savings potential, this could be even higher.

Table 1.8 (provided on page 20) presents the results from a set of scenarios in which the current rate is once again the default or starting condition, but rather than offering customers one TD rate as an alternative, they are offered a second as well.
From these findings we could conclude that offering multiple products does not significantly increase the number of opt-in switchers when the current rate is the default rate. Given the combination of pilot rates tested here (and assuming only two were offered as modeled), the utilities could expect approximately three-quarters to remain on their current rate (assuming 70% awareness). That said, each of the scenarios tested here looked only at adding a CPP-V or pure CPP-V rate as the second TD alternative. Previous results described in this report would suggest that offering the more desirable TOU SPP rate or the CPP-F SPP or pure CPP-F rates as the second alternative might increase the total number of opt-in switchers, though most likely not dramatically so.

The last set of scenarios investigate potential share when the current rate is not the default and two rates are offered as opt-in options – another TD rate as well as the current rate (Table 1.9 provided on page 21).

From these findings we could conclude that offering multiple products when the default or starting rate is the CPP-F or TOU SPP rate does not significantly increase the number of customers remaining on a TD rate. In fact, we see only a 1-3% point reduction in the number of customers opting to go back on their original rate. Thus, given the combination of rates tested here the utilities could expect roughly a third of customers to go back on their current rate (assuming 70% awareness) when offering a combination of these two rates.

However, offering multiple products when the default is the CPP-V SPP rate is more of a winning proposition, particularly if we are to assume that the CPP-V rate is only available to eligible premises with central AC. In these cases, we could expect that the number of customers remaining on a TD rate would increase by either 7% when the default CPP-V rate

is available to all customers, or increase by 26% when it is available only to eligible premises. Given the combination of rates tested here, we could still expect a little over a third of customers to go back on their current rate.

Table 1.6 – Market Scenarios with Starting (Opt-in) Condition Set as TD Rate

Starting / Default Condition	Opt-in Condition	Share for T.D. Rate (Adjusted for Risk Avoidance and Inertia)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 70% Awareness)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 50% Awareness)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 30% Awareness)
CPP-F(SPP)	CR	CPP-F –51% CR – 49%	CPP-F-66% CR – 34%	CPP-F-75% CR – 25%	CPP-F-85% CR – 15%
CPP-F(Best Savings)	CR	CPP-F – 70% CR – 30%	CPP-F – 79% CR –21%	CPP-F – 85% CR –15%	CPP-F – 91% CR –9%
TOU(SPP)	CR	TOU – 62% CR – 38%	TOU – 73% CR – 27%	TOU– 81% CR – 19%	TOU – 89% CR – 11%
TOU(Best Savings)	CR	TOU – 78% CR – 22%	TOU – 85% CR – 15%	TOU – 89% CR – 11%	TOU – 93% CR – 7%
CPP-V(SPP)	CR	CPP-V –41% CR – 59%	CPP-V –59% CR – 41%	CPP-V –70% CR – 30%	CPP-V –82% CR – 18%
CPP-V(SPP-*assumes available only to those with CAC*)	CR	CPP-V –29% CR – 71%	CPP-V –40% CR – 60%	CPP-V –47% CR – 53%	CPP-V –55% CR – 45%
CPP-V(Best Savings)	CR	CPP-V – 63% CR – 37%	CPP-V – 74% CR – 26%	CPP-V – 81% CR – 19%	CPP-V – 89% CR – 11%
CPP-V(Best Savings- *assumes available only to those with CAC*)	CR	CPP-V – 44% CR – 56%	CPP-V– 51% CR – 49%	CPP-V – 55% CR – 45%	CPP-V – 59% CR – 41%

Table 1.7 – Market Scenarios with Starting / Default Condition Set as a Time-Differentiated Rate; Current Rate not Provided as an Option

Starting / Default Condition	Opt-in Condition	Share for T.D. Rate (Adjusted for Risk Avoidance and Inertia)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 70% Awareness)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 50% Awareness)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 30% Awareness)
CPP-F(SPP)	TOU(SPP)	CPP-F – 64% TOU– 36%	CPP-F – 75% TOU – 25%	CPP-F – 82% TOU – 18%	CPP-F – 89% TOU (SPP) – 11%
CPP-F(Best Savings)	TOU(Best Savings)	CPP-V – 86% TOU – 14%	CPP-V – 90% TOU – 10%	CPP-V – 92% TOU – 7%	CPP-V – 96% TOU – 4%
TOU(SPP)	CPP-F(SPP)	TOU – 83% CPP-F – 18%	TOU – 88% CPP-F – 12%	TOU – 91% CPP-F – 9%	TOU – 95% CPP-F – 5%
TOU(Best Savings)	CPP-F(Best Savings)	TOU – 90% CPP-F – 10%	TOU – 93% CPP-F – 7%	TOU – 95% CPP-F – 5%	TOU – 97% CPP-F – 3%
CPP-V(SPP)	TOU (SPP)	CPP-V – 47% TOU – 53%	CPP-V – 63% TOU – 37%	CPP-V – 74% TOU – 26%	CPP-V – 84% TOU – 16%
CPP-V(SPP-*assumes available only to those with CAC*)	TOU (SPP)	CPP-V – 32% TOU – 68%	CPP-V – 42% TOU – 58%	CPP-V – 49% TOU – 51%	CPP-V – 56% TOU - 44%
CPP-V(Best Savings)	TOU (Best Savings)	CPP-V – 71% TOU – 29%	CPP-V – 79% TOU – 21%	CPP-V – 85% CR – 15%	CPP-V – 91% CR – 9%
CPP-V(Best Savings- *assumes available only to those with CAC*)	TOU (Best Savings)	CPP-V – 49% TOU – 51%	CPP-V – 54% TOU – 46%	CPP-V – 57% TOU – 43%	CPP-V – 61% TOU – 39%

Table 1.8 – Market Scenarios with Starting / Default Condition Set as Current Rate with Two TD Rate Opt-in Options

Starting / Default Cond.	Opt-in Condition	Opt-in Condition	Share for T.D. Rates (Adjusted for Risk Avoidance and Inertia)	Share for T.D. Rates (Adjusted for Risk, Inertia, and Awareness – 70% Awareness)	Share for T.D. Rates (Adjusted for Risk, Inertia, and Awareness – 50% Awareness)	Share for T.D. Rates (Adjusted for Risk, Inertia, and Awareness – 30% Awareness)
Current Rate (CR)	CPP-F (SPP)	CPP-V (SPP)	CPP-F – 18% CPP-V – 18% CR – 64%	CPP-F – 12% CPP-V – 12% CR – 75%	CPP-F – 9% CPP-V – 9% CR – 82%	CPP-F – 5% CPP-V – 5% CR – 89%
CR	CPP-F (SPP)	CPP-V (SPP – *assumes avail. only to those with CAC)*	CPP-F – 21% CPP-V – 14% CR – 65%	CPP-F – 15% CPP-V – 10% CR – 75%	CPP-F – 11% CPP-V – 7% CR – 82%	CPP-F – 6% CPP-V – 4% CR – 89%
CR	CPP-F (best savings)	CPP-V (best savings)	CPP-F – 20% CPP-V – 19% CR – 61%	CPP-F – 14% CPP-V – 13% CR – 73%	CPP-F – 10% CPP-V – 9% CR – 80%	CPP-F – 6% CPP-V – 6% CR – 88%
CR	CPP-F (best savings)	CPP-V (best savings - *assumes avail. only to those with CAC*)	CPP-F – 24% CPP-V – 15% CR – 61%	CPP-F – 17% CPP-V – 10% CR – 73%	CPP-F – 12% CPP-V – 7% CR – 80%	CPP-F – 7% CPP-V – 4% CR – 88%
CR	Pure CPP-F	Pure CPP-V	Pure CPP-F – 19% Pure CPP-V – 18% CR – 63%	Pure CPP-F – 13% Pure CPP-V – 12% CR – 74%	Pure CPP-F – 9% Pure CPP-V – 9% CR – 82%	Pure CPP-F – 6% Pure CPP-V – 5% CR – 89%
CR	Pure CPP-F	Pure CPP-V (*assumes avail. only to those with CAC)*	Pure CPP-F – 23% Pure CPP-V – 14% CR – 63%	Pure CPP-F – 16% Pure CPP-V – 10% CR – 74%	Pure CPP-F – 11% Pure CPP-V – 7% CR – 82%	Pure CPP-F – 7% Pure CPP-V – 4% CR – 89%
CR	Pure CPP-F (best savings)	Pure CPP-V (best savings)	Pure CPP-F – 21% Pure CPP-V – 19% CR – 60%	Pure CPP-F – 14% Pure CPP-V – 14% CR – 72%	Pure CPP-F – 10% Pure CPP-V – 10% CR – 80%	Pure CPP-F – 6% Pure CPP-V – 6% CR – 88%
CR	Pure CPP-F (best savings)	Pure CPP-V (best savings - *assumes avail. only to those with CAC)*	Pure CPP-F – 25% Pure CPP-V – 15% CR – 60%	Pure CPP-F – 17% Pure CPP-V – 11% CR – 72%	Pure CPP-F – 12% Pure CPP-V – 8% CR – 80%	Pure CPP-F – 7% Pure CPP-V – 5% CR – 88%

Table 1.9 – Market Scenarios with Starting / Default Condition Set as TD Rate with Current Rate and Second TD Opt-in Rates

Starting / Default Cond.	Opt-in Condition	Opt-in Condition	Share for T.D. Rates (Adjusted for Risk Avoidance and Inertia)	Share for T.D. Rates (Adjusted for Risk, Inertia, and Awareness – 70% Awareness)	Share for T.D. Rates (Adjusted for Risk, Inertia, and Awareness – 50% Awareness)	Share for T.D. Rates (Adjusted for Risk, Inertia, and Awareness – 30% Awareness)
CPP-F (SPP)	Current Rate (CR)	TOU (SPP)	CPP-F – 44% TOU – 9% CR – 46%	CPP-F – 61% TOU – 6% CR – 32%	CPP-F – 72% TOU – 5% CR – 23%	CPP-F – 83% TOU – 3% CR – 14%
TOU (SPP)	CR	CPP-F (SPP)	TOU – 60% CPP-F – 3% CR – 37%	TOU – 72% CPP-F – 2% CR – 26%	TOU – 80% CPP-F – 2% CR – 19%	TOU – 88% CPP-F – 1% CR – 11%
CPP-V (SPP)	CR	TOU (SPP)	CPP-V – 34% TOU – 14% CR – 52%	CPP-V – 54% TOU – 10% CR – 36%	CPP-V – 67% TOU – 7% CR – 26%	CPP-V – 80% TOU – 4% CR – 16%
CPP-V (SPP – *assumes avail. only to those with CAC*)	CR	TOU (SPP)	CPP-V – 24% TOU – 30% CR – 45%	CPP-V – 37% TOU – 31% CR – 31%	CPP-V – 45% TOU – 31% CR – 23%	CPP-V – 53% TOU – 32% CR – 14%

Differences in Likely Response to TD Rates by Customer Subgroups

We were able to explore the differences in preference share for a few different customer subgroups of interest. Based on an analysis of the rates explored in this report we can conclude:

- Those currently on a TOU rate tend to be more receptive to a new TD rate, regardless of the specific details of that rate. The share of preference for the TD rates modeled tends to be larger for those on a TOU rate than for those not currently on a TOU rate, though the magnitude of this difference varies depending on the specific scenario being modeled.

- Those customers who believe they are not on a rate with a demand charge tend to more strongly prefer the TD rates modeled over their current rate. On the other hand, a higher proportion of those who believe their rate does include a demand charge prefer their current rate to any of the TD rates modeled. While the magnitude of this difference does vary depending on the specific set of products modeled, the trend is consistent. There does not appear to be any discernable patterns with regard to those who are not sure if their rate includes a demand charge or not.

- More businesses that have and directly pay for the central AC used by their business space tend to prefer TD rates to their current rate, regardless of the specific details of that rate, than those who do not have or pay for their central AC. The magnitude of this difference does vary depending on the specific set of products modeled, but the trend is consistent.

- Among building types, hospitals, buildings used for lodging, and buildings utilized for education-related purposes seem more inclined to accept TD rates in general, without regard to the specifics of the plan. Notably, hospitals stand out as the group most likely to prefer CPP-V rates that include equipment control options.

- In situations where customers are offered the option to opt-in to any of the 10 TD rates tested in this report from the current rate, SCE customers are generally more inclined than their PG&E and SDG&E counterparts to select the TD rate plan.

- Among geographical regions, Zone 1 businesses are generally the least inclined to prefer TD rates in general, particularly CPP rates, regardless of configuration.

Likely Takers of Select TD Rate Options

This section of the report profiles the likely takers for five specific rate options (see Tables 1.10 – 1.14 below for this data) that were specified to be as close as possible to several of the rates used in the SPP as well as others currently under consideration, such as the “Pure” CPP-F and “Pure” CPP-V rates.

For this analysis a “likely taker” has been identified as the top 10% of customers with the highest utility scores for a given product. Characteristics that distinguish the “likely takers” for a particular rate are provided in the following tables, and these characteristics have been identified by the computation of an index value for each characteristic.

The index values were computed for each characteristic by dividing the percent of “likely takers” (as defined above) that have a characteristic of interest (i.e. the percent of “likely

takers" that are PG&E customers) by the percent of all respondents with the characteristic (i.e. the percent of all respondents that are PG&E customers) and multiplying the result by 100. As the magnitude of difference increases (either positive or negative) between the resulting index value and 100 (which would indicate the two populations are the same), the more useful the characteristic is for identifying "likely takers." One can also look at this resulting index value, a ratio level statistic, as telling us the degree to which the likely takers are more or less prevalent in a particular subgroup of interest. Looking at the first row in Table 1.10 below we find a resulting value of 130 for PG&E. This would tell us that PG&E customers are 1.30 times more likely to exist as likely takers of the CPP-F SPP rate than they exist in the general California customer population.

While there are several unique differences that emerged between the groups of takers for each of the example rates used in this analysis, the most interesting finding here is the number of *similarities among* these groups of customers. These similarities can be grouped into the following categories:

- *Climate zone* – Takers of the TOU and CPP-F rates were somewhat more likely than the average customer to live in climate zone 2, especially if they are currently PG&E customers. Likely takers of the CPP-V, pure CPP-F or pure CPP-V rates were no more or less likely to live in climate zone 2.

- *Rate Plan* – Likely takers are, in some cases, nearly twice as likely to currently be on a TOU rate plan. The prevalence of likely takers on a TOU rate is even higher among the PG&E customer base. Likely takers of these TD rates are also more likely to indicate that they are not sure if their rate includes a demand charge.

- *Energy Use* – These TD rates tend to differentially attract PG&E customers with low electricity usage (between 0-20kWh). The CPP-F and TOU rates also attract more low usage customers in climate zone 2.

- *Ownership and Occupancy* – Most likely takers have a slightly higher tendency to occupy only a portion of the building their business resides in.

- *Hours of operation* - Likely takers are also more inclined to operate more than 40 hours per week.

- *Electricity Management* –Likely takers of the CPP-F, TOU, and Pure CPP-F are also more apt to be using an energy management system than non-takers.

- *Conservation Behavior* – Most of the likely takers of these rates were more likely to have demonstrated a willingness to change / curb their electricity use when needed.

- *Building Age and Locations* – Likely takers of the Pure CPP-V and Pure CPP-F tend to occupy buildings that are between 10 and 30 years old. These businesses are also more prone to have 1-2 additional locations in California.

These similarities, as well as some unique differences between these groups of takers, can be found in the following five tables (Tables 6.6 – 6.10).

Table 1.10 – Most Likely Takers of the CPP-F Pilot Rate

	Indexed Values
Utility	
PG&E[7]	130
Climate Zone by Usage	
Zone 2, Low Usage	123
Climate Zone by Utility	
Zone 2, PG&E	165
Rate Plan by Utility	
PG&E, TOU Rate	252
PG&E, non-TOU rate, Don't know if it includes demand charge	150
Energy Usage by Utility	
Low Usage (0-20 kWh), PG&E	133
Interest in Fixed Price Premium Rate	
Low Interest	124
Own/Rent Status	
Rent	135
Building Occupancy – All, Partial, or None	
Occupy a portion of the building	123
Building Square Footage	
2,000 – 5,000 square feet	128
Type of Business Activity	
Retail Sales Floor	163
Use of Energy Management System	
Yes	147
Presence of "other" Major Electrical Equipment	
Yes (refrigeration, cooking, industrial equipment, etc.)	124
Electricity as % of Total Operating Costs	
10 – < 20%	194
Actions Taken in 2001 Crisis	
1 – 3	152
Actions Taken Since 2001 Crisis	
Less than during crisis, more than none	143

[7] Note that for Climate Zone and for the other attributes, the only categories that have been listed here are the ones for which the index value is significantly higher than 100 (meaning that the category is significantly more likely than average to appear among likely takers of the specified rate). If a category is not listed, that means that the category is "average" in its representation among likely takers.

Table 1.11 – Most Likely Takers of the TOU Pilot Rate

	Indexed Values
Climate Zone	
Zone 2	133
Rate Plan	
TOU	212
Non-TOU, don't know if have a demand charge	128
Climate Zone by Usage	
Zone 2, Low Usage	142
Climate Zone by Utility	
Zone 2, PG&E	196
Rate Plan by Utility	
PG&E, TOU Rate	307
PG&E, Non-TOU Rate, Don't know if have a demand charge	180
Interest in Equipment Controls	
Low interest	138
Type of Building	
Part of larger building, complex, or mall	123
Building Square Footage	
2,000 – 5,000 square feet	163
Use of Energy Management System	
Yes	163
Age of Structure	
10 -< 30 years	126

Table 1.12 – Most Likely Takers of the CPP-V Pilot Rate

	Indexed Values
Rate Plan	
TOU	182
Rate Plan by Utility	
PG&E, Non-TOU Rate, don't know if includes a demand charge	155
Energy Usage by Utility	
Low Usage (0-20 kWh), PG&E	121
Interest in Equipment Controls	
Moderate interest	167
Building Occupancy – All, Partial, or None	
Occupy entire building	121
Type of Business Activity	
Meeting Rooms	503
Weekly Hours of Operation	
60 hours or more	125
If Business has and pays for (A/C, Heat, etc.)	
Air Conditioning	123
Heat	121
Electricity as % of Total Operating Costs	
20% or more	212
Actions Taken in 2001	
1-3	138

Actions Taken Since 2001	
Less than during crisis, more than none	137

Table 1.13 – Most Likely Takers of the Pure CPP-V Rate

	Indexed Values
Rate Plan	
Non-TOU, rate includes a demand charge	121
Non-TOU / Don't Know if they have a demand charge	128
Rate Plan by Utility	
PG&E, TOU Rate	140
PG&E, don't know if rate includes a demand charge	180
Energy Usage by Utility	
Low Usage (0-20kWh), PG&E	133
Interest in Equipment Controls	
Moderate Interest	178
High Interest	193
Type of Building	
Part of larger building, complex, or mall	129
Building Occupancy – All, Partial, or None	
Occupy a portion of the building	127
If business has and pays for (A/C, heat, etc.)	
Heat	128
Type of Business Activity	
Office Work	152
Weekly Hours of Operation	
40-59 hours	131
Actions Taken in 2001 Crisis	
1-3	123
Age of Structure	
10 -< 30 years	126
Other California Locations	
1-2 Additional Locations	157

Table 1.14 – Most Likely Takers of the Pure CPP-F Rate

	Indexed Values
Rate Plan	
Non-TOU, rate includes a demand charge	126
Rate Plan by Utility	
SCE, rate includes a demand charge	150
Use of Energy Management System	
Yes	143
Presence of "other" Major Electrical Equipment	
Yes (refrigeration, cooking, industrial equipment, etc.)	138
Actions Taken in 2001 Crisis	
1-3	135
Actions Taken Since 2001 Crisis	
Less than during crisis, more than none	147

Age of Structure	
10 -< 30 years	125
Other California Locations	
1-2 additional locations	214

The team also reviewed the likely takers of the various rate plans, under a "best savings" scenario which offered the highest potential savings for the SPP rates analyzed above. The likely takers of the "best savings" rate plans exhibited some common characteristics:

- High energy usage for likely takers of all CPP - best savings rates
- Current rate plan tends either to be a TOU rate plan or a non-TOU rate plan that includes a demand charge
- Likely to have higher electricity costs as % of total operating costs (greater than 10% of total operating costs)
- Likely to have modified their energy use when needed in the past

Lastly, the team profiled the group of customers identified as non-takers. That is, for every option presented, they chose not to participate in the rate plan options presented. As Table 1.15 indicates below, there were few characteristics included in the survey that could be used to define this group. The group seems to have low interest ratings in equipment controls, TD rates, and fixed premium rates, does not have a history of changing their energy usage, and also tends to have demand charges as part of their bill.

Table 1.15 – Rate Option Non-Takers

	Indexed Values
Climate Zone	
Zone 3	132
Rate Plan	
Non-TOU rate, includes a demand charge	130
Climate Zone by Usage	
Zone 3, Low Usage	141
Rate Plan by Utility	
SCE, Rate includes a demand charge	156
Interest in Equipment Controls	
Low interest	149
Interest in TD Rates	
Low interest	144
Interest in Fixed Premium Price Rate	
Low interest	137
Changed Behavior in 2001 Energy Crisis	
No	155

Summary of Findings – Understanding Likely Response to Equipment Control System Options

As with our analysis of the TD rates, the data used to answer these questions are generated from the analysis of the discrete choice tasks.

Survey respondents[8] were asked to react to a series of choice tasks that contained various combinations of the equipment control system building blocks. Through statistical analysis, we are able to translate the preferences they express into a set of "utilities". Again, "utility" is the statistical term for what, in plain language, we would describe as the mathematical representation of the value respondents place on each of the levels or options within a building block.

These "utilities" or measures of attractiveness or importance have no absolute interpretation in the "real world" but represent an estimate of the relative value of each of the different levels of the building blocks.

To begin, let's take a look at the utilities for the extensiveness of the system in Table 1.16. In this table are the average utility values across all respondents in the survey. The utility for basic controls is 1.37, for moderate it is .11 and -1.48 for extensive controls. Note that the utility value for a basic control system option is both positive and the largest value in the table. This tells us that customers value basic control systems the most, followed by moderate control systems. Extensive control systems have a large negative value indicating that they are valued the least.

Table 1.16 – Utility Values for Extensiveness of Equipment Control System

Extensiveness of Control	Utility
Basic	1.37
Moderate	0.11
Extensive	-1.48

Then, we can explore response to the monthly cost building block. In Table 1.17 the utility values across monthly costs for basic, moderate and extensive equipment control systems are compared.

- Customers are most sensitive to increases in monthly price from the entry level or base price regardless of the type of equipment control system. Unsurprisingly, when looking at the utility values for each type of control, we see that the smallest monthly cost has the largest value to customers. Furthermore, the drop in the utility when going from the lowest priced system to the next lowest priced system (regardless of whether this is a basic, moderate, or extensive system) is larger than any other drop in value.

- Customers are the most sensitive to changes in price for the extensive equipment control system than for any other system. In reviewing the utilities for the extensive control system we see that this system has larger drops in utility values for each respective increase in monthly cost than for either the basic or moderate control system.

[8] Please note that only those customers that indicated they pay for the air conditioning used at their business premise directly (Q12), or paid for at least a portion of this air conditioning expense directly (in the case of building managers / owners – Q35) were asked these questions.

Thus, customers are more sensitive to price increases for the extensive system than for either the basic or moderate systems, quite possibly because some the price points for the extensive system are larger than for either of the two other systems (with price points going up to $40 and $50).

Table 1.17 – Utility Values for Monthly Cost of the System

	Monthly Cost	Utility
Monthly Cost for **Basic** Equipment Control System	$5	.68
	$10	.09
	$15	-.26
	$20	-.51
Monthly Cost for **Moderate** Equipment Control System	$15	.57
	$20	.13
	$25	-.21
	$30	-.49
Monthly Cost for **Extensive** Equipment Control System	$20	.79
	$30	.15
	$40	-.30
	$50	-.65

Table 1.18 reports the utilities associated with monthly summer bill savings. The reader will note that, similar to the evaluation of savings potential for the various TD rates, the choices evaluated in the survey by customers were not percentages. Rather, respondents were shown absolute dollar value bill impacts that were calculated based on their monthly utility bills in order to simplify the presentation for respondents. This allows us to evaluate the degree to which the value respondents attached to these savings levels were driven by both the percentage value of the savings and by the size of their electric bill. Table 1.18 lists the utilities for both the percentage savings impact as well as the dollar-metric impact associated with the absolute size of their bill.

Table 1.18 – Utility Values for Monthly Bill Savings

	Monthly Savings	Utility
Monthly Summer Bill Savings (Total Impact)	5%	-.82
	10%	-.02
	15%	.83
Monthly Summer Bill Savings (Dollar-metric Impact)	5%	-.02
	10%	.00
	15%	.02
Monthly Summer Bill Savings (Percentage Impact)	5%	-.79
	10%	-.02
	15%	.81

From Table 1.18 we find that:

- Most of the value associated with monthly summer bill savings comes from the percentage statement of the savings (5%, 10%, 15%) though a very small additional

value is attached to higher savings values by those businesses with higher bills (that is, those with higher bills like higher savings levels.)

The value that customers attach to the various options for system programming and activation are reported in Table 1.19. From this table we find that:

- Customers more highly value options that give them the most control. Within this feature we find that customers prefer the option to program themselves, followed by the utility handling the programming, but allowing the customer to override the settings.

- A system that gives customers the least amount of control by having the utility program it and not allowing for the customer to override any programmed settings is the least valued. In fact, when looking at the absolute value of the utility for this option (2.95) we see that it is larger than the absolute value of the utility for the most preferred option "customer programs" (1.34). This would indicate that customers' dislike for this option is stronger than their preference for the most preferred option.

- The range from the largest positive utility value (1.34) to the largest negative value (-2.95) is larger than for any of the other equipment control building blocks which gives us some indication of the importance or contribution of this building block to customers' preference for a equipment control system option.

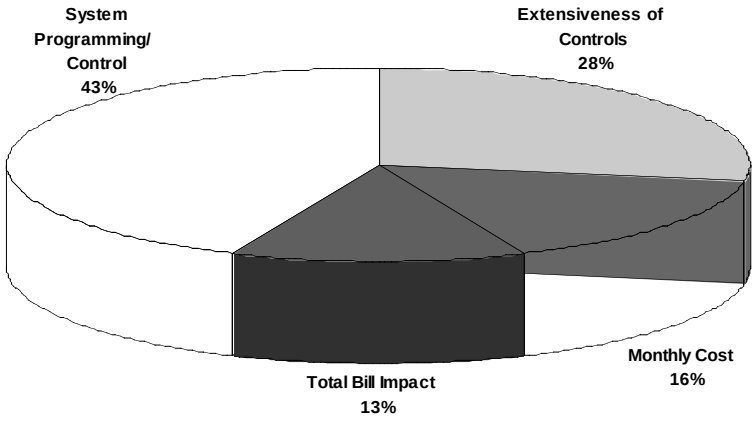
Table 1.19 – Utility Values for System Programming & Activation

System Programming & Activation	Utility
Customer programs	1.34
Utility programs to customers' specs	0.50
Utility programs, but customer can override	1.12
Utility programs but customer cannot override	-2.95

Chart 1.3 presents a summary of the relative importance of each of the equipment control system features tested. The percentages for each component in the chart represent the relative contribution of each towards a customer's stated preference for a given option. The chart indicates that 43% of customer preference for a given option is driven by the features chosen in the system programming and control component. Approximately 28% of customer preference is driven by the extensiveness of the controls. A relatively small percentage of customer preference is driven by monthly cost of the system (16%) and total bill impact they could expect to see when using this system (13%).

Thus, to change the way an equipment control system is constructed by changing the percentage of savings realized by the customer will have a much smaller effect on customer preference for the option than a change in how the system is programmed and controlled, how extensive the controls are, or the monthly cost of the controls.

Chart 1.3 – Relative Importance of Equipment Control System Features



Given the greater importance attached to features with a financial impact when constructing TD pricing programs, it may seem surprising to find that potential savings and monthly cost are least important overall for the design of equipment control systems. However, respondents are not being inconsistent, seemingly suddenly unconcerned with financial outcomes. There will certainly be some customers who will be more motivated by features with a financial impact – primarily a desire to produce some savings on their electricity bill through the use of the least expensive system available. However, for many more customers, the other two components, dealing with issues of customer control and potentially complex equipment control systems, are simply so much more important than the potential for monthly savings or a relatively small monthly cost.

For the purposes of this report, we explored fourteen different options for discussion on the basis that they represent a reasonable range (from basic to extensive) of products that the utilities may consider offering. The products included here in this report are intended only as examples of the types of results that can be calculated for each product. There are numerous other options that could be constructed from the features and levels tested in this research (in fact, there are 2,304 different products that could be constructed from the features explicitly tested in this design, and even more if we interpolate beyond the explicit savings values, etc. tested in the design). The reader may wish to build their own products using the market simulator that accompanies this report.

To account for different levels of awareness of the systems once introduced, customer share of preference estimates are provided that have been adjusted for different assumptions regarding awareness. More specifically, estimates have been calculated for “high”

awareness (70%), “moderate awarness” (50%) and “low” awareness (30%). Note, however, that unlike the TD rate response analysis, share of preference for the equipment control systems has not been adjusted for customer intertia or risk aversion. These adjustments were not made for this product category based on the fact that customers typically have more experience with purchasing these types of products and are better able to estimate their actual likely response to new options in this category.

Please note: Only those businesses that use and pay direct for central AC at their business premise evaluated the different equipment control system options. Thus, the shares reported below are for this subset of the population and do not represent expected shares for the customer population as a whole. Approximately two-thirds of the business premises surveyed use and pay directly for central AC.

Table 1.20 – Base Equipment Control System Options for Market Share Analysis

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
How Extensive Controls are (Basic, Moderate, Extensive)	"Best" Basic	Basic	Basic	Basic	Basic ("worst" controls best other)	"Best" Mod.	Mod.	Mod.	Mod. ("worst" controls best other)	"Best" Ext.	Ext.	Ext.	Ext.	Ext. ("worst" controls" best other)
Monthly Cost 6($5.00 to$50.00)	$5	$10	$10	$10	$5	$15	$15	$15	$15	$20	$30	$30	$20	$20
Bill impact (5% to 15%)	15%	10%	10%	5%	15%	15%	5%	10%	15%	15%	10%	10%	15%	15%
System Prog./Control (Customer Programs; Utility Programs to Customer Specs; Utility Programs – Customer can / can't override	Cust. Prog.	Cust. Prog.	Utility Prog./ Cust. override	Cust. Prog	Utility Prog./ No override	Cust. Prog.	Cust. Prog.	Utility Prog./ Cust. override	Utility Prog/ No override	Cust. Prog.	Cust. Prog.	Utility Prog./ Cust. override	Utility Prog./ Cust. override	Utility Prog. No override

Table 1.21 – Summary of Simple Share of Preference: All Options vs. No Control

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
How Extensive Controls are (Basic, Moderate, Extensive)	"Best" Basic	Basic	Basic	Basic	Basic ("worst" controls best other)	"Best" Mod.	Mod.	Mod.	Mod. ("worst" controls best other)	"Best" Ext.	Ext.	Ext.	Ext.	Ext. ("worst" controls" best other)
Monthly Cost 6($5.00 to$50.00)	$5	$10	$10	$10	$5	$15	$15	$15	$15	$20	$30	$30	$20	$20
Bill impact (5% to 15%)	15%	10%	10%	5%	15%	15%	5%	10%	15%	15%	10%	10%	15%	15%
System Prog./Control (Customer Programs; Utility Programs to Customer Specs; Utility Programs – Customer can / can't override	Cust. Prog.	Cust. Prog.	Utility Prog./ Cust. override	Cust. Prog	Utility Prog./ No override	Cust. Prog.	Cust. Prog.	Utility Prog./ Cust. override	Utility Prog/ No override	Cust. Prog.	Cust. Prog.	Utility Prog./ Cust. override	Utility Prog./ Cust. override	Utility Prog. No override
Share of Preference (Total Population) (Against the alternative of no appliance controls)	65%	58%	55%	52%	33%	56%	46%	44%	28%	46%	37%	36%	42%	20%
Share of Preference Adjusted for Awareness (Total Population) (Against the alternative of no appliance controls)														
70%	46%	41%	39%	37%	23%	39%	32%	31%	19%	32%	26%	25%	30%	14%
50%	33%	29%	28%	26%	17%	28%	23%	22%	14%	23%	18%	18%	21%	10%
30%	20%	17%	16%	16%	10%	17%	14%	13%	8%	14%	11%	11%	13%	6%

The results generated from the simulations investigated here lead us to several conclusions.

- The system features with the biggest impact on share are the type of control system offered (basic, moderate, extensive) and the type of programming and activation offered. The biggest changes in share of preference can be seen when manipulating these two features.

- Thus, as would be expected, the systems garnering the most share are basic equipment control systems that allow for the most customer control (programmed by the customer or by the utility with override).

- The monthly fee and potential savings features have much less of an impact on customer preference for a particular system and even the most favorable price and savings potential is not able to counteract negative reaction to a system that provides for the utility to program and activate without customer override.
    - Given customers' relative insensitivity to changes in price and potential savings, the utility's may wish to consider offering a system at a price higher than the lowest price tested and / or offering less monthly savings than the maximum tested (15%).

- Assuming more realistic awareness levels of 30-50%, however, we would expect nearly a third of the customers using and responsible for the payment of their AC to adopt one of the five most positively received basic and moderate equipment control systems (options 1-4 and 6).

Differences in Response to Equipment Control System Options by Subgroups

We were able to explore the differences in preference share by a few different customer subgroups of interest. Based on the analysis of the systems evaluated in this report we can conclude:

- Those currently on a TOU rate tend to be more receptive to equipment control options overall. The magnitude of difference does vary depending on the specific set of products modeled, however. The product options that offer customer programming control and higher savings reveal on average a share of preference of 20-24% higher for those on a TD rate. This difference is less dramatic for extensive controls systems with share of preference for those currently on a TOU rate plan being 10% higher than those not on such a rate, overall.

- While the magnitude of difference does vary depending on the specific set of products modeled, overall, those customers in hospitals, food sales, office, and food services buildings appear to be more receptive to equipment control options, with hospitals generally being the most receptive to such options.
    - For hospitals the share of preference is 20-30% higher on average than the total for the products modeled here, except when the product is utility programmed with no customer override.

- Those companies with high electricity usage (20-200kW[9]) tend to be more receptive to equipment control options generally when compared to those who have low electricity use (0-20kW).

[9] 20-100kW for SDG&E

- Those in climate zone 3 tend to be less receptive overall to all of the basic equipment control system options. Those in zone 4 tend to be less receptive to options which specify for utility programming with no customer override.

- There are no notable differences in preferences for equipment control system options by utility.

Likely Takers – Basic Equipment Control System Options

There were some fairly interesting and consistent patterns identified in terms of the similarities among the likely takers for the three most plausible basic equipment control system options tested in this report.

In fact, the likely takers for option 2 ($10, 10% savings, utility programs and activates w/customer override) were nearly identical to the takers for option 3 ($10, 10% savings, customer programs the system). Thus, all other things being equal in options 2 and 3, a system that allowed the customer to program and activate it and one that allowed the utility to program and activate it with a customer override would attract essentially the same types of customers.

Option 4 was similar to option 3 except that a smaller savings potential was offered (5% instead of 10%). Changing this one feature resulted in a set of likely takers that appeared to be a subset of the takers for options 2 and 3.

The profiles for two of these three these products have been provided in Tables 1.22 – 1.23 for illustration purposes.

Overall, the key similarities among those interested in a basic equipment control system like options 2 and 3 included the following (Table 1.22):

- This system appears to differentially attract more customers from PG&E generally, and in particular those in climate zone 2, and those customers that are not currently on a TOU rate.

- These equipment controls systems tend to capture the interest of those who would otherwise have little interest in such systems generally and who tend to have little interest in TD rates.

- Businesses most interested in these equipment control systems are more likely to have their business occupy only a portion of the existing building, and this building is most often part of a larger office building or complex. The building occupied among likely takers tends to be less than 10 years old.

- These systems appear to differentially attract buildings classified as manufacturing, offices, and public assembly.

- These options seem to attract businesses that do not have a history of making modifications to their energy use behavior.

Table 1.22 – Most Likely Takers – Option 2
(Basic, $10, 10% Bill Impact, Utility programs/activates with customer override, 28% Share of Preference at 50% awareness)

	Indexed Values[10]
Utility	
PG&E	124
SCE	69
Utility by Climate Zone	
PG&E, Zone 2	145
Utility by Rate	
PG&E, non-TOU Rate	128
SCE, non-TOU Rate	67
Utility by Energy Usage	
SCE, Low usage	47
Overall Interest in Equipment Control Systems	
Low Interest	116
Overall Interest in TD Rates	
Low Interest	130
Type of Building	
Part of a larger building / office complex / mall	122
Building Occupancy	
Occupy entire building	80
Building square footage	
2,000 or less	44
2,000 – 5,000	181
Age of Building Structure	
<10 years	185
Building Type – Self Identified	
Retail	23
Manufacturing	162
Building Type – Utility Identified	
Office	145
Public Assembly	246
Retail	27
Action Taken During 2001 Crisis	
Yes	80
Number of Actions Taken During 2001 Crisis	
None	159
Actions Taken Since 2001	
None	154

The likely takers of a basic equipment control system that offers nearly the same features but only a 5% savings potential have the following characteristics:

- This system appears to differentially attract more customers from PG&E, climate zone 2.
- It also tends to capture the interest of those who would otherwise have little interest in such systems generally.
- Likely takers are also more likely to have their business occupy only a portion of the building they occupy and they more frequently occupy a space between 2,000-5,000 square feet.

[10] These index values are created by dividing the percentage of likely takers in the category of interest by the percentage of population that falls into the category interest and multiplying this value by 100. This produces a ratio level statistic. Figures over or under 100 indicate that the % likely takers in the category of interest appears more frequently / less frequently that in the population for that category. Taking the first line of the table as an example, PG&E are 1.24 times more likely to be likely takers of option 2 than appear in the population at large.

- This system also differentially attracts buildings classified as manufacturing and office buildings.

- These options seem to attract businesses who do not have a history of making modifications to their energy use behavior but that are currently using an energy management system.

Table 1.23 – Most Likely Takers – Option 4
(Basic, $10, 5% Bill Impact, Utility programs/activates with customer override, 26% Share of Preference at 50% awareness)

	Indexed Values
Utility by Climate Zone	
PG&E, Zone 2	173
Overall Interest in Equipment Control Systems	
Low Interest	121
Building Occupancy	
Occupy a portion of the building	133
Building square footage	
2,000 or less	70
2,000 – 5,000	166
Building Type – Self Identified	
Retail	28
Manufacturing	151
Building Type – Utility Identified	
Office	158
Retail	39
Action Taken During 2001 Crisis	
Yes	81
Number of Actions Taken During 2001 Crisis	
None	152
Actions Taken Since 2001	
None	152
Use an Energy Management System	
Yes	142

General Summary / Conclusions

The research and analysis conducted as part of this project suggests the following general findings and conclusions with regard to the way that small business customers in California would likely react to time-differentiated electricity pricing options and equipment control systems:

- Price has the most dramatic effect on the proportion of customers likely to select a new TD rate offering. In cases where a rate plan is constructed with relatively unfavorable price savings potential, however, including very favorable non-price features could help to gain some share, though results will not be dramatic.

- Though not discussed at length in this report, billing type (flat vs. a time-differentiated rate) is one of the most important rate features driving share. Though no simulations were conducted for this report to look at the flat rate bill option specifically, the utilities produced by the discrete choice analysis suggest that this billing type is preferred over TD rate billing and is an important rate feature in terms of driving share.

- Given the limited number of scenarios tested in this analysis, regardless of whether customers are given the option to opt-in to one or two TD rates from their current rate, we could expect roughly 1/4 of customers to do so, regardless of the specific rates offered and assuming 70% awareness of these options. The percentage opting-in to a TD rate would, of course, necessarily decrease as awareness decreases and increase as awareness increases.

- When customers are placed on a TD rate as their default rate, we can expect roughly 2/3-3/4 of customers to remain on that TD rate, regardless of whether they are given a second TD rate option to opt-in to or not on the assumption that 70% are aware of their options, with the TOU SPP rate garnering the greatest share.

- Based on the limited number of rates tested here, under both opt-in and opt-out conditions, the specifics of whether the TD rate(s) offered are TOU rates or CPP-F rates do not have a dramatic effect on customer response; customer response is similar, in other words, regardless of the specific structure of the rate option (within the range of plausible alternatives). There is a greater difference in response when offering a CPP-V rate (with share decreasing), particularly when only made available to those customers that use and pay directly for central AC.

- Analysis suggests that there is a consistent trend of differences in response to TD rates depending on the customer's current rate type and AC use and ownership and, to a much lesser extent, building type, utility and geographic region. Those currently on TOU rates, those on rates without a demand charge, and those that use and are responsible for their premise's central AC; and hospitals, lodging and educational buildings tend to prefer the TD rates modeled here more than other customers. SCE customers seem to show a slight preference for TD rates over PG&E and SDG&E customers. Customers in climate zone 3 are generally less inclined to prefer TD rates.
    - Other differences will also certainly exist when examining a particular rate option, but these trends consistently appear across a variety of different options and

market scenarios.

- Equipment control system packages also have the potential to win a fair number of qualified businesses (with 37-46% of customers selecting such options) if the packages offered focus on basic and or possibly moderate controls options and if they offer a certain degree of customer control over their use and activation through a customer programmed system, or a utility programmed system with override.

- Analysis suggests that there is also a consistent trend of differences in response to equipment control options with the following generally expressing greater interest in such systems: those currently on TOU rates; high electricity-use businesses; and premises that are hospitals, food sales, food service, or office buildings.

Notes on the Use of the Rate Simulator

Accompanying this report is a simulator which will allow the user to simulate up to three different alternative rate options and the current rate (represented by "none" in the simulator). The simulators labeled as Versions 1.3 and 1.4 are the final versions and were used to calculate the share of preference estimates described here. Version 1.3 will allow the user to estimate share for customers in all of California, while version 1.4 will allow the user to look at the results separately for the three California IOUs. When opening the simulator, which has been created in Excel, the user will have to click the button for "enable macros" for the simulator to run properly.

On the simulator sheet there are three columns for specifying the three alternative rate options, labeled alternative A, B, and C. Alternative A is automatically included in each simulation. Alternatives B and C will only be included if the box below each of the two columns, which reads "include in simulation" is checked.

To specify the rate options for simulation, type in the appropriate percentage for each of the three bill impacts. The valid range for each of the three bill impacts (maximum, some and no adjustments) can be seen in the upper left hand corner of the screen. Any percentage in the valid ranges can be simulated. If invalid percentages are entered for the bill impacts, the product will be ignored in the simulations. Please also note that a valid simulation requires the percentage bill impact to be higher for maximum adjustments than some or no adjustments, and higher for some adjustments than no adjustments. If this rule is violated, the simulator will not return a result for that product.

For the remaining rate features, the levels for simulation are chosen from a drop down menu. Please note that for the "notice of critical days provided" feature there is no option for "N/A" which would be appropriate for a TOU rate. The simulator will automatically flag the critical day-dependent features, setting them to "N/A" if the number of critical days is equal to zero. Also, though the simulator allows the user to enter 0 critical days and "only on critical days" for when on-peak periods occur, the simulator will not return a result for that product and will present an error message that reads "Critical days must be greater than 0."

Before hitting the "run simulation" button at the top right of the screen, please note that there are options at the top middle of the screen for running uncalibrated shares, shares calibrated for stickiness only, and shares calibrated for stickiness and risk, which are selected from a drop down menu. The user may wish to look at all three to see the affect of each. Also, right below this is a drop down labeled "default." This option will allow the

simulation to be run specifying "none" (or the current rate) or any of the three alternative rate options as the starting condition. How the inertia calibration is applied will depend on the rate specified as the default.

Below this is the selection for whether or not to adjust for AC ownership. Using this adjustment the preference shares can be calculated for a CPP-V rate that is only made available to those that use and directly pay for the central AC at their business premise.

The final level of adjustment that can be applied is level of awareness. The user can select 100%, 70%, 50% or 30%.

PLEASE NOTE: Given the complex nature of the simulator, we were unable to have the AC Ownership adjustment and the awareness adjustment be correctly applied when the default product is a CPP-V rate. The user should not rely on the figures reported here in these cases.

Once the "run simulation" button is hit, the program will automatically take the user to the results page. The top of the screen lists each of the rates simulated and the share of preference for each rate and for none (or the current rate). On the bottom portion of the screen, the simulator shows the share of preference for each alternative rate and none broken out by several different subgroups.

The user can then click on the "simulator" tab at the bottom of the screen to specify a new simulation.

Notes on the Use of the Equipment Control System Simulator

Accompanying this report is a simulator which will allow the user to simulate up to three different alternative equipment control systems. The final version of the simulator (labeled as Version 1.1) was the one used to calculate the share of preference estimates described here. Version 1.2 is also available for the user who wishes to look at results by the three utilities separately.

The simulator is quite similar in form to the one created to explore the various pricing rate designs. There are three columns for specifying up to three different alternative systems, labeled alternative A, B, and C. Alternative A is automatically included in each simulation. Alternatives B and C will only be included if the box below each of the two columns, which reads "include in simulation" is checked.

The type of control option (basic, moderate, or extensive) is chosen from a drop down menu. To specify the monthly cost and bill impact, type in any number within the valid range stipulated in the upper left hand corner of the "simulator" sheet. If invalid numbers are entered in for monthly cost or bill impact, the product will be ignored in the simulations, returning a 0% share of preference. Please be sure to enter both the $ and % signs as appropriate. The type of activation and control for the system can be chosen from a drop down menu. At the top of the simulator, the user can also specify the awareness assumption – 100%, 75%, 50%, or 30%.

Unlike the rate design simulator, the equipment control system simulator will not include options to calibrate for risk or inertia or AC ownership (all respondents completing this

exercise used and paid directly for their AC use). Once the "run simulation" button is hit, the program will automatically take the user to the results page. The top of the screen lists each of the options simulated and the share of preference for each and for none, or the percentage of customers that would not purchase. On the bottom portion of the screen, the simulator shows the share of preference for each alternative and none broken out by seven different subgroups. Bases sizes for some subgroups may be smaller than desirable and in these cases notes to this effect can be found at the bottom of the simulator. The user can then click on the "simulator" tab at the bottom of the screen to specify a new simulation.

Background & Objectives

For a variety of well-recognized reasons, there is significant interest in better understanding how California business and residential customers might respond to time-differentiated electricity prices. Many economists have argued that a more rational electricity market could be constructed if customers were faced with electricity prices that better reflected the time-varying cost of generating electricity as this varies across seasons, days and hourly periods. With this information in hand, customers would potentially make decisions about when and how much electricity to use that might defer the cost of generating and purchasing electricity at peak times of the year when generating costs are at their highest.

As part of the effort to explore the potential for such a change in electricity pricing structures for investor-owned utilities in California, a Statewide Pricing Pilot (pilot) was developed and implemented. The primary purpose of the pilot has been to measure price elasticities of demand in order to understand how business customers placed on time-varying electricity rates -- such as a time-of-use (TOU) rate or a critical peak pricing (CPP) rate – change the way they use energy.

As a companion to the pilot assessment of changes in energy use, this research effort – known as the Customer Preferences Market Research (CPMR) study – was conducted with business customers of the three investor owned utilities in California. The residential version of this research has already been completed, with the report finalized for distribution in June 2004. In both cases, the focus of the CPMR was on understanding the preferences that customers have for the various specific features that might be combined to create new time-differentiated electricity pricing options and how those preferences might translate into the number or share of customers selecting different pricing options that might be made available to them.

In summary the SPP experiment was designed to provide estimates of the way that customers change their use of electricity when placed on a time-varying rate, while the CPMR research was designed to estimate how customers might respond if offered the opportunity to sign up for one or another time-varying rate.

More specifically, the CPMR research was designed to answer the following questions:

- If one or more time-differentiated electricity options are offered in the marketplace, how many business premises might reasonably be expected to adopt each of those options?
  - How will adoption rates differ depending on how the specific options are constructed?
  - How will adoption rates differ depending on how the portfolio of options made available to customers is constructed?
  - How will adoption rates differ depending on the starting condition to which business customers are assigned (opt-in or opt-out)?
  - Which business customers are more likely to acquire which options?

- If, in order to facilitate the ability to respond to time-varying prices, equipment controls systems are offered in the marketplace, how many business premises might be expected to adopt these systems?
  - How does this differ depending on the cost and functionality of the control system offered?
  - Which customers are more likely to acquire which options?

Of course, in developing these responses it is important to recognize that this research is constrained by the fact that ultimately it is customer research and not a real market environment. As a result, the responses customers offer to the research questions may not map exactly to the responses they would exhibit in a “real” environment.

A “real” environment in which time-differentiated rates might be offered to customers might involve different rates than those tested here, would certainly involve a different set of educational activities, and would require that customers be prepared to actually deal with the consequences of their expressed preferences. All of this means that the preferences that customers express in any research setting will not map exactly to the preferences they are likely to express in the “real world.” Having said that, however, the goal of research is to design a research environment that allows us to estimate as best as possible the choices that customers will actually make when they have the opportunity to do so, recognizing that no such research environment exactly maps to real world choices.

Methodology

This section of the report describes both the field methodology used to collect the data for this research effort and key elements of the approach used to analyze that data. More specifically, the discussion covers the following issues:

- Data collection methodology
- Questionnaire development and administration
- Sample management and data weighting
- Use of discrete choice analysis to evaluate alternative rate designs
- Use of discrete choice analysis to evaluate alternative equipment controls designs
- Translating percentage bill savings into absolute bill savings values in the discrete choice exercises
- Estimating preference shares
- Forecasting anticipated customer response to pricing and equipment controls options
- Statistical accuracy of the reported results

Data Collection Methodology

The data used to produce this report were collected through a survey of individuals primarily responsible for managing energy related aspects of businesses or business facilities in the service territories of one of three participating utilities (SCE, PG&E, and SDG&E). In order to qualify for the survey individuals had to meet the following criteria:

- Been working for the business / managing the business facility for more than 6 months
- Business / business facility with demand of 20-200kW (20-100kW for SDG&E)
- Not participating in, and had not been solicited to participate in, the Statewide Pricing Pilot
- Not an employee of a utility, a market research, advertising, or public relations firm, or from a business in the agriculture, forestry, farming, livestock, fishing or hunting industries
- Able to complete the survey in English, online, through an internet connect from work, home, school, etc.

Potential respondents were solicited for participation by phone through a random sample of the three utilities' business customers with 20-200kW demand (20-100kW in SDG&E's territory). Once a potential respondent passed through the appropriate screening over the phone, they were invited to complete the online survey at their convenience. Though individuals appeared in the sample frame provided multiple times because of cases in which different locations of the same business / facility used the same energy management decision maker, each person was only allowed to complete the survey once. However, different locations of the same business were allowed in the sample if they were managed by different decsionmakers.

Please note that the survey was made available only in English. In the residential CPMR it was found that, though the survey in all forms was made available in Spanish, only a handful (fewer than 10) were completed in Spanish. Thus, the decision was made that the cost of implementing the survey in Spanish outweighed the potential benefit of offering the survey in Spanish. Furthermore, in the C&I CPMR it was found that only 4% or 97 of 2,429 eligible respondents were unable to complete the survey in English.

The online survey took approximately 30-60 minutes for each person to complete. To encourage participation for a typically difficult population to survey, a variety of different incentive strategies were employed in an effort to find one that would both increase the response rate and shorten the time required to complete fielding. When fielding began May 4, 2004, each person was offered $25 for completing the survey. May 12, when response to the survey was not at the level expected, the incentive structure was modified to $20 for each respondent completing the survey and entry into a single drawing for five prizes of $500 each for those completing within 48 hours of being invited to do so. Approximately two weeks later on June 3 the incentive structure was modified again, with each person completing the survey still being paid $20, but providing entry into daily drawings for $200 cash for those completing the survey within 24 hours of being invited to do so. This strategy appeared to work the best in terms of increasing the response rate and was used until July 6. On July 5 the daily prize drawing was lowered to $100 and this strategy was employed until fielding ended July 14, 2004.

Ultimately, 1002 valid, completed[11] surveys were received. Data were collected from May 4 – July 14, 2004.

Unlike the residential Customer Preferences Market Research (CPMR), those without internet access were not given the option to complete the survey using a phone-mail-phone methodology, in which the discrete choice portions would have been filled out in a workbook mailed to their home or business, with data collected from the workbooks in a follow-up phone survey. Using strictly an online methodology to complete the core questionnaire for this research (recognizing that the screening was completed by telephone) is a potentially controversial decision, though, perhaps, less controversial than the residential CPMR research in which an online panel was also used as the sample frame. Traditionally, research with utility customers has been conducted with telephone or mail surveys. The online survey methodology is a relatively recent capability and the implications of its use are still being evaluated. However, as noted in the residential report, the team chose to use the online survey methodology for this research since, the benefits appeared to outweigh the potential biases. Before considering the potential biases associated with this methodology, however, the following lists the reasons why the team chose to use an online survey for this research effort:

- Online research is faster to implement and has lower field costs than do either telephone research or in-person interviewing. These advantages are well known, and are often the primary reason for selecting this sort of an approach.
- Online research allows for the inclusion of automated skip patterns and question customization based on prior responses that both simplify navigation of the questionnaire for the respondent and ensure that choices are relevant to the specific nature of the respondent's situation.
- Online research allows for the visual display of stimulus material and the visual display of response categories (as do printed self-administered questionnaires). There appear to be advantages in this approach over telephone-based surveys in which respondents are

[11] Please note that, due to the extended fielding period (10 weeks) and the need for preliminary results by mid-August 2004, 38 surveys were counted as completes if they completed each of the relevant conjoint exercises, but did not complete some of the last few firmographic questions and questions related to the creation of the risk and inertia indexes (discussed later in this section of the report.) It was deemed that this level of partial data could be tolerated and would still produce robust results.

required to listen to, and then retain, information about both the question and the response categories before they respond.

- Online research allows respondents to complete surveys at a time of the day that is convenient for them, rather than within the window of time typically allowed for telephone interviewing. Most telephone interviewing is conducted from 5 pm to 9 pm local time, and respondents who are not home or who are not available at this time are not included in the pool of potential respondents. Online interviewing, on the other hand, allows all respondents with internet access to complete a survey at a time of their own choosing.
- Online research also reduces data entry error. Since respondents enter their own responses directly, this means that a step in the response translation/data entry process has been removed (i.e., the role of the interviewer as response coder and data entry clerk). This does not mean that respondents cannot make mistakes, of course, though the same problem exists for telephone interviewing (that is, respondents can misreport their response, or misuse/misunderstand scales or scale end points).

While the advantages noted above are important ones, and represent the key reasons why this methodology was selected for this project, it is also true that there are downsides to online research. These include that:

- Online research excludes those customers that do not have access to the internet at home or work, or by other publicly available means. In this research, however, only a relatively small percentage of qualified respondents were unable to complete the survey because they did not have access to the internet (1% or 30 people out of 2,429 otherwise eligible).
- The bigger issue for online research is that respondents know they are being paid to complete a survey, and as a result, have compensation as their primary motivation. While compensation is often provided for telephone surveys, this is not always the case, and a “for the greater good” motive underlies at least some portion of telephone-based interviewing participation. The key concern about this difference for online research is that respondents may tend to “game” their answers in a way that gets them through the survey as quickly as possible (i.e., answering similarly across multiple questions, or answering in patterns) without reference to the validity of their responses.
- Interviewers are not present to encourage/probe respondents on open-ended questions or to encourage appropriate responses to other questions (to reduce “don’t know” responses, for example.The reality is that most people are more comfortable providing a verbal response than in writing out the same set of words in “longhand.” As a result; in writing their answers to open-ended questions, respondents are likely to use shorthand phrases, and/or take other steps to shorten and simplify their responses.

While there are benefits to using an online survey methodology to complete research efforts such as these, it is also true that the market research industry does not yet know everything there is to know about the biases (to be more specific, the unique biases, since all research methodologies embed biases) that might be introduced from such a research approach. Ultimately, the project team chose to use the online survey methodology, recognizing that it might introduce unspecifiable biases into the results, in part because those biases did not seem to be uniquely associated with the specific content of the research, and in part because the clear advantages of the methodology appeared to outweigh the potential for the introduction of biases that could neither be specified nor weighed. Furthermore, the large expense associated using a dual mode methodology in order to capture the relatively small portion of the population without internet access (1% in this case) was deemed not worth the expense given the relatively small amount of precision given up.

Questionnaire Development and Administration

It is important to recognize that while the project team made every effort to insure that the questionnaires ultimately administered were clear, concise, meaningful, and well understood by respondents, the reality is that the research design required a lengthy and complex questionnaire instrument that asked respondents to make choices among rate options that were distinguished on the basis of attributes that respondents had not seen before, and as a result, with which they were in many cases completely unfamiliar. Most respondents took between 30 minutes and an hour to complete the survey, and completing the survey "correctly" (that is, honestly) required a good deal of intellectual investment on the part of respondents.

It is reasonable to ask if all respondents made – or could make – the intellectual investment necessary to complete the survey accurately, and it is certainly reasonable to suspect that some did not or could not. In addition, it is reasonable to ask if all respondents sufficiently understood the tasks they were asked to complete, and / or if the choices they were expressing were consistent with their real preferences (or if, alternatively, they might have expressed different choices if they better understood, or were more familiar with, the options being described).

The bottom line is that it is impossible to tell the real extent to which these issues may have occurred. The project team attempted to do everything possible to design an appropriate research instrument, and to provide the appropriate education so that respondents could answer effectively. In examining the research results, it seems reasonably clear that most respondents answered consistently and in a sensible way (given the computed results of the discrete choice analysis, for example), but ultimately, it is still the case that a survey of this length and complexity leaves open the possibility that some portion of the data provided by respondents should not be viewed as providing accurate insight.

Sample Management and Data Weighting

Unlike the residential CPMR research, it was determined that this research would be best served by using customer lists provided by each of the utilities as the sample frame. These customer lists contained valuable information about each of the businesses that respondents would be unlikely to be able to self-report accurately. Thus, by using the customer lists as the sample frame we were able to append this data to the data collected for each respondent, with assurances that it would be reasonably accurate – or at least more accurate than self-reported information generally.

This information, such as demand and building type, was valuable in helping to ensure that the sample collected would be representative of the business population in the three service areas of interest as well as would provide the ability to examine survey responses within a variety of specific population subgroups. Thus, the information provided in the sample allowed the research team to manage the types of respondents qualifying to participate in the survey on an ongoing basis to ensure that each subgroup was adequately represented. This meant placing caps on the participation of some groups (i.e. office buildings) and attempting to enhance response rates among other, harder to reach subgroups (i.e. educational K-12 buildings), in some cases yielding an intentionally disproportionate sample. The sample size floor and ceiling values and the final number of completed surveys by sample management cell are reported in Table 2.1.

Unlike a telephone survey, managing quotas for a telephone recruit to a web survey can often be a challenge. Quotas are managed both at the telephone recruitment phase as well

as the web survey phase. While we know that not all telephone recruited survey respondents will go on to complete the web survey, we typically expect that the various subgroups of recruited survey participants will complete the web survey in roughly the same proportion at they were recruited. This is not always the case and has contributed to some of the variance from the desired quotas. As Table 2.1 indicates, the final sample characteristics were within the target quota ranges for utility provider and climate zone. A combination of other quota requirements and a disproportionate sampling strategy, however, made it difficult to meet the quota for high demand electricity customers, with the sample falling short by 53 cases.

Table 2.1 Sample Quota Targets and Final Sample Sizes by Quota Cell

		Quota Target Floor	Final Sample	Quota Target Ceiling
Electricity Provider	PG&E	335	361	410
	SCE	335	387	410
	SDG&E	225	254	275
Climate zone	1	110	126	140
	2	400	437	500
	3	250	318	300
	4	110	121	140
Electricity Usage	High Demand (20-200kW; 20-100kW in SDG&E)	290	237	360
	Low Demand (0-20kW)	600	765	740
Building Type[12]	Education – College, university	63	11	77
	Education – K-12	63	84	77
	Food sales	63	62	77
	Food service	63	41	77
	Hospital	63	47	77
	Lodging	63	96	77
	Office	72	108	88
	Public assembly	63	85	77
	Public order / safety	63	13	77
	Retail (excluding food sales / service)	63	82	77
	Warehouse / storage	63	116	77
	Manufacturing	63	85	77
	Other / Non-classified	135	172	165
Rate[13]	TOU Rate	40	138	60
	Non-TOU Rate	850	864	1050
Building Structure	Free standing building with occupied space	225	580	475
	Occupied space part of a larger / other building	450	410	550
	Free standing structure without occupied space	20	12	30
Own / Rent Status	Own	560	467	690
	Rent	335	535	410

The team also employed a disproportionate sampling strategy with regards to the thirteen different building types in order to conduct analysis by building type. However, a combination of low incidence of some of these building types, other competing quotas, and the survey period (summer – a particularly difficult time to reach higher education energy decision makers) made it difficult to reach all quotas here and contributed to going over

[12] Figures reported here for each building type are from the respective utility's customer records. Respondents were also asked to report their building type the results of which produced a fair bit of deviation from what is described here. Because of this, both the self-reported data and the customer information data is used in later analyses.

[13] Figures reported for rate represent what is on file with each of the utilities. The self-reported information collected from each customer was quite a bit different from what is reported here, with 98 final cases indicating they are on a TOU and 904 indicating they are not. The utility information was deemed the more correct in this case and used here as well as in all subsequent analyses.

quota for office buildings, for example, that are at a much higher overall incidence in the population. Table 2.1 also indicates we went over quota for those customers on a TOU rate that appeared to respond at a differentially higher rate than those not on a TOU rate.

The last of the subgroups tracked, building structure and own / rent status, also appear to differ from the desired quota. Please note, however, that these desired quotas were determined through guess work initially since these were not available in the utilities' customer records. Thus, completes by building structure and own / rent status were allowed to fall as they did in the population as a whole.

Because the final sample was intentionally disproportionate in character relative to the underlying population of eligible businesses / business facilities in the sample universe (i.e., it intentionally over-represented some groups and under-represented others), it was necessary to weight the final sample so that a final weighted sample population could be developed that was, demographically speaking, representative of the universe of eligible businesses / business facilities The weighted sample, in other words, is intended to both provide the opportunity to conduct analysis of specific sub-groups of adequate size for individual assessment, while at the same time providing an aggregate representation of the population of interest, and in each case, to provide a demographically balanced and representative sample of each.

It is important to note here, however, that weighting a sample so that it is demographically representative of an underlying population does not guarantee that all potential biases are removed from such a sample. Weighting can, for example, ensure that businesses / business facilities from a given climate zone exert only as much influence on a set of aggregate results as they "should" given their representation in the overall population. Weighting cannot, however, control for biases that are not linked to any of the demographic attributes that are not managed by the weighting scheme, nor can it ensure that the businesses / business facilities within a given demographic group are necessarily representative of the population of businesses / business facilities in that group. As a result, while population weighting is typically applied as a method to manage the most obvious effects of intentional over sampling, it should not be viewed as a panacea for the removal of all possible effects of sample bias.

In order to weight the total sample to the appropriate set of demographic characteristics, it was first necessary to specify the distribution of the relevant characteristics in the "true" underlying population. These figures, for the most part, were available directly from the utilities and can be found in Table 2.2 under the "count of eligible qualifying premises" and "% of Universe" columns.

However, some information for a number of customers was missing from the utilities' customer universe counts, making the basis of our weighting scheme less than perfect. From the utilities' customer universe counts, climate zone was unknown for less than 1% of the businesses premises. However, we were able to determine climate zone for all customers when this information was missing through their business' zip code. Thus, since this information was known for all survey respondents, but not for the entire population universe, we were forced to proportionately distribute the number of unclassified businesses in the universe across the other climate zones. On the assumption that there was no particular trend or systematic bias that led one climate zone to end up as unclassified over another, the 1% unclassified businesses / business facilities were distributed proportionately to the original counts of the 4 climate zones in the "count of eligible qualifying premises" column.

Additionally, approximately 31% of all the businesses listed in the utilities' sample were not classified in terms of their building type. Respondents were asked to self-report the building type for their premise and this information was then used to fill in for any customers with the building type listed as "unclassified" in the customer records. Then, on the assumption that there was no particular trend or systematic bias that led one particular type or types of buildings to end up as unclassified, the 234,024 unclassified businesses / business facilities were distributed proportionately to the original counts of the 13 building types in the "count of eligible qualifying premises" column. Thus, the need for balancing the number of "unclassifieds" obtained in our sample against the number in the utilities' customer records was no longer necessary.

The reader may wonder why respondent reported building type was not used for all respondents, rather than just those listed as "unclassified." It was determined by the team that information from the utilities' customer records for all of the subgroups listed in Table 2.2 (electricity provider, climate zone, energy usage, building type, rate) could generally be considered more accurate than self-reported information. This is not to say by any means that utility customer information is perfect, but rather, *for this type of information*, the team decided it would generally be more accurate.

Counts by type of building structure and own / rent status were not available in the utilities' customer records and since neither of these were used as a basis for disqualifying a potential respondent, they were not included in our weighting scheme.

The next two columns in Table 2.2 labeled "final sample count" and "% of sample" report the initial sample distributions for each of the managed sample characteristics. The "weighted %" column reports the results of the application of the weighting scheme which is meant to bring the sample proportions for each subgroup in line with their actual representation in the universe.

The final column in Table 2.2 indicates that the weighted sample maps well against the population target values (the estimates of the true distribution of business premises on these attributes), with the delta (or difference) between the weighted proportions and true population proportions less than 2% in every case.

Table 2.2 Sample Quota Targets and Final Sample Sizes by Quota Cell

		Count of eligible / qualifying premises (745,737)	% of Universe	Final Sample Count	% of Sample	Weighted %	Delta Weighted % vs Universe %
lectricity rovider	PG&E	337,626	45.27%	361	36.03%	45.25%	-0.02%
	SCE	289,020	38.76%	387	38.62%	40.33%	1.57%
	SDG&E	119,091	15.97%	254	25.35%	14.42%	-1.55%
limate one	1	88,871	11.92%	126	12.57%	10.15%	-1.77%
	2	355,684	47.70%	437	43.61%	49.16%	1.46%
	3	218,497	29.30%	318	31.74%	29.57%	0.27%
	4	82,685	11.09%	121	12.08%	11.13%	0.04%
lectricity sage	High Demand (20-200kW; 20-100kW in SDG&E)	75,604	10.14%	237	23.65%	9.90%	-0.24%
	Low Demand (0-20kW)	670,133	89.86%	765	76.35%	90.10%	0.24%
uilding ype	Education – College, university	1,043	0.14%	11	1.10%	0.14%	
	Education – K-12	12,053	1.62%	84	8.38%	1.63%	0.02%
	Food sales	23,747	3.18%	62	6.19%	3.16%	-0.03%
	Food service	52,696	7.07%	41	4.09%	6.91%	-0.16%
	Hospital	2,433	0.33%	47	4.69%	0.34%	
	Lodging	10,417	1.40%	96	9.58%	1.38%	-0.02%
	Office	261,054	35.01%	108	10.78%	35.11%	0.10%
	Public assembly	34,078	4.57%	85	8.48%	5.17%	0.60%
	Public order / safety	4,374	0.59%	13	1.30%	2.17%	1.58%
	Retail (excluding food sales / service)	77,953	10.45%	82	8.18%	8.81%	-1.65%
	Warehouse / storage	43,950	5.89%	116	11.58%	4.30%	-1.59%
	Manufacturing	19,110	2.56%	85	8.48%	3.37%	0.81%
	Other	202,830	27.20%	172	17.17%	27.52%	0.32%
ate	TOU Rate	40,495	5.43%	138	13.77%	6.81%	1.38%
	Non-TOU Rate	705,242	94.57%	864	86.23%	93.19%	-1.38%

The Use of Discrete Choice Analysis to Evaluate Alternative Pricing Designs

Most of the core research objectives focused on understanding how commercial and industrial electricity customers in California make tradeoffs when evaluating different pricing options that might be made available to them. More specifically, the interest was in understanding how customers might trade off different features of new time-differentiated pricing plan, and as a result, explain how and why customers might choose to participate in newly offered time-differentiated electricity pricing plans.

One of the complications in testing potential marketplace response to new product offerings comes in dealing with new products that have many variable features. It is relatively easy to test customer response to a product, for example, that can only differ by size and price (a new can of peas, for example, that only comes in two sizes and two prices). In such cases,

it is easy to test customer response to all possible combinations of the product (in the pea example, there are only four possible combinations).

For more complicated products, however, this is not possible. The description of "complicated" certainly applies to the time-differentiated electricity pricing options tested in this work. Each of the pricing options could differ along several dimensions (e.g., the amount of savings, whether there were Critical Peak periods or not, whether every day had a peak price, what the on-peak hours were, etc.). In addition, there were several design options for every dimension (e.g., for the on-peak hour dimension there were multiple options including 12-5 pm, 12-6 pm, 12-7 pm, 1-6 pm, etc.). Please note that, imbedded in the various electricity pricing features tested, is the option for a fixed price per kWh, as denoted by the fact that the "when on peak periods occur" dimension has a "never" feature. In total, pricing options were allowed to differ in the following ways:

- Bill impact with maximum adjustments consistently employed
  - 20% savings
  - 15% savings
  - 10% savings
  - 5% savings

- Bill impact with some adjustments employed
  - 10% savings
  - 7.5% savings
  - 5% savings
  - 2.5% savings
  - 0% savings
  - 2.5% higher bill
  - 5% higher bill

- Bill impact with no adjustments made
  - 5% savings
  - 0% savings
  - 5% higher bill
  - 10% higher bill
  - 15% higher bill

- On-peak period
  - Always Noon - 5 pm weekdays
  - Always Noon – 6 pm weekdays
  - Always Noon – 7 pm weekdays
  - Always 1 pm – 6 pm weekdays
  - Always 1 pm – 7 pm weekdays
  - Always 2 pm – 6 pm weekdays
  - Varies; usually Noon – 6 pm weekdays, but time period usually shorter on CRITICAL days
  - None (No peak periods)

- On-peak periods occur
  - "Every weekday" – Every weekday has an on-PEAK period
  - "ONLY on CRITICAL days" – The on-peak periods are only on CRITICAL days (not on every weekday)
  - Never (price per kWh is always the same regardless of the day / hour)

- Number of CRITICAL days per summer
  - 0
  - 5
  - 10
  - 15
  - 20

- Controls provided (ONLY PRESENT WHEN CRITICAL DAYS NOT EQUAL O)
  - No; manual/current equipment
  - Yes; automated to how you want your system to run
  - N/A (no peak or critical peak periods)

- Notice of CRITICAL days provided (ONLY PRESENT WHEN CRITICAL DAYS NOT EQUAL 0)
  - The day before
  - That morning
  - N/A

This specification of possible rate program attributes highlights both the complexity of the products to be tested and the fact that most have relatively little experience dealing with such attributes. While many business customers have some experience dealing with time-of-use pricing in consumer product areas (such as cell phone service), the reality is that most are less familiar if not completely unfamiliar with the notion of TD pricing in electricity, nor have they given any thought to the implications of the issues noted above.

The research sought to deal with these issues by providing a good deal of education to respondents within the context of the survey (explaining the concept of time-differentiated rates and the logic for implementing them), and by providing an opportunity for respondents to think about and explore the way that they might respond to those rates in the context of the business location in question and on how difficult such response might be. Even so, with these best efforts to familiarize respondents with the nature of these rates and their features, it must be recognized that the rates were still new concepts for most people, and as a result, might be viewed differently as customers come to understand both the rates more completely, and the implications of how they might respond to those rates more fully.

Because of the pure complexity of the rate options, it was not possible to test customer response to all possible product combinations. There is, however, a survey methodology that is commonly used to deal with situations like this one. The technique – called discrete choice analysis – makes it possible to estimate how individual survey respondents would evaluate all of the different ways that a product might be constructed, even when there are too many product combinations to test individually.

Discrete choice works by essentially providing survey respondents with a sample of all of the possible product combinations in sets of three and then asking the respondent to indicate which of the three proposed options they would select, given a choice among them (respondents can also say that they would want to choose none of the options). If the product combinations are constructed and grouped randomly, it is possible to use each respondent's evaluations of a series of such choices to estimate the relative value that each respondent would attach to each feature of the products tested (in this case, the different pricing products), and the degree to which they find each feature to be important in determining whether or not they would want to adopt such an option.

In this survey, each respondent evaluated sixteen different choice tasks in which each task asked them to select their preferred option from among one of three different pricing program designs, or alternatively, to indicate that they would prefer "none" of the three options, implicitly indicating that they would prefer to stay on their current pricing plan.

Each of the three time-differentiated pricing plans tested in each task were described in terms of the eight dimensions listed above. Across respondents, there were ten different task "rotations" (meaning that there were ten different randomly selected sets of sixteen different choice tasks), and respondents were randomly allocated to one of the ten different choice task rotations. In order to guard against consistent order and fatigue effects in the data, the order of presentation of the choice tasks within a given rotation was randomized across respondents so that two respondents who received the same rotation (group of choice tasks) did not see those tasks in the same order.

The data resulting from the choice tasks (that respondent X chose Option 1 in Task 1 of their assigned rotation of sixteen choice tasks, for example) was then analyzed to develop estimates for each person of the way that they assign value and importance to each of the different pricing design features listed above. Formally stated, the discrete choice design used what is called a "partial profile" approach, and the arithmetic used to make substantive sense of the survey responses is reasonably complex. Essentially, the analytic team estimated the relevant utilities using a Hierarchical Bayesian/Metropolitan Hastings methodology that allows for heterogeneity to be accounted for at the individual respondent level. This analytic methodology provides a better fitting model at the individual respondent level than does conventional aggregate-level logit estimation, and it also makes it possible to incorporate prior information that might be available for each respondent (i.e., the size of their bills) into the analysis.

The analytic output of the modeling work yields both average measures of the utility (or value) that respondents in general associate with each level of each attribute, and also information about the distribution of individual respondent values on these scores (meaning that it is possible to conduct post-hoc segmentation around these values). This utility information can ultimately be used to develop estimates of the way that individual survey respondents (and by extrapolation, the relevant universe of business premises) might be anticipated to assess a new set of pricing options that could be offered to them. The process used to move from these initial preferences to developing forecasts of anticipated customer response is described in the section on "Forecasting" below, while the section below provides more details about the statistical analysis used to develop the initial preference share estimates.

The Use of Discrete Choice Analysis to Evaluate Alternative Controls System Designs

Besides the interest of the project team in understanding the way that commercial and industrial electricity customers trade off different elements of time-differentiated pricing plans, there was also an interest in understanding customer decision-making around the acquisition of equipment controls systems. The objectives for understanding this set of decisions were similar in their logic to the types of objectives that existed for time-differentiated rates (to understand how customers trade off different specific elements of the feature functionality and pricing of controls systems and how these tradeoffs are likely to affect customer adoption of these technologies).

The key analytic issues were similar for this set of "products" to those relevant to the assessment of time-differentiated rates. There were, in this case as well, several different dimensions along which controls systems could differ, and the goal of the research was to understand the combined tradeoffs that customers make as they evaluate their response to these options. Since the issues were similar, the team used a similar approach (i.e., discrete choice analysis) to develop the relevant customer insights.

In total, control options were allowed to differ in the following ways:

- Monthly cost – Basic controls
  - $0
  - $10
  - $15
  - $20

- Monthly cost – Moderate controls
  - $15
  - $20
  - $25
  - $30

- Monthly cost – Extensive controls
  - $20
  - $30
  - $40
  - $50

- How extensive the controls are
  - Extensive
  - Moderate
  - Basic

- Bill impact
  - 5%
  - 10%
  - 15%

- System programming and control
  - You program the system according to how you want the system to run
  - Your utility programs the system according to how you want the system to run
  - Your utility programs the system according to how it wants the system to run, but you can choose to override the system if you need to
  - Your utility programs the system according to how it wants the system to run, but you cannot override the controls

As with the exercises for time-differentiated rates, each respondent completed a series of choice tasks that asked them to select among three different equipment controls options (each of which were described as a combination of the attributes and levels outlined above) or to indicate that they would rather have "none" of the options. In this section, respondents each evaluated twelve different choice tasks, and there were four different rotations of tasks that were randomly assigned across respondents.

Translating Percentage Bill Savings into Absolute Bill Savings Values in the Discrete Choice Exercises

In order to make the savings estimates provided in both of the discrete choice exercises more meaningful to respondents, the team chose to translate percentage bill savings estimates into absolute dollar value savings estimates based, in large part, on respondent-provided information about their monthly summer electric bills. Rather than seeing a savings of "10%" on their bill in a discrete choice exercise, respondents saw an absolute dollar savings value that was based on their real, reported highest monthly summer bill value (in the simplest case, if their highest summer electric bill was $1000, then a discrete choice option that implied a 10% savings was described to that customer as a potential monthly savings of $100, whereas for a customer with a monthly bill of $5000, that same percentage savings was portrayed to the customer as a potential savings of $500). As a result, survey respondents never saw the percentage savings claims, and only ever saw the way these percentage savings estimates were translated into absolute dollar values that mapped to their actual reported highest summer electricity bills.

However, this method was complicated somewhat by cases in which the respondent was unable to recall their highest summer electricity bill for the previous year. In these cases, the calculation of potential savings was computed using the premise's average summer electric bill for the previous year, as provided by each of the utilities.

Estimating Preference Shares

The discrete choice exercises used in the pricing analysis and in the appliance controls analysis (see the discussion below) provided data for estimating utility functions to express customer preferences for the proposed product features. In the choice exercise, respondents selected between three product alternatives A, B, and C, each made up of the different levels of the features tested (experimental effects). In addition, a "none of the above" choice was also permitted, if the respondent found none of the alternatives to be appealing relative to "doing nothing."

Modeling equations

With a "pick one" dependent variable, a multinomial logit model was appropriate, since the choices represented probabilities of selection for any alternative choice *i* among *j* possible alternatives in a given task. More formally, we estimated a hybrid conditional logit model:

a) Some of the design features were conditional on the alternative shown (i.e. Controls provided being relevant in the Pricing exercise only if the number of critical days were non-zero, or when Monthly Cost levels for the Controls exercise were conditional on an alternative in each Controls task having a particular level of control—Basic, Moderate, or Extensive)
b) The context for bill impact was not merely the relative % impact, but the calculated dollar savings ($) in absolute terms, since the absolute size of each respondent's current bill could vary as well. Hence, we needed to estimate both an experimental effect (a characteristic of the choice), and the income payoff (an interaction of the characteristic of the choice, % Bill Impact, and a characteristic of the chooser, Current Bill). Such an approach, with a respondent demographic acting as a covariate with an experimental variable, is called a "hybrid" model in the choice literature.

The parameterization of each model is shown in Tables 2.3-2.4 below:

Table 2.3 - Pricing Model

Feature	Estimation	Coding	Type of effect
Bill impact with maximum adjustment (% savings/cost)	Log-Vector	Logarithmic of ratio to current, mean-centered	Experimental
Bill impact with some adjustments (% savings/cost)	Log-Vector	Logarithmic of ratio to current, mean-centered	Experimental
Bill impact with no adjustments (% savings/cost)	Log-Vector	Logarithmic of ratio to current, mean-centered	Experimental
Bill Type (Flat or Variable)	Part-worth	Separate levels, last level as reference	Experimental
Duration of on-peak periods	Part-worth	Separate levels, last level as reference	Experimental
Frequency of on-peak periods	Part-worth	Separate levels, last level as reference	Experimental
Number of critical days	Part-worth	Separate levels, last level as reference	Experimental
Controls provided	Part-worth	Separate levels, last level as reference	Experimental
Notice of critical days provided	Part-worth	Separate levels, last level as reference	Experimental
Bill impact with maximum adjustment ($ savings/cost)	Vector	Mean-centered	Covariate
Bill impact with some adjustments ($ savings/cost)	Vector	Mean-centered	Covariate
Bill impact with no adjustments ($ savings/cost)	Vector	Mean-centered	Covariate

Table 2.4 - Equipment Control System Model

Feature	Estimation	Coding	Type of effect
Extensiveness of controls	Part-worth	Separate levels, last level as reference	Experimental
Monthly cost (basic)	Log-Vector	Logarithmic, mean-centered	Experimental
Monthly cost (moderate)	Log-Vector	Logarithmic, mean-centered	Experimental
Monthly cost (extensive)	Log-Vector	Logarithmic, mean-centered	Experimental
Bill impact (% savings)	Log-Vector	Logarithmic of ratio to current, mean-centered	Experimental
System programming control	Part-worth	Separate levels, last level as reference	Experimental
Bill impact ($ savings)	Vector	Mean-centered	Covariate

Depending upon the type of feature to be estimated in the modeling, and the way that they would be addressed in the simulator, we utilized three different coding schemes:

Part-worth parameterization

For features that were defined qualitatively (e.g. duration of on-peak periods), a part-worth coding scheme that utilized orthogonalized effect-coding was employed. This results in utility scores that are relative to a hypothetical average of 0 within feature, with the utility scores summing to 0 across that feature's levels.

In the model estimation, for any feature with k levels, we estimated k-1 parameters to preserve full-rank coding. We treated the last level of a part-worth coded feature as the reference level (the one parameter held out). Otherwise, for each of the k-1 parameters within feature, we coded 1 for the particular feature level, 0 if not that feature level, and -1 for the reference feature level. Thus, we can derive the utility of the reference level by summing that feature's levels and multiplying by -1.

Part-worth coding can be more useful to an analyst than indicator (dummy) coding, where a particular level of a feature is set to 0, and the utilities are relative to a particular reference level. In that case, the interpretation may change depending upon the reference level chosen, and hence requires special knowledge of the feature to be meaningful. With part-worth coding, the estimation is invariant of the reference level chosen.

Additionally, use of indicator-coded features can be confounded with the "none" parameter, because all levels of the experimental parameters estimated are set to 0 when the "none" choice is in the design matrix. Consequentially, it can be confused with an alternative where all levels of the features are at the reference level.

Vector parameterization methods: Vector and Log-Vector

While qualitative, part-worth coding is appropriate when the levels of a feature only are of interest. There were some features where it was desirable to be able to interpolate instead of only looking at the levels addressed. That is, not only estimate the impact of the actual levels shown (for example, 20%/15%/10% savings with maximum adjustment), but to look at intermediate levels in that range (such as a 17% savings, or a 12% savings).

Although we could have shown more levels of these features to respondents, that would have increased the size of the experimental design, the number of tasks shown to each respondent and in total, and would have decreased the precision around the individual parameter estimates involved for the sample.

Thus, we decided to estimate a continuous vector effect for these features. Rather than estimate separate parameters for these feature levels, we estimated a single parameter for each feature involved, assuming linearity. Linearity assumes a constant elasticity (a fixed degree of impact as a unit change in the independent variable occurs across the entire range of the variable in question). Such a model is more parsimonious because fewer terms are estimated. The cost is that we lose some of the information between the levels of those features.

One way around this information loss is to use higher order terms in a model (such as quadratic or cubic effects). Another more parsimonious approach is to assume *curvilinearity* rather than simple linearity. This method, common in econometrics, involves taking the log of variables such as price and percentage bill impact. The log effects captures curvature, where the degree of change varies as a unit change in the variable in question occurs. A log-transformed feature's elasticity does not have to be strictly constant, as a result. The direction of change depends on the parameter to be estimated.

We utilized a Log-Vector approach for the experimental effects for Bill Impact (defined in % terms) and Monthly Cost (defined in dollars), and a simple Vector approach for the covariate effect of the respondent's current bill[14] with the degree of % Bill Impact (defined in dollars).

[14] In actuality the team truncated outlier bills at a cutoff of $5,000. This was based on a frequency distribution which found that 95% of all respondents had a bill of approximately $5,000 / month or lower. Thus, those

For capturing Bill Impact (%) in both the Pricing and Equipment Control System model, we converted the % savings to a ratio of the current bill prior to logarithmic conversion (since we cannot take the log of a negative number, in cases where the bill impact could involve a cost). That is, a savings of 20% represented a ratio of 0.8, relative to a current level of 1.0. For Monthly Cost, we took the log of price directly.

While we could have assumed curvilinearity for the dollarmetric Bill Impact effect, we preserved simple linearity to account for dollar increases in a bill due to increased cost as well as dollar-based bill savings, because we found that a curvilinear effect did not improve the model fit.

Regardless of whether a simple Vector or a Log-Vector effect was to be estimated, we then did the following:

a) Mean-centered the levels of Vector features by subtracting the average coded level (raw or in logarithmic terms) from each of the individual levels
b) Orthogonalized the levels by dividing by the mean-centered levels by the range between the lowest and highest mean-centered levels, and multiplying the result by 2

By completing these steps, the Vector estimated features could be defined in the same range as the qualitative, effect-coded features (-1 to +1 across the feature levels with a mean of 0). This is of great value in interpretation of the utilities as all effects would be part-worths, and defined in standardized levels. Once we derived the model estimates, we can compute utilities for specific levels of the Vector-coded features of interest.

Shortcomings of traditional MNL modeling estimation

As mentioned previously, we utilized multinomial logit estimation (MNL) for modeling the consumer preferences. Traditionally, an MNL model is fit at the aggregate level, using Maximum Likelihood estimation methods, because we do not have enough tasks completed per respondent to fit independent preference functions for each individual consumer (as we typically do with full-profile or adaptive conjoint methods based on OLS regression). However, such a model has two major disadvantages:

a) It is assumed that respondent preferences are identical for all individuals in a given model
b) MNL models are highly sensitive to the violations of the IIA property (Independence of Irrelevant Alternatives)

The first issue involves the notion that a model can be “one size fits all”. Whether we conduct modeling in total or at a segment level, it is assumed with traditional MNL that consumers have homogeneous preferences.

An illustration where this is not tenable would be where the average utilities for a feature are relatively flat. That would imply, for instance, that respondents value having automatic vs. manual controls identically. While on average this might be true, if preferences are highly polarized (an approximately equal number valuing each type of control in an extreme case), then the model will poorly reflect the relative importance to individuals in making

customers with bills over $5,000 / month were assigned a bill of $5,000 for the purpose of modeling this covariate effect.

preference decisions. If there is a group of people that would switch plans based on the type of control, we would miss them entirely.

In addition to providing relatively poor model fit at a total level, an aggregate-level model would need to be estimated for each segment of interest (PG&E customers, Climate Zone 1, PG&E/Climate Zone 1, etc.). This would require relatively large sample sizes to be practical, and an a-priori understanding of what segments are to be analyzed. Further, it would not be possible to conduct any ad-hoc segmentation as needed.

The second modeling issue involves the assumption of MNL that adding new product alternatives (or changing an existing one in a particular fashion) will result in proportional draw from other possible alternatives.

To illustrate, were we to have products in a market simulation where a new product were added that was identical to an existing choice except for having automatic controls (vs. manual for the existing product), the conventional "share of preference" simulation from an aggregate-level MNL model would give the existing product and the new product nearly identical shares.

More seriously, the combined impact of both products on preference would be exaggerated. A realistic simulation would divide the existing interest in the two, nearly identical products to capture incremental reach from consumers that might desire automatic controls (that wasn't reflected in the market otherwise). Thus, the net reach of the two similar alternatives would reflect reality better.

We can partially avoid this latter problem by building models with product availability effects. Unfortunately, these effects can move in counter-intuitive directions (price goes up, and preference for other, similar products goes down). Fortunately, a considerably simple solution is possible today.

How Hierarchical Bayesian estimation works

We utilize Hierarchical Bayesian methodology (HB) to overcome these shortcomings of traditional, aggregate-level modeling. HB builds upon a relatively recent development in modeling technology, the Metropolis-Hastings Sampler, and modern computer speed to infer a preference function for individuals based upon an assumed statistical distribution that describes those preferences in total.

With HB, we can substantially improve model fit because we can then conduct simulations at a respondent level (and then aggregate them up to whatever segment scheme is desired). With individual-level simulations, we can utilize a **first choice rule** and avoid the IIA problem substantially. Respondents that would shift based on, say, automatic controls, would have high positive utilities for that feature (and large negative utilities for manual), while other respondents might weakly favor manual controls. Thus, only the former would move to a new product with automatic controls, while the manual control respondents would stay with their current choice.

HB takes advantage of multiple observations per respondent (i.e. the 16 choice tasks for each exercise that each person sees). Thus, there is a hierarchy of tasks within individuals. Bayesian estimation involves the notion that an estimate for a given individual is the product of a sequential series or "draws" of preferences in a chain. Each conditional preference or draw is a "prior" of the next one.

An HB estimation starts with a set of "priors" for each person (usually determined from conventional regression). Then, we use that prior estimate and add an independently drawn variate from the sampling element to improve the overall fit for the sample at a high degree of acceptance. The variate gets "smarter", using the estimates from one draw to inform how the variate should be drawn in the next draw. The draws continue until we reach a point where the parameter variation doesn't change very much across several thousand iterations.

With multiple tasks per person, we can also "borrow" information between individuals based on the overall likelihood of a common set of answers given a similar design scheme. The borrowing effect acts to stabilize individuals so that not only the total estimation is stable, but the individual respondent-level estimates achieve a minimal degree of change over the draws. The borrowing element goes into the way that the sampler achieves its acceptance rates.

Finally, we assume normality for the distribution of estimates for each parameter individually, and multivariate normality for the way that the parameters work at the total sample level, along with the multinomial logit link to the choice preferences. With these assumptions, we can optimize estimates with the goal of maximizing the precision of the estimates (minimizing the errors around each parameter estimate).

Not only is the precision determined at the total level, however. We also get a draw of estimates for each individual, so we have a much larger body of information to build utilities from than any conventional estimation method for regression. All we need is multiple observations per respondent for consistent estimation, and a large enough sample to provide some measure of stabilization in total.

In our application, we conducted 2000 "burn-in" draws to achieve initial stability, and then executed 10,000 further estimates so that we can arrive at 1000 separate estimates of the utilities for each person (i.e. taking each 10^{th} draw to avoid any possible autocorrelation problems in the estimation). The draws are then averaged for each person to provide their final preference functions.

The use of multiple estimates, essentially a sample of functions for each person, also allows us to impose modeling constraints that are not easily implemented otherwise. For example, we can choose to only use "draws" that have bill impact effects that move in a particular direction (more savings = more preference). It is also possible to use directional constraints for part-worth features.

To illustrate the improvement in model fit for an HB model vs. a conventional MNL estimation, we present the following measures of variation explained (perfect fit=1.0):

Model	Pricing	Controls
Aggregate MNL estimation	0.0932	0.0337
Hierarchical Bayes estimation	0.6313	0.4625

We also see that the parameters estimated are larger, with higher t-values (representing differences from the null hypothesis of parameter=0). For illustration, consider the type of control:

Type of Control	MNL Mean	MNL Standard Error	MNL t-value	HB Mean	HB Standard Error	HB t-value
Manual	0.024	0.031	0.774	0.150	0.026	5.769
Automatic	-0.024	0.031	0.774	-0.150	0.026	-5.769

Forecasting Anticipated Customer Response to Pricing and Control options

As we noted above, some of the critical outputs of the discrete choice analysis are the assessments of the relative value (or utility) that each respondent assigns to each level of each attribute that can be used to describe a pricing (or controls) option.

Consider an example attribute such as on-peak periods. The example data in Table 2.5 below describe the sort of data that exist for each respondent. In this example, Respondent 1 has a range of positive and negative utility values for different on-peak periods. Higher positive utility values mean Respondent 1 likes (attaches positive utility) to the specified on-peak period, while greater negative values means Respondent 1 dislikes (attaches negative value) to the specified on-peak period.

In this example dataset, Respondent 1 most likes the 1-6 pm weekday on-peak period and most dislikes the noon-7 pm period. Respondent 2 has the same pattern of most/least liked periods, but has more extreme tastes. Respondent 3 also has the same pattern of most/least liked periods, but has even more extreme preferences.

Table 2.5 Example Value (Utility) Data for On-Peak Period for Several Respondents

Example Data			
On Peak-periods	**Respondent 1**	**Respondent 2**	**Respondent 3**
Always 12-5 pm	0.2	0.6	-1.0
Always 12-6 pm	-0.5	-1.0	-2.0
Always 12-7 pm	-1.2	-1.9	-2.5
Always 1-6 pm	0.9	1.7	3.0
Always 1-7 pm	0.6	1.2	-1.2
Always 2-6 pm	-0.1	-1.1	-1.6
Varies; Usually 12-6 pm, but time period usually shorter on critical days	0.1	0.0	1.2

Since this sort of data exists for every respondent for every attribute in the discrete choice design, it is possible to construct a measure of the total utility that respondents attach to a specified pricing option by summing the utilities that respondents attach to each of the attributes used to specify a given option.

Assume that we wish to know how a given respondent might value a given pricing option. First, we need to specify the pricing option in terms of the different attributes in the discrete choice design. For purposes of example, consider a CPP option that has 10 critical days, but which also has on-peak periods every day from 12-6 pm. We might specify the option in the following way:

- Bill impact with maximum adjustments consistently employed
  - 20% savings
- Bill impact with some adjustments employed
  - 10% savings
- Bill impact with no adjustments made
  - 0% savings
- On-peak period
  - Always 12 pm – 6 pm weekdays
- On-peak periods occur
  - Every weekday
- Number of CRITICAL days per summer
  - 10
- Controls provided
  - No; manual/current equipment
- Notice of CRITICAL days provided
  - The day before

In the same way that we described in Table 2.5 for "on-peak period," it is also the case that each respondent has a utility value associated with every level of every attribute. For Respondent 1, then, the utility they attach to the level "20% savings" for the attribute "bill impact with maximum adjustments" would be added to the utility they attach to the level "10% savings" for the attribute "bill impact with some adjustments," which would be added to the utility they attach to the level "0% savings" for the attribute "bill impact with no adjustments," etc. across all of the attribute levels used to describe this CPP rate option. In this way, a total utility (which represents the sum of the utilities for a given respondent that are associated with each of the attribute levels used to define a rate option) can be identified for each pricing option.

Note that each rate option has three different savings values associated with it (one each for the savings associated with "maximum," "some," and "no" adjustments). The relative attractiveness of any given rate option is calculated, at least in part, by summing the utilities associated with each of the three savings components of the given rate option.

In and of themselves, these total utility values are not particularly informative, but their value in the analysis is a comparative one. Since total utility values can be calculated for any pricing option that can be described by its different discrete choice attributes, it is possible to calculate total utility values for a wide variety of different pricing options and then compare those options in terms of their relative attractiveness to individual respondents (in addition, by default, the total utility associated with the current pricing plan can also be specified).

Estimates of the way that customers might respond to a given offer of new pricing options are then developed by comparing the way that respondents attach total utilities to those options. If we wish to know, for example, how customers might respond to an offer of two new pricing options (a TOU rate with a specific set of features and a CPP-F rate with a specific set of features), recognizing that they could also choose to stay on their current

rate, the pricing product simulator starts by calculating the total utilities for each of the three options (the new TOU rate, the new CPP-F rate, and the "none" option).

Using what is called a "share of preference" model, the simulator then uses a logit-based equation to compare the total utilities for each respondent across the (in this example) three options and assigns a probability that each respondent would select each of the options. We call this probability the unadjusted estimate of market preference. When appropriately summed across all survey respondents and weighted, these summed estimates can be interpreted as estimates of the proportion of the relevant customer universe that could be expected to prefer each of the tested options, given the following set of assumptions:

- That all of the relevant customers were aware of, and fully informed about, the different options and their specific features
- That each of the relevant options was in fact available to all of the relevant customers
- That customers were not encumbered by transaction costs, inertia, or any other factor that might cause them to not act to implement their initial preference

The last issue noted above is an important one. Simply using unadjusted estimates of market preference to forecast the likely number of customers that would actually sign up for a given price offer in a given period assumes (among other things) that customers will act on their preferences, and that as a result, even a small incremental preference for one option over the others that customers face will lead them to go through the trouble of both finding out how to "sign up" for that option, and to actually go through with this behavior.

It is widely recognized, of course, that customers do not always act on their preferences. While customers may say, and even mean, that they would prefer to be on a new TOU rate, rather than their current inclining block rate, they may not go to the trouble of making this change for a variety of reasons:

- Simple inertia (the fact that it is always easier to do nothing) may overcome their marginal preference for a new option as will the inertia associated with the perception that perceived transaction costs are high (or uncertain); or stated otherwise, customers might assume that going through the process of changing rates is difficult and time-consuming, or at least that it is not clear at the start how difficult and/or time consuming it will be
- While on the face of it a new rate might be appealing, because it is new, it is also likely to be viewed as risky, and those customers who tend to be very risk averse may choose to "wait and see" rather than acting to select an option they might otherwise define as attractive

Since a critical goal of this research and analysis effort was to develop plausible (and not just academic) estimates of what might be described as anticipated customer adoption levels for a given new rate option (or set of new rate options) if these were offered in the marketplace, it was important to be able to develop adjustments to the "market preference" values that would take these inertia and risk issues into account and facilitate the development of more realistic estimates of anticipated market response. The team did this by applying a methodology that attempts to take into account the effects of inertia and risk aversion that exist in the marketplace, and which recognizes that these factors affect customers differentially. Some customers, in other words, are more risk averse than others, while at the same time some customers are more affected by inertia than others. In order to reflect these facts, the team used the core survey questionnaire to estimate the impact of

these two factors on each survey respondent. These two factors were then used to develop adjusted market preference estimates that were used to develop more textured estimates of anticipated customer response to new rate offerings.

In implementing these adjustments, the team used a methodology developed by the contractor for this research over the course of many years of conducting market forecasting research. While this methodology uses standard industry procedures for developing individual and market-based indices, it uses these indices to adjust estimates of likely behavior in a unique way. The methodology, then, while based on a good deal of experience, is ultimately judgmental, and represents a best-efforts method for adjusting for known errors in traditional methods of forecasting customer response. As a result, while it is impossible to demonstrate the mathematical purity of the methodology employed, the approach represents a logical, and tested in other markets, method for accounting for the fact that – without adjustment – customer responses are know to substantially overstate likely response to truly new products.

Implementing these adjustments meant first aggregating customer responses to individual "switching" items included in the questionnaire to create an individual inertia index score. In total, there were twelve switching items (from questions 72 and 73 in the questionnaire) and these items were placed on equivalent scales ranging from "1" to "7," with some responses inverted to ensure that high scores represent "sticky" responses. Scores across the twelve items were then summed for each respondent, yielding an additive, unadjusted value that could range from 12 to 84 for any given respondent. These unadjusted scores were then scaled from 0 to 100.

The resulting scaled values could then be viewed as akin to probabilities, with a "100" value interpreted to mean that the respondent had a probability of 100% of staying with their default starting point condition (whether that default starting condition was their current rate or some new rate) even if the discrete choice analysis suggested that the person should prefer another option. Alternatively a "0" value was interpreted as meaning that the person was unaffected by any "bias" or affinity for their default condition and they would select the option predicted by their calculated utilities for each of the different pricing options available to them in the scenario. Intervening values (from 1 to 99) were interpreted as moving the given respondent further in the direction of adopting the default alternative (so that, for example, a value of 50 moves the respondent 50% of the way from their "natural" estimated probability of staying with the default value to being 100% likely to stay with the default).

Next, the team used the risk acceptance/avoidance items in the base questionnaire (questions 74, 75, 75a, 76, and 76a) to construct an individual risk avoidance index score using the same process outlined above. However, unlike the inertia index, the risk avoidance index was created using a separate set of questions for small and large business customers. The only difference in these questions, however, was in the degree of "risk" described in the questions for the small vs. large customers, with the riskier options associated with larger dollar values for the large customers. This was done to better reflect the reality of perceived risk that would be expected to correspond to the size of the business.

For small business customers, questions 74, 75 and 75a were used to create the risk acceptance/avoidance index. First, the six individual items were placed on equivalent scales, inverted as appropriate to ensure that high scores indicate risk avoiding options, and summed. Since there were six individual items in this group and the individual items had responses that could range from "1" to "7," the unadjusted additive values for this index

could range from 6 to 42. These unadjusted scores were scaled from 0 to 100 with high scores assigned to customers identified as more likely to exhibit risk avoiding behavior. The risk acceptance/avoidance index was calculated similarly for large business customers using questions 74, 76 and 76a.

Like the switching factor, the risk avoidance factor functions as a probability adjustment to the individual respondent's calculated preferences. In this case, a score of 100 means that a respondent is accorded a 100% probability of accepting their current rate. The logic here is that customers tend to see their current condition as the least risky option available to them ("the devil you know is better than the devil you don't"). Alternatively, a value of 0 defines the person as risk accepting and means that their likelihood of accepting riskier options is consistent with their calculated preferences. Intervening values were treated in the same way as are the intervening inertia factor values described above.

It is worth noting that the inertia factor functions by making default choices more likely (at least for customers who score high on inertia) and that the risk avoidance factor functions by making the current rate option choice (whether or not it is the default) more likely (at least for customers who score high on risk avoidance). At the other end of the scale, the factors do not work to increase the "natural" probability of other choices, but simply function to allow the natural preferences for those choices to be expressed.

Being "high" on inertia, in other words, means having a bias toward staying with your current situation. Being "low" on inertia, however, does not meaning having a bias toward change, but being open to change. Similarly, being "high" on risk avoidance means having a bias towards staying on or moving back on to the current rate. Being "low" on risk avoidance does not mean having a "bias" toward riskier, unknown options, but does mean that a respondent is free to exercise their "natural" preferences for higher risk options.

As noted previously, approximately 26 out of our sample of 1,002 did not complete the individual inertia and risk survey question items. However, in order to include these 26 respondents in the analysis of the pricing and equipment control system conjoints, we needed a way to calculate an index for these respondents. By using a process of mean substitution data was imputed for the relevant survey question items. Each of these 26 respondents were "matched" to the mean that we would predict would have been closest to their actual value if they had completed the survey items themselves by assigning them the mean for the population subgroup they are in. These subgroups were defined by the intersection of climate zone, power usage, rate, and building type.

As a last issue here, it is important to note that the inertia and risk avoidance factors have been applied to the forecasts of anticipated customer response to the pricing options, but not to the control options. The logic here is that the forecasts of customer response to the pricing options needed to consider different default, starting point conditions (i.e., the team wanted to model some situations in which customers can opt-in to a new time-differentiated rate, or be put in a situation in which they would have to opt-out of such a rate if they wanted to return to a traditional rate), needed to reflect the financial significance of the electric bill to at least some customers, and needed to reflect the fact that customers have relatively little experience making rate choice decisions for electricity (thereby making the issues of inertia and risk aversion potentially more significant).

The equipment controls options tested, on the other hand, have less uncertainty associated with them, and have comparable examples existing in the marketplace already. As a result, the team thought it was reasonable to treat the controls product adoption forecasts with a more traditional approach.

In addition, in providing the final estimates of likely market response, the team wanted to note the impact that different awareness levels would have on customer activity. Customers can only respond to an option if they know it exists, and it is rarely the case that every customer knows about any specific program option that might be available to them.

Estimates of what is likely to happen in a "real" marketplace must account for the fact that how many customers actually know that they can change (or change back) to an alternative electricity rate will not likely reach 100%. For this reason, this report provides market response estimates for "high" (70%), "moderate" (50%), and "low" (30%) awareness levels that will vary, of course, depending on the nature and extent of the communication made with customers about these options.

The Statistical Accuracy of the Reported Results

The survey is intended to provide a sample that once weighted, offers a representative and valid view of the underlying population the survey was drawn to reflect (i.e., individual business premises in the service territories of the three IOUs). Given this logic, the survey results can be described as having the levels of statistical accuracy described in Table 2.6. With 95% confidence, we would expect percentage results described in this report for PG&E customers (to choose as an example the first line of data in the table below) to be within +/- 5.2% of the results that would be observed in the "true" population. For results described for the total population, we would expect reported percentages to be within +/- 3.1% (see the last line of the table).

Note that these confidence intervals apply to both basic percentage values reported from the survey, as well as to unadjusted market preference shares estimated using the choice simulators. Estimates of the appropriate confidence intervals to apply to the adjusted preference shares are less subject to precise statistical estimation. As the discussion in the previous section outlines, the unadjusted market preference shares have been adjusted for inertia and risk avoidance to develop market share estimates that do a better job of taking these "real life" issues into account. Due to the fact that these adjustments are in part judgmental, there is no single statistical translation that can be made to estimate the relevant confidence intervals. In order to accommodate this fact, the project team has proposed that, as a conservative estimate, the confidence interval for market shares start with the base estimated confidence interval for the total sample unadjusted shares (+/- 3.1%, for example) be multiplied by three (to account for the two adjustments made over and above the base estimate) (to a maximum value of + / -9.3%). See Table 2.9 for a summary of these confidence levels.

Table 2.6 95% Confidence Intervals for Base Survey Results

		Sample Size	Maximum 95% Confidence Interval
Electricity Provider	PG&E	361	+/- 5.2%
	SCE	387	+/- 5.0%
	SDG&E	254	+/- 6.2%

Climate zone	1	126	+/- 8.7%
	2	437	+/- 4.7%
	3	318	+/- 5.5%
	4	121	+/- 8.9%
Electricity Usage	High Demand (20-200kW; 20-100kW in SDG&E)	237	+/- 6.4%
	Low Demand (0-20kW)	765	+/- 3.5%
Building Type	Education – College, university	11	+/- 29.6%
	Education – K-12	84	+/- 10.7%
	Food sales	62	+/- 12.4%
	Food service	41	+/- 15.3%
	Hospital	47	+/- 14.3%
	Lodging	96	+/- 10.0%
	Office	108	+/- 9.4%
	Public assembly	85	+/- 10.6%
	Public order / safety	13	+/- 27.18
	Retail (excluding food sales / service)	82	+/- 10.8%
	Warehouse / storage	116	+/- 9.1%
	Manufacturing	85	+/- 10.6%
	Other	172	+/- 7.5%
Rate	TOU Rate	138	+/- 8.3%
	Non-TOU Rate	864	+/- 3.3%
Building Structure	Free standing building with occupied space	580	+/- 4.1%
	Occupied space part of a larger / other building	41	+/- 15.3%
	Free standing structure without occupied space	12	+/- 28.3%
Own / Rent Status	Own	467	+/- 4.5%
	Rent	535	+/- 4.2%
Total		**1,002**	**+/- 3.1%**

Confidence intervals for the assessments of value and importance developed through the discrete choice analysis can also be specified. Table 2.7 reports confidence intervals for the estimates of the value (utility) that customers attach to each level of each attribute (these are summarized at the attribute level in the table). Confidence intervals for the estimates of the relative importance customers attach to each of the tested attributes are listed Table 2.8.

Table 2.7 95% Confidence Intervals for Estimates of Attribute / Level Utilities Developed Through the Discrete Choice Analysis

Attributes	95% Confidence Interval
Pricing Discrete Choice Utility Value Confidence Intervals	
Bill impact with maximum adjustments (total impact)	+/- .04
Bill impact with some adjustments (total impact)	+/- .03
Bill impact with no adjustments (total impact)	+/- .07

Type of bill	+/- .12
Duration of on-peak periods	+/- .05
Frequency of on-peak periods	+/- .03
Number of critical days	+/- .07
Controls provided	+/- .05
Notice of critical days provided	+/- .03
Equipment Controls Discrete Choice Utility Value Confidence Intervals	
Extensiveness of controls	+/- .12
Monthly cost (basic)	+/- .05
Monthly cost (moderate)	+/- .04
Monthly cost (extensive)	+- .04
Bill impact (total)	+/- .05
System programming / control	+/- .18

Table 2.8 95% Confidence Intervals for Estimates of Attribute Importances Developed Through the Discrete Choice Analysis

Attributes	95% Confidence Interval
Pricing Discrete Choice Utility Value Confidence Intervals	
Bill impact with maximum adjustments (total impact)	+/- 0.6%
Bill impact with some adjustments (total impact)	+/- 0.4%
Bill impact with no adjustments (total impact)	+/- 0.8%
Billing Type	+/- 0.8%
Duration of on-peak periods	+/- 0.4%
Frequency of on-peak periods	+/- 0.4%
Number of critical days	+/- 0.4%
Controls provided	+/- 0.4%
Notice of critical days provided	+/- 0.4%
Equipment Controls Discrete Choice Utility Value Confidence Intervals	
Extensiveness of controls	+/- 1.2%
Monthly cost	+/- 0.8%
Bill impact (total)	+/- 0.8%
System programming / control	+/- 1.2%

Note that it might be surprising to some readers that the 95% “confidence interval” for Utility Estimates (Tables 2.7 and 2.8) tends to be much smaller in magnitude than the equivalent intervals for the Base Survey Results (Table 2.6). While anecdotally interesting, such a comparison is not directly useful, however:

- The Base Survey confidence intervals represent bands of sampling error at 95% confidence for a given sample size. For instance, the PG&E sampling error is +/- 5.2%. This reflects a sampling error calculation for a maximum case (proportion of 0.5/50% percentage).
- The Utility Value confidence intervals represent bands of sampling error at 95% confidence for the individual parameter estimates of each attribute, such as the +/- 0.04 around bill impacts with maximum adjustments. The units for the utility estimates are utils (part-worths for each level of each feature, averaged on a feature basis). They **do not** represent a percentage degree of error from the utility estimates, and as a result are not directly comparable to the Base Survey results.

- Further, the Utility Value estimates are total sample calculations, not calculated at a subgroup level as presented. Thus, comparison of relative error to the subgroup Base Survey error is not appropriate.

Even if the Utility Value Estimates and Base Survey estimates **were** on the same metric for an identical sample, the relative magnitude of the sampling errors is not surprising:

- The survey sampling errors can be easily validated by looking at a conventional sampling error formula, based on a single estimation of a variable from a random sample (i.e. no replication within individual).
- The utility estimate sampling errors are calculated from the distribution of utilities around each parameter estimate at the **individual** level, not from a theoretical formula of distribution around 1/0 proportions. Model estimates are taken from Hierarchical Bayesian estimation, and the results are averaged to the total level.
- Thus, with more sensitivity at the respondent level due to the multiple tasks seen by each person, there is less uncertainty about each respondent's estimates. With such replication, we have more power than from a single preference for each respondent (it is the same reason that dependent tests are generally more powerful than independent tests). It is a comparison of multiple, experimentally designed "trials" vs. a single Bernolli "trial". Consequentially, the errors will be smaller in the former than the latter.

Incidentally, the individual utility estimates were the engine behind the results in the "what-if" simulators, not the average utility scores.

Confidence intervals for the market share estimates developed through the discrete choice analysis can also be specified using the logic outlined above. It is important to remember that the market share estimates provided in this report are not actually point estimates but, are rather, point estimates with an associated range or confidence interval. That is any given specific share estimate, while represented as a point estimate, is actually an estimate that has a 95% confidence interval associated with it. Table 2.9 reports confidence intervals for a range of different share point estimates below.

Table 2.9 95% Confidence Intervals for Share Estimates Developed Through the Discrete Choice Analysis

Point Share Estimate	95% Confidence Interval
90%	+/- 5.6 %
80%	+/- 7.4 %
70%	+/- 8.5 %
60%	+/- 9.1 %
50%	+/- 9.3 %
40%	+/- 9.1 %
30%	+/- 8.5 %
20%	+/- 7.4 %
10%	+/- 5.6 %

Detailed Findings: Distinguishing "Likely Takers of Time-Differentiated Rates

Perhaps an easy way to start the discussion of customer response to time-differentiated rates is to ask the question: What kinds of business locations would most want to sign-up for such rates? Leaving aside the question for now of how many business locations might choose to sign up (under different conditions) we can start with the simpler question of whether or not those most likely to sign up are similar to or different from other business locations. It might be the case, for example, that the business locations most likely to sign up for time-differentiated electricity prices are simply a random selection of business locations. Alternatively, they might represent certain specific sub-groups that, for one reason or another, find such options appealing. We take up in this chapter the question of which business locations are most likely to respond positively if given the option of signing up for a new time-differentiated electricity rate.

Data Used in This Analysis

In order to explore the general question of "who would be most interested in TD (time-differentiated) electricity pricing options," the team used customer responses to four specific "holdout" task questions administered in the survey. Besides the very detailed responses to the discrete choice exercises that will be discussed in the following chapter, customers were also asked four direct questions about their likelihood of participating in each of several specific pricing options.

The pricing options tested in these four holdout tasks were selected because they represented reasonable exemplars of basic TD options such as TOU, TOU/CPP-F, Pure CPP-V, etc. Because it was not possible to administer a large number of holdout tasks, a representative set of such tasks were selected, recognizing that it is perhaps the case that takers for some time-differentiated rate alternatives not tested might be slightly different than those that could be tested. The objective of these holdout tasks was twofold: first, to provide a direct assessment of customer response to a small set of program options that could be used to assess the results of the discrete choice-based calculations, and second, to provide an easy way to identify "likely takers" for time-differentiated rate options (the question addressed in this section).

Table 3.1 – Pricing Options Tested in the "Holdout" Tasks, and as a Result, Available for Use in the TD Rate Taker Analysis

	TOU	CPP-F / TOU	CPP-F / TOU	Pure CPP-V
Monthly Electricity Bill Savings Impact	10% savings (Max) 5% savings (Some) 5% higher (None)	10% savings (Max) 5% savings (Some) 10% higher (None)	15% savings (Max) 10% savings (Some) 5% higher (None)	5% savings (Max) 0% savings (Some) 5% higher (None)
Days when on-peak periods occur	Every weekday	Every weekday	Every weekday	Only on critical days
On-peak hours	Always noon-6pm	Always noon-6pm	Always Noon-6pm	Varies; Noon-6pm, but usually shorter
Number of critical days per summer	0	5	20	20
Notice of critical days provided	N/A	Day before	Day before	Day before
Equipment control system provided	No	No	No	No

Detailed Findings: Distinguishing "Likely Takers of Time-Differentiated Rates

Using respondents' ratings to each of these product options, an additive index was created that summed each person's rating for each of the four pricing options together to yield a single value. The logic for taking this "additive" approach was used because the focus of the inquiry at this point was not to determine if those customers who might respond to TOU options are different than those who might respond to CPP-V options, but to start with a simpler question. Across the different TD options, are "takers" (those most likely to say they would sign up for such options under a voluntary arrangement) different from those who say they would be unlikely to adopt such options?

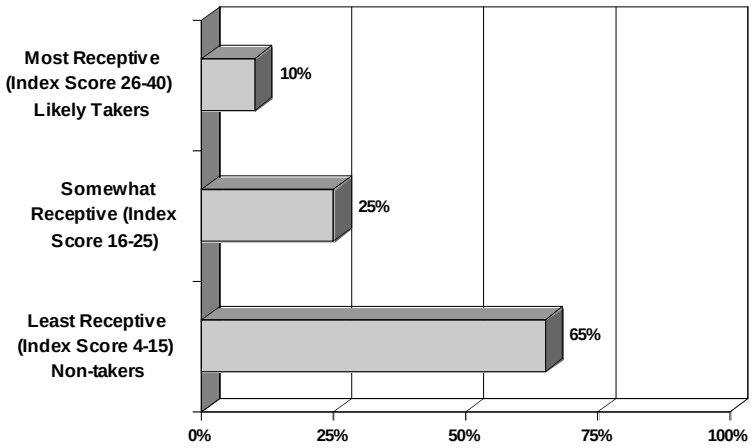
The arithmetic we used in order to define "takers" vs. "non-takers" was to calculate the sum of the way that each respondent rated each of the four products on a 10-point interest scale. Thus, each person had an additive score that ranged from 4-40 (where a score of "4" meant they rated each pricing option a "1," the lowest possible interest score, and a score of "40" meant that they rated each option a "10," the highest possible interest score).

Respondents were then separated into three categories that ranged from likely takers / most receptive, to non-takers / least receptive. Those with a receptivity score of 26 or higher (roughly equivalent to giving each option a score of 6.5 or higher on average on a 10-point scale) were allocated to the taker / most receptive to TD rates group. Those with a receptivity score of 16-25 (roughly equivalent to giving each option a score of 4-6 on a 10-point scale) are described as "somewhat receptive" and those with a receptivity score of less than 16 (or scoring less than four on average on a 10-point scale) were described as non-takers / least receptive.

It should be noted that the score required for classification as a likely taker in this exercise is somewhat less stringent than what is typically used to define "likely takers" (typically ratings of 8 to 10 are used). Overall, there is a general lack of strong interest among customers in signing up for time-differentiated rates. For this reason, the definition of a "likely taker" was expanded to provide sufficient data for analysis.

The sizes of each of the groups described above are reported in Chart 3.1 below.

Chart 3.1 – Receptivity to Time-differentiated Rates



QDC6 – QDC9. If a pricing plan were available to the business location at [ADDRESS] now with the specific options listed below, how likely do you think you would be to sign up for this plan? (1=No chance I would sign up this location; 10=I would definitely sign up this location)
n=1002

It is important to note here that by allocating 10% of business customers to the "most receptive" or "likely takers" group, we are not suggesting that it is only this group, or even necessarily this entire group, that is the segment likely to respond to a given TD electricity pricing offering. We are not saying, in other words, that only 10% of all business customers are likely to adopt any given TD pricing option if it was offered in the marketplace (issues of market size are taken up extensively later in this report).

Rather, the intent of this analysis is simply to identify the group that is "most likely" to participate across a variety of TD options. The proportion of business customers that might be anticipated to select a given TD pricing option if it were offered might well be larger, or smaller, than 10% depending on how that option was designed and marketed. Regardless of that proportion, however, we would expect the "most likely takers" defined in this analysis to be a core part of the group that would prefer to sign up for whatever TD option that was offered.

Across the variety of different TD pricing options that could be made are the customers who are most positive in their response to those options similar to or different from those less positive in their responses in important ways? Not surprisingly, the answer is "yes," though as always, the more interesting question is "how?"

Distinguishing Most Likely TD Rate Takers from Non-Takers

Table 3.2 below provides the data that details the differences found between the most and least likely taker groups. Highlights of these differences include that:

- Likely takers of TD pricing options appear to be more open to new products and services generally. They are more likely to express interest not just in the TD options tested in this research, but also the fixed price at a premium and real-time pricing plans. One possibility is that this group of customers tends simply to be less "sticky" to existing vendors or services and possibly more risk accepting when considering new options. It is not clear what may be behind this response, but besides being just an attribute that the energy decision maker holds personally, it may be related to the ability of the business to more easily absorb or accept risk with regards to its energy use.

- Likely takers of TD pricing options are somewhat more likely to believe they are on a rate that does not include a demand charge.[15] Why this might be the case is an interesting point to ponder. It may be that those on a rate with a demand charge are set up to control demand, not usage or time of usage and, as such, do not have any mechanisms in place for controlling usage at certain times of the day – making it difficult to imagine how they might do so on a TD rate.

- Likely takers of TD pricing options are more likely to indicate that they have been able to curb their energy use behavior in the past and believe they would be able to do so again if placed on such a TD pricing plan. Likely takers were more likely to indicate that they took action during the 2001 energy crisis and were more likely to have taken more actions at that time that the non-takers. If placed on a TD rate plan, takers are more likely to feel that they would be able to respond by making "maximum" or "some"

[15] Please note: Respondents were asked to report their understanding of whether or not their bill included a demand charge. It is quite possible (and probable) that some number of respondents have reported this incorrectly. While this data may be "incorrect" in some sense of the word, customers' perceptions of reality probably has a greater bearing on their impressions of these rates than reality itself.

adjustments to their energy use without too much difficulty. Conversely, many lacking interest in TD rates feel they have limited control over their electricity use due to the nature of their business or simply feel there is nothing more they could do to curb their use.

- Likely takers of TD pricing options are more likely to believe that the money savings potential is the most important reason for signing up for a TD rate option. Non-takers, on the other hand, are more likely to cite reasons related to the good of California – preventing blackouts and securing California's energy future.

- Overall, there are few differences between likely takers and non-takers of TD pricing plans in terms of their businesses' end uses.

- Those in the food service and accommodation sectors were more likely to be positively receptive to time-differentiated rates. Those in the manufacturing industry, however, were more likely to be non-takers.

Table 3.2 – Differences between Those Most and Least Receptive to TD Pricing

	Most Likely Takers / Most Receptive to TD Rates	Most Likely Non-Takers / Least Receptive to TD Rates
Interest in Other Types of Rates / Equipment Controls Systems		
Most receptive to fixed price rate at a premium	62%[16]	6%
Least receptive to fixed price rate at a premium	16%	84%
Interest in real-time pricing plan (mean rating)	6.0[17]	3.2
Most receptive to equipment control systems[18]	22%	4%
Least receptive to equipment control systems	18%	47%
Current Rate type		
Respondent believes that electric bill does not include a demand charge[19]	31%	17%
Behavioral Differences		
Took 4 or more actions during 2001 energy crisis	48%	30%
Would reduce electricity during weekday afternoons under a TD pricing plan	45%	13%
Some adjustments to electricity use expected to be very difficult	6%	48%
Some adjustments to electricity use expected to be not that difficult	70%	7%
Maximum adjustments to electricity use expected to be impossible to make	1%	26%
Maximum adjustments to electricity use expected to be very difficult to make	15%	36%
Maximum adjustments to electricity use expected to be not that difficult to make	53%	12%
Expect would make "no adjustments" under TD rate	3%	50%
Expect would make "some adjustments" under TD rate	69%	47%
Expect would make "maximum adjustments" under TD rate	28%	3%

[16] All differences between the two groups are significant at the 95% confidence level
[17] Mean rating on a 10-point scale; 1=No chance would sign up; 10=Definitely would sign up
[18] Calculated index; see "Detailed Findings: Distinguishing Likely Takers of Equipment Control Systems" for calculation
[19] Please note: Respondents were asked to report their understanding of whether or not their bill included a demand charge. It is quite possible (and probable) that some number of respondents have reported this incorrectly. While this data may be "incorrect" in some sense of the word, customers' perceptions of reality probably has a greater bearing on their impressions of these rates than reality itself.

(continued)	Most Likely Takers / Most Receptive to TD Rates	Most Likely Non-Takers / Least Receptive to TD Rates
Making changes to electricity use difficult because have limited control of guest / tenant electricity usage	7%	32%
Making changes to electricity use difficult because unable to modify space heating / cooling (can't compromise, guests / tenants/ patients / employee / students comfort; manufacturing process requires certain temp.)	3%	26%
Making changes to electricity use difficult because already doing things to conserve energy use / lack many end uses	<1%	10%
Most Important Reasons for Signing Up for TD Rates		
Saving money by changing electricity use	39%	20%
Common good (reducing blackouts & creating secure energy future for California)	24%	43%
Building structure		
Building 50 years old or older	27%	10%
End Uses		
Air conditioning equipment used – Heat pumps	1%	8%
Electric hot water paid for by respondent	82%	62%
Industry / Primary Business Activity / Building Type		
Primary Industry: Accommodation & Food Service	30%	11%
Primary Industry: Manufacturing	5%	12%
Primary Business Activity: Food Service	18%	4%
Building Type (self-reported)[20]: Food Service	18%	5%

[20] In addition to the building type information provided by the utilities for each respondent, respondents were also asked to self-identify their business' building type. As the reader might expect, this self-identification produced slightly different results from what appeared in the utilities' customer records. Recognizing that both reports have some measure of error, both were used in this analysis.

Detailed Findings: Distinguishing "Likely Takers of Fixed Price at a Premium" Rates

Before continuing on with our discussion of customer response to time-differentiated rates, it is worth taking a short detour first to explore what customer response was to fixed price at a premium rates. The fixed price at a premium rate option was explored in this research as a possible alternative to TD rates. While the treatment of fixed price at a premium options in this report will only be brief, data will be made available for those wishing to explore this option more extensively.

Much like our analysis of time-differentiated rates, this brief analysis will explore the answers to questions like: What kinds of business locations would most want to sign-up for such a rate? Leaving aside the question of how many business locations might choose to sign up, we once again start with the simpler question of whether or not those most likely to sign up are similar to or different from other business locations.

Data Used in This Analysis

In order to explore the general question of "who would be most interested in fixed price at a premium electricity pricing options," the team used customer responses to the appropriate "holdout" task question administered in the survey. As we noted earlier, besides the very detailed responses to the discrete choice exercises, customers were also asked a direct question about their likelihood of participating in a specific fixed price at a premium rate option. The specific option selected for use in this analysis was chosen because it represents a reasonable exemplar of the basic notion of a fixed premium rate.

Table 4.1 – Fixed Price at a Premium Pricing Option Tested in the "Holdout" Tasks, and as a Result, Available for Use in the Rate Taker Analysis

	Fixed price at a premium
Monthly Electricity Bill Savings Impact	5% savings (Max) 0% savings (Some) 10% higher (None)
Days when on-peak periods occur	No on-peak periods
On-peak hours	No on-peak periods
Number of critical days per summer	0
Notice of critical days provided	N/A
Equipment control system provided	No

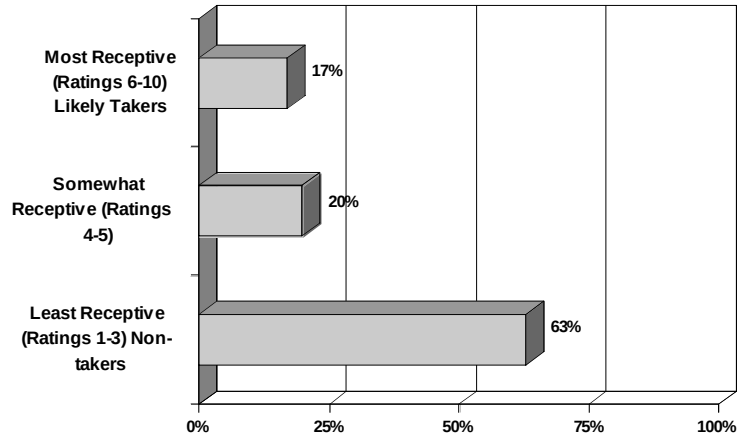
Similar to the analysis done for the TD rate holdout tasks, respondents were then separated into three categories that ranged from likely takers / most receptive, to non-takers / least receptive on the basis of their ratings given to this holdout task. Those with ratings of 6 or higher on the 10-point scale were allocated to the taker / most receptive to fixed premium rates group. Those with ratings of 4-5 are described as "somewhat receptive" and those with ratings of less than 4 were described as non-takers / least receptive.

It should be noted that the score required for classification as a likely taker in this exercise is also less stringent than what is typically used to define "likely takers" (typically ratings of

8 to 10 are used). Overall, there is a general lack of strong interest among customers in signing up for fixed premium rates. For this reason, the definition of a "likely taker" was expanded to provide sufficient data for analysis.

The sizes of each of the groups described above are reported in Chart 4.1 below.

Chart 4.1 – Receptivity to Fixed Price at a Premium Rates



QDC10. If a pricing plan were available to the business location at [ADDRESS] now with the specific options listed below, how likely do you think you would be to sign up for this plan? (1=No chance I would sign up this location; 10=I would definitely sign up this location) n=1002

Again, it is important to note here that by allocating 17% of business customers to the "most receptive" or "likely takers" group, we are not suggesting that it is only this group, or even necessarily this entire group, that is the segment likely to respond to a given fixed price at a premium electricity pricing offering. Rather, the intent of this analysis is simply to identify the group that is "most likely" to participate in such an option.

Now that the most and least likely taker groups have been defined, we can explore whether customers who are more positive in their response to this option are similar to or different from those less positive in their response to this option in important ways. The next section describes the ways in which these two groups of customers differ from each other.

Distinguishing Most Likely Fixed Premium Rate Takers from Non-Takers

Table 4.2 below provides the data that details the differences found between the most and least likely taker groups. Many of the same kinds of differences found between takers and non-takers of TD rates are also found here. Highlights of these differences include that:

- Overall, likely takers of a fixed, premium rate appear to be more open to new products and services. Takers are more receptive to TD rates, equipment control systems, and real-time pricing plans.

- Characteristics of likely takers' current rate appear to be correlated with their receptivity to a fixed, premium rate. Likely takers of a fixed premium rate tend to be more likely to believe that their bill does not include a demand charge. Likely takers are also more likely to be SCE customers, to be on a non-TOU rate, and to not be sure if their rate

includes a demand charge.

- Takers are less likely to have made energy reductions in the 2001 crisis, but they are more likely to feel that making reductions to TD rates would not be that difficult.

- There were only few differences between takers and non-takers in terms of how they used electricity. Likely takers are more likely to have CAC, however they are also more likely to operate their thermostat by turning it off during operating hours during the summer and by setting it for more than 80 degrees during closed hours in the summer.

Table 4.2 – Differences between Those Most and Least Receptive to Fixed Price at Premium Pricing

	Most Likely Takers / Most Receptive to Fixed Premium Rates	Most Likely Non-Takers / Least Receptive to Fixed Premium Rates
Interest in Other Types of Rates / Equipment Controls Systems		
Most receptive to TD rates[21]	37%[22]	3%
Least receptive to TD rates	24%	86%
Interest in real-time pricing plan (mean rating)	5.3[23]	3.5
Most receptive to equipment control systems[24]	20%	5%
Least receptive to equipment control systems	23%	44%
Current Rate type		
Respondent believes that electric bill includes a demand charge	20%	39%
Respondent not on TOU rate, does not believe electric bill includes demand charge	30%	16%
Utility Provider by Rate		
PGE, non-TOU rate	26%	41%
SCE, non-TOU	54%	38%
PGE, non-TOU rate with a demand charge	7%	17%

[21] Calculated index; see "Detailed Findings: Distinguishing Likely Takers of TD Rates" for calculation
[22] All differences between the two groups are significant at the 95% confidence level
[23] Mean ratings on a 10-point scale; 1=No chance would sign up; 10=Would definitely sign up
[24] Calculated index; see "Detailed Findings: Distinguishing Likely Takers of Equipment Control Systems" for calculation

Detailed Findings: Distinguishing "Likely Takers of Fixed Price at a Premium" Rates

(Continued)	Most Likely Takers / Most Receptive to Fixed Premium Rates	Most Likely Non-Takers / Least Receptive to Fixed Premium Rates
PGE, non-TOU rate, not sure if have a demand charge	8%	22%
SCE, non-TOU, not sure if have a demand charge	30%	15%
Behavioral Differences		
Reduced electricity usage during 2001 energy crisis	7%	18%
Maximum adjustments to electricity use expected to be impossible to make	9%	24%
Maximum adjustments to electricity use expected to be not that difficult to make	32%	16%
Expect would make "maximum adjustments" under TD rate	21%	5%
Feel already doing everything can to conserve electricity	<1%	10%
Building structure		
2000 or less square feet	52%	34%
End Uses		
Has / pays for air conditioning	74%	62%
Thermostat turned off during operating hours in the summer	4%	18%
Thermostat set for more than 80 degrees for largest operating space during closed hours of summer	2%	14%
How water uses for apartments / tenant kitchens	<1%	5%
Utility Provider		
PG&E	30%	47%
SCE	54%	38%
Utility Provider by Climate zone		
PGE, zone 3	1%	9%
SCE, zone 3	23%	11%

Detailed Findings: Understanding Customer Response to Specific Pricing Features

One of the critical objectives of the research was to develop an understanding of how customers assess the different building blocks of a TD or fixed rate at a premium pricing program. Certainly, we expect them to care about the savings that might be implied by any such program, and to attach more value to the expectation of greater savings. But are potential savings the only thing they care about? Does everything else in terms of pricing program design pale in comparison? How much does the type of billing program (fixed vs. time-differentiated or variable) matter? How much do on-peak hours matter, and to the extent they do, which on-peak periods do they like most (and least)? How much does the number of critical days matter (in CPP designs), and does each addition of critical days matter by the same amount?

In order to understand how to design a pricing program that has the best chance of being successful, or simply to design an option that appropriately takes into account the different tradeoffs that drive business customer responses to TD options, it is important to understand first how business customers respond to each element of TD options separately. Once we understand how business customers evaluate each of the separate building blocks that can be used to construct a TD option, we can explore how to combine those building blocks to create attractive TD options and to estimate how business customers are likely to respond to each of several pricing options that could be constructed from those building blocks.

Identifying Pricing Program "Building Blocks"

The first step in this process for the research team was to define the building blocks that could go into defining (or "constructing") a pricing option. Ultimately, the team selected the following set of eight pricing program building blocks:

- Bill impact with maximum adjustments: This element of a pricing program involved describing for customers the savings they would be likely to see if they made "maximum adjustments" in the way they used electricity during peak periods. The questionnaire provided examples for respondents of what it would mean to make "maximum adjustments" and provided different examples for customers depending on their energy usage. Bill savings levels tested in the survey varied from:
  - 20%
  - 15%
  - 10%
  - 5%

- Bill impact with some adjustments: This second building block used to define pricing options in the research involved describing for customers the savings they might expect if they only made "some adjustments" in the way they use electricity during peak periods. As with "maximum adjustments," "some adjustments" were defined for respondents, taking into account respondent energy use and equipment holdings. Unlike the first bill impact elements, the impact here could be negative. That is, under some scenarios, customers were told that if they made only some adjustments, then their bill could actually increase by some amount. Bill impact from "some adjustments" could vary from:

- 10%
- 7.5%
- 5%
- 2.5%
- 0% (no change)
- 2.5% bill increase
- 5% bill increase

- Bill Impact with no adjustments: The next building block used to define pricing program alternatives for customers was to specify the bill impact they might expect if they made "no adjustments" to their usage during peak periods. Like the bill impact for "some adjustments" the impact here could be negative. That is, under some scenarios, customers were told that if they made no adjustments, then there bill could increase by some amount. Similarly, in some cases, if they made no adjustments they were also told that they could realize some savings. Bill impacts from making no adjustments could vary from:
  - 5% savings
  - 0% (no change)
  - 5% bill increase
  - 10% bill increase
  - 15% bill increase

- Duration of on-peak periods: The fourth building block used to define a pricing option, and the first that did not involve bill impacts, was to specify the times of the day when on-peak periods would occur. Leaving aside the question for now of on how many weekdays these peak periods would occur, these peak periods were allowed to vary from:
  - 12- 5 pm weekdays
  - 12-6 pm weekdays
  - 12-7 pm weekdays
  - 1-6 pm weekdays
  - 1-7 pm weekdays
  - 2-6 pm weekdays
  - Variable periods (defined as usually 12-6 pm, but sometimes shorter)
  - No on-peak periods

  Included in the specification of this building block was an option for no on peak periods which would be used in the specification of a fixed, non-time-differentiated rate.

- When on-peak periods occur: This element of the pricing design differentiates pricing options that have on-peak periods every weekday (such as TOU options or CPP-F / CPP-V options with an underlying TOU structure), from those that have on-peak periods only on critical days (such as a pure CPP options), or from those that do not have any on-peak periods (fixed, non-time-differentiated rates).

- Number of critical days: This program building block defines the number of critical peak days in the year (as distinguished from what might be thought of as the "everyday" peak periods that might occur with a TOU option) during which on-peak prices will be particularly high. This element can vary from:
  - 0 days
  - 5 days
  - 10 days

- 15 days
- 20 days

For a pure TOU rate option or for a fixed, non-time-differentiated option, this element will always be 0.

- Whether or not appliance controls are provided: One of the ways to make customer response to on-peak pricing easier is to automate their response to on-peak times. If customers were provided with an equipment control system to be used on their business premise as part of the program design, this type of response would be enabled. This building block specifies whether or not such a control system is to be provided to customers. This option is only made available for time-differentiated rates which have critical days (CPP rates).

- When notice of a critical day event is provided: The final building block is when customers are told that a given day will be a critical peak day (assuming the number of such days in the program is more than zero). This program feature could be either that notice was provided the day before a critical peak day was called, or only provided the morning of the critical day.

Given the specification of these building blocks, our next step was to explore how customers assign value to each (i.e., how much they "care" about each). As the Methodology section of this report outlines, the team used discrete choice analysis to understand customer preferences for these different program elements (see the Methodology section for a full discussion of the research tasks used and analysis procedures employed).

How Customers Value the Price-Related Program "Building Blocks"

Our key question at this point was to understand how much business customers care about each of the different pricing program building blocks. In part, our question was, which building blocks do they care most about? In addition, however, we also care about understanding how much business customers value different program building blocks in comparison with one another (that is, sure they care about savings, but are savings much more important than everything else?), and we care about understanding how much customers value the range of options that each program building block can take (i.e., we would expect them to like 20% savings more than 10% savings, but is the share of customers who would select a time-differentiated program twice as great if they can save 20% than it is if the maximum they can save is only 10%?).

The data used to answer these questions are generated from the discrete choice analysis and these calculated values are called "utilities," with the label coming from a traditional economics-based notion of the term "utility" (that is, a measurement of the value that a person assigns to a thing). A "utility" value, in this language then, is simply an arithmetic representation of the relative value that respondents placed on each level of each building block. And while these utility values do not have a direct application or interpretation in the "real world," they are directly interpretable as indicators of the relative value that business customers assign to different program building blocks.

Let's take an example. Consider Table 5.1 below. In this table we report average utility values for respondents in the survey (weighted to represent all business premises in the eligible universe). What the table says is that, on average, customers assign a mean

"utility" value to 20% savings of .66. The mean utility value for 15% is .21, for 10% it is negative .23 and for 5% it is negative .65.

What does this tell us? For starters, since the utility value for 20% is positive, and the highest value, it tells us that customers value ("like") 20% savings the most, followed by 15% savings, 10% savings and 5% savings. There is no surprise in those results, but the interesting part comes when we start comparing these results to those for other building blocks[25].

Table 5.1 – Utility Values for Bill Impact with Maximum Adjustments

Bill Impact with Maximum Adjustments	
Savings Level	**Utility**
20%	.66
15%	.21
10%	-.23
5%	-.65

Table 5.2 provides comparative utility values across the different bill impact adjustment levels, and in reviewing the different patterns observed, several important outcomes emerge:

- Customers appear to worry more about having to make adjustments to electricity usage and bill increases that might occur under a new pricing program than they care about the savings they might experience. This difference is indicated by the relative size of the extreme utility values for maximum, some, and no adjustments. For maximum adjustments the highest positive utility is .66, while for some adjustments, the equivalent value is .75. While this may not appear to be a large difference, it represents a 14% difference in relative "value" to customers. Then, in looking at the highest positive utility for no adjustments, we see that it is even larger – 1.41. Thus, moving from some adjustments to no adjustments represents an *88% difference in relative value*. If we were to compare the highest positive utility value for maximum adjustments to that of no adjustments we see that the difference between the two represents an even larger relative value to customers – 114%!

  The implication of this difference is that while customers care about – and value – the savings they can realize, they value even more the possibility of not having to change their energy use and the potential loss if they make no adjustments. The potential of "losing" 5% on their bill more than outweighs the positive value associated with moving from a savings of 5% to a savings of 10% on their bill.

- Customers do not weigh what might appear to be equivalent economic outcomes the same. Implicit in what we said above is the finding that customers attach more value to a potential "loss" of 5% (moving from a 5% savings to a 0% savings on their bill) than a potential "gain" of 5% (moving from a 5% savings to a 10% savings on their bill). Simplistic economics might suggest that customers would be expected to attach a

[25] Note that the fact that the utility values for each building block sum to zero across the different levels is an artifact of the analytic procedure.

positive value to a potential 5% savings gain that is at least equal to the negative value they attach to a potential 5% loss. This is not the case, however.

Furthermore, adding to this seeming incongruence, we find that customers attach more value to the potential "loss" of 5% when making no adjustments (moving from a 5% savings to a 0% savings on their bill) than the same potential "loss" of 5% (moving from a 5% savings to a 0% savings on their bill) when making some adjustments.

Table 5.2 – Utility Values for Bill Impacts across Adjustment Levels

	Savings Level	Utility
Bill impact with Maximum **adjustments**	20%	.66
	15%	.21
	10%	-.23
	5%	-.65
Bill impact with **Some** adjustments	10%	.75
	7.5%	.49
	5%	.24
	2.5%	-.01
	0%	-.25
	2.5% increase	-.49
	5% increase	-.72
Bill impact with **No** adjustments	5%	1.41
	0%	.67
	5% increase	-.03
	10% increase	-.70
	15% increase	-1.35

Before moving on, it is worth noting another bit of complexity in the pattern of responses to potential bill impacts. In the choices that customers evaluated in the survey, they did not actually see descriptions of percentage bill impacts. Instead, customers were shown absolute dollar value bill impacts that mapped – in percentage terms – appropriately to their actual bills.

Rather than seeing that a given pricing program might save them 10% in other words, they were shown that it might save them $100 (if their bill was $1,000), or $50 (if their bill was $500). The reason for doing this was to simplify the exercise for respondents (so that they did not have to apply percentages to their own bills in their heads – leaving aside the issue of whether or not they could do so correctly or recall their bills correctly), and to make it more relevant to them.

What this allowed the team to do in addition, however, was to explore the question of the degree to which the total "value" that respondents attach to each amount of potential savings was driven by: 1) the percentage value and 2) the size of their own electric bill. It might have been the case, for example, that everyone attached the same value to a 10% savings. Alternatively, it might have been the case that 10% savings is "worth more" to

some respondents than others depending on the size of their bill. Is $100 "worth more" than $50 if they both represent a 10% savings on an electric bill?

The table below answers that question. The table first replicates from above the total value that customers attach to the different levels of savings that might accrue from maximum adjustments. Following this, the table disaggregates this total value into the portion that is accounted for by the percentage savings statements and the portion that is accounted for by the absolute size of the respondent's bill (reported as the dollar-metric values).
The results in the table indicate that most of the value associated with "bill impact with maximum adjustments" comes from the percentage statement of the savings (20%, 15%, 10%, 5%). In addition, however, a small amount of additional value is attached to the higher savings values by those people with higher bills. For a 20% potential bill savings, the raw percentage savings contributes +.61 out of the total of +.66 total utility, but another +0.06 (or around 9% of the total utility) is contributed by the dollar-metric component. This means that the higher a respondent's current electric bill, the more they tend to like higher savings levels, and that on balance, the size of a respondent's electric bill contributes around 9% to the total value they attribute to a given savings level.

Table 5.3 – Utility Values for Bill Impacts Given MAXIMUM Adjustments Accounting for Dollar-metric Contribution

	Savings Level	Utility
Total **Bill Impact**	20%	.66
	15%	.21
	10%	-.23
	5%	-.65
Percentage Bill Impact	20%	.61
	15%	.19
	10%	-.21
	5%	-.59
Dollar-metric Bill Impact	20%	.06
	15%	.02
	10%	-.02
	5%	-.06

Similar patterns appear for the other bill impact values (under "some adjustment" and "no adjustment" options), as the data in Table 5.4 below show. In each case, the directional impact of the dollar-metric values is the same. Those customers with higher bills reinforce the value they give to percentage savings impacts (they tend to "like" a given percentage savings value more than do those with lower bills, and they tend to "dislike" a given percentage potential bill increase more than do those with lower bills).

Table 5.4 – Utility Values for Bill Impacts Given SOME and NO Adjustments Accounting for Dollar-metric Contribution

Some Adjustments		
Total Bill Impact	**Savings Level**	**Utility**
	10%	.75
	7.5%	.49
	5%	.24
	2.5%	-.01
	0%	-.25
	2.5% increase	-.49
	5% increase	-.72
Percentage Bill Impact	10%	.64
	7.5%	.42
	5%	.2
	2.5%	-.01
	0%	-.22
	2.5% increase	-.42
	5% increase	-.62
Dollar-metric Bill Impact	10%	.10
	7.5%	.07
	5%	.03
	2.5%	.00
	0%	-.03
	2.5% increase	-.07
	5% increase	-.10
No Adjustments		
Total Bill Impact	5%	1.41
	0%	.67
	5% increase	-.03
	10% increase	-.70
	15% increase	-1.35
Percentage Bill Impact	5%	1.34
	0%	.64
	5% increase	-.03
	10% increase	-.67
	15% increase	-1.28
Dollar-metric Bill Impact	5%	.07
	0%	.04
	5% increase	.00
	10% increase	-.04
	15% increase	-.07

How Customers Value Non Price-Related Program "Building Blocks"

The different values that survey respondents attached to the other six pricing program building blocks are reported in Table 5.5 below. These other building blocks have to do with the number / timing of on-peak periods and other related issues. Please note that the "Billing Type" attribute was not a program feature seen by respondents. This attribute was actually embedded in the specification of the other five program building blocks. Thus, for example, a flat billing type would be specified by designing a rate that never has on-peak periods, has no critical peak days (and thus no critical peak day notice), and no automated equipment controls. For analysis purposes, the billing type has been teased out of these other five attributes in order that we may more easily understand customer response to the two possible billing types (time-differentiated pricing and flat pricing) and so that our analysis of duration of on-peak periods is comparable to the analysis conducted for residential customers in a separate report. An examination of this table tells us several things, including that:

- Of these six non-price-related attributes, billing type is the most important (since it is the program feature with the greatest positive and negative utility values among this group). Within this feature, customers most prefer the flat rate billing option.

- The number of critical peak days is the next most important attribute. Within this feature, customers most prefer the option for 0 critical peak days, representing a TOU only rate option.

- How often critical peak days occur (whether they are every day or only on critical days) is an important issue for respondents, though less so than critical peak days and billing type. Most customers prefer for peak periods to occur only on critical peak days, despite the contradictory desire for 0 critical peak days as noted in the bullet above.

- "Duration of on-peak periods" is relatively less important than some of the other program features. Within this feature, customers most prefer the 2-6pm on peak period, which was the shortest tested duration of 4 hours. The two second most preferred on-peak periods were 1-6pm and 12-5pm, each at 5 hour duration.

- The provision of an automated equipment control system is somewhat important, with most preferring that no control system is provided.

- Issues of when critical day notice is provided appears to be less important than other issues.

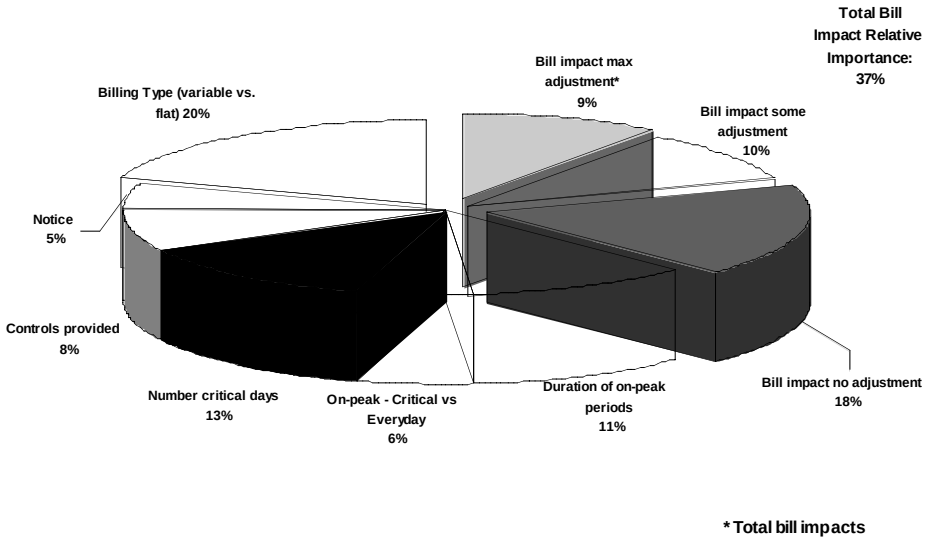
Table 5.5 – Utility Values for Non-Price Program Features

Program Feature	Level	Utility
Billing Type	Time Differentiated	-.83
	Flat	.83
Duration of on-peak periods	12-5pm	.05
	12-6pm	-.09
	12-7pm	-.23
	1-6pm	.06
	1-7pm	-.04
	2-6pm	.22
	Varies (typically 12-6pm, but could be shorter)	.02
How often on-peak periods occur	Every weekday	-.33
	Only on Critical Peak days	.33
Number of critical peak days	0	.79
	5	.10
	10	-.19
	15	-.33
	20	-.38
Automated equipment control system provided	No	.28
	Yes	-.28
Notice of critical peak day provided	Day before	.09
	That morning	-.09

Chart 1.1 below provides an integrated summary of the relative importance of each of the pricing program features tested for predicting customer preference for particular rate option. A customer's conclusion about how much they prefer a given rate option might be described as being driven proportionally by the different building blocks that go into defining that option. The reported results say that 20% of a given preference is driven by the billing type and that 18% of that preference is driven by the bill impact with no adjustments, with the other building blocks contributing as indicated. A change in the way a given rate option is constructed that involves billing type or bill impact for no adjustments should have a much greater effect on overall customer preference than might a change in the timing with which critical peak notice is provided.

It is worth noting that in aggregate the three savings-related program building blocks, taken together, drive 37% of customer preference for a given program design – a significant amount, but less than half. Alternatively, the program building blocks that have to do with if, when and how often on-peak periods and critical peak days occur, taken together, drive 50% of customer preference for a given program option, surpassing the contribution of the savings potentials.

Chart 5.1 – Relative Importance of Pricing Features



Understanding Customer Variability in Preference for Specific Product Features

While the previous section describes average, or aggregate, information about the way that business customers in total evaluate different pricing program building blocks, there is a second question looming here: Do businesses differ substantially in the way they respond to these features? That is, do all businesses customers tend to have the same reaction to each program feature – or to the relative importance of the different features – or do some types of businesses respond consistently in a different way?

If the latter issue is true – if businesses are systematically different in the way they evaluate different pricing program building blocks – then this might have important implications for developing a segmented approach to the marketplace. It might mean, in other words, that different program combinations could be appropriate for specific types of businesses.

In order to answer this question, the team looked not just at average utility values for each of the levels making up the different pricing program building blocks, but also at the way that different types of businesses assigned value to each feature. The team looked, for example, at business segments defined by climate zone, utility, pattern of usage, existing rate plan, type of business, size of business, hours of business operation and other attributes, and compared the way each of these different segments assigned utility (or value) to each of the levels of each building block.

The goal of this analysis was to see if there were any patterns in the way that different business segments assigned value to different features. Do businesses that have a pattern of high energy use, for example, assign values to different pricing program features in a

different way than those with lower energy use? Do business customers in hotter climate zones assign values differently than do business customers in cooler climate zones?[26]

Ultimately, while the end result of this analysis might have been very complicated (since there are many possibilities for differences between groups and it is easy to hypothesize ways in which, and reasons for which, different groups may have different opinions on issues such as these), there is a single, overriding outcome to the analysis[27]. It is that:

- Businesses who use *more* energy (as measured indirectly by using other indicators such as climate zone, number of employees, size of building,) attach *more* value to the savings that a pricing program might yield even after the contribution of actual bill size-to-savings utilities has been taken into account.

In analyzing these results it was found that businesses who use more energy tended to assign higher utilities to a given percentage savings level. This means that businesses with larger electricity bills "liked" a given percentage savings level (5%, 7.5%, 10%, etc.) more than did an equivalent business with a smaller bill. It was for this reason that the analysis of aggregate utilities included a "dollarmetric" component of utility for each savings level. The data presented earlier described a "total utility" for each savings level that was partly driven by the percentage savings level and partly driven by the average dollar amount of the respondent's electric bill.

What the results in this section suggest is that, once the contribution of a respondent's electric bill to their evaluation of the value of savings is taken into account, businesses with higher usage still attach more utility to higher percentage savings levels, as well as viewing potentially higher bills (in percentage terms) more negatively. However, despite this, potential dollar savings produces larger differences in perceived value between these two groups of high and low energy use customers than corresponding percentage savings. The tables below highlight this pattern.

Table 5.6 - Variation in Utilities by Business Energy Usage

Energy	10% Bill	10% Bill	10% Bill	7.5% Bill	7.5% Bill	7.5% Bill

[26] It is important to recognize that this analysis explores a meaningfully different issue than does the "taker" analysis discussed elsewhere. Here, the issue is to understand which types of business customers attach more or less importance to given specific features that can be used to define a time-differentiated program. Taker analysis explores simply which customer groups were generally more or less likely to sign up for a time-differentiated program.

[27] Certainly, the analytic team observed a number of other specific differences in the utility values that different specific business subgroups assigned to unique levels of the various particular program features when compared to customers overall. In each of these other cases, however, there did not appear to be any consistent pattern in those differences within subgroup across multiple program building blocks.

Usage	Impact Some Adjustments (total)	Impact Some Adjustments (%)	Impact Some Adjustments ($)	Impact Some Adjustments (total)	Impact Some Adjustments (%)	Impact Some Adjustments ($)
High[28]	1.03	.72	.31	.67	.47	.20
Low	.70	.63	.07	.46	.41	.05

Energy Usage	5% Bill Impact Some Adjustments (total)	5% Bill Impact Some Adjustments (%)	5% Bill Impact Some Adjustments ($)	5% Higher Bill Impact Some Adjustments (total)	5% Higher Bill Impact Some Adjustments (%)	5% Higher Bill Impact Some Adjustments ($)
High	.33	.23	.10	-1.0	-.70	-.30
Low	.22	.20	.02	-.70	-.60	-.10

Table 5.7 further supports the observation that high energy use customers more highly value potential savings. When holding climate zone constant, high usage businesses still value potential savings achieved with some adjustments much more than their lower usage counterparts.

Table 5.7 - Variation in Utilities by Business Energy Usage & Climate Zone

Energy Usage	10% Bill Impact - Some Adjustments (Total)			
	Zone 1	**Zone 2**	**Zone 3**	**Zone 4**
High (20-200kw)	1.33	.99	.96	1.27
Low (0-20kw)	.75	.73	.67	.63

We might also expect for the number of employees at the business location to be somewhat correlated to a business' energy usage, so it is not surprising that we see similar patterns for how potential savings is valued by number of employees. As number of employees (and presumably, more energy use) increases, the value of potential savings with some adjustments also increases, which is presented in Table 5.8. Conversely, as the number of people working at a location increases, the potential for a higher bill when making some adjustments is more negatively valued.

Table 5.8 – Variation in Utilities by Business Size (# of employees)

[28] For SDG&E, high usage was defined as 20-100kw.

# of People Working at Location	10% Bill Impact - Some Adjustments (Total)	5% Higher Bill Impact - Some Adjustments (Total)
0	.65	-.63
1-24	.72	-.69
25-49	.93	-.90
50+	1.09	-1.06

Those businesses that have and pay for air conditioning, heat, and hot water also show similar characteristics as a group to high energy usage businesses. One might assume that these businesses have higher electric bills than those without these end uses (as well as those that do not have to pay for them.) As might be expected, businesses with responsibility for paying for these end uses see more value in potential savings than their counterparts, as illustrated in the tables below. These businesses also significantly devalued any rate plans that proposed higher bills as a result of TD pricing.

Table 5.9 – Variation in Utilities by Heat Use / Responsibility

Heat	10% Bill Impact - Some Adjustments (Total)	7.5% Bill Impact - Some Adjustments (Total)	5% Bill Impact Some Adjustments (Total)	5% Higher Bill Impact - Some Adjustments (Total)
Have & Pay for	.79	.52	.25	-.76
Don't Have or Don't Pay for	.62	.41	.20	-.60

Table 5.10 – Variation in Utilities by Hot Water Use / Responsibility

Hot Water Responsibility	10% Bill Impact - Some Adjustments (Total)	7.5% Bill Impact - Some Adjustments (Total)	5% Bill Impact Some Adjustments (Total)	5% Higher Bill Impact - Some Adjustments (Total)
Have & Pay for	.78	.51	.25	-.75
Don't Have or Don't Pay for	.67	.44	.21	-.65

The tables below provide summary information about the impact that other key respondent differences make in how respondents assign value to the various elements of a pricing program.

PG&E's customers assign more value to potential savings when making some adjustments to their electricity use than customers from either of the two utilities. Similarly, PG&E customers also more highly value a zero impact to their bill when making no adjustments to their behavior.

Table 5.11 – Variation in Utilities by Utility Provider

Utility Provider	10% bill impact some adjustments (Total)	0% bill impact no adjustments (Total)
SCE	.68	.58
PG&E	.80	.75
SDG&E	.77	.69

Customers that are already currently on a TOU rate more highly value potential savings when making some adjustments and zero impact for making no adjustments.

Table 5.12 - Variation in Utilities by Type of Rate Plan

Rate Plan	10% bill impact some adjustments (Total)	0% bill impact no adjustments (Total)
TOU	1.00	.84
Non - TOU	.71	.65

Among building types, hospitals stood out among businesses as being particularly attracted to the savings that might be possible through a new pricing program, as detailed in Table 5.13. For example, for the pricing plan that offered 10% savings for some adjustments, hospitals had a 70% higher utility value than any other building type.

Table 5.13 - Variation in Utilities by Building Type

Building Type	10% bill impact some adjustments (Total)	7.5% bill impact some adjustments (Total)	5% bill impact some adjustments (Total)	5% higher bill impact some adjustments (Total)
Hospital	1.70	1.12	.54	-1.65
Food Sales	1.00	.66	.32	-.97
Manufacturing	.87	.57	.27	-.83
Retail	.70	.46	.22	-.68

The last table in this section, Table 5.14, suggests that the greater a business' electricity costs when considered as a portion of their total operating costs, the less likely the business is to prefer a flat billing rate, as opposed to a time-differentiated rate.

Table 5.14 - Variation in Utilities for Billing Type by Electricity Costs

Electricity as % of Total Operating Costs	Billing Type: Flat (Non-TD Rate)
<5%	1.04
5-9%	.80
11-19%	.68
20%+	-.11

Detailed Findings: Estimating Market Potential

The focus of the discussion so far has been on understanding how business customers assign value to the different building blocks that make up a potential rate option. At this point, however, the goal is to move beyond understanding how business customers evaluate the different piece-parts of a new pricing program and understand how business customers might react to whole pricing programs that could be offered. Specifically, the goals of this section of the report are to:

- Explore for several sample pricing options the way that program design affects anticipated customer response
- Explore the sensitivity of anticipated customer response for a specific program to changes in the details of program design
- Provide estimates for several sample market scenarios of the way that customers might be anticipated to respond to different pricing program market introduction strategies that vary in terms of the number of rates offered and the default condition to which customers are assigned.
- Explore how customer response to the different pricing programs evaluated might differ by several relevant customer groups of interest.

The Core Example Pricing Products Used in This Section

The remainder of this chapter uses the eleven pricing options listed in Table 6.1 as the central examples used in the analysis of anticipated market response. Three of the ten specific pricing options (labeled as "SPP" in the table) were chosen, in part, because they map as closely as possible to the pricing options currently being used in the residential SPP program[29]. Additionally, several of the rates without TOU components were chosen in part because they

Rate Options

The market simulator provided as an accompanying deliverable to this report makes it possible to estimate customer response to every rate option that can be defined with variations in the rate program building blocks specified earlier in this section. The rate options that can be evaluated cover TOU options, CPP options (with both fixed and variable components), "pure" CPP options (with on-peak periods only on critical dayjs), fixed rate at a premium options, and others. In total, more than 44,800 different pricing options can be evaluated.

[29] Please note that the team did their best to accurately predict reasonable savings levels possible under each of the electricity usage scenarios presented to customers (maximum, some, and no adjustments in electricity usage behavior). However, hindsight being 20/20, it was found that the savings levels tested did not map as well as hoped once initial analysis was done on the SPP program data. Thus, the rates here come as close as possible to the pilot rates tested given the constraints of our design.

Note also that the way the rate for each of these pricing options was communicated to respondents in the Customer Preferences Market Research was different from how it was communicated to SPP pilot participants, which has implications for our ability to specify the SPP rates using the features and levels tested in the conjoint. While SPP pilot participants were given prices per kWh for off-peak, peak, and super peak times, the CPMR participants were given an explanation of the rate by describing dollars saved for maximum, some, and no adjustments in electricity use behavior. At no time did the survey refer to prices per kWh. So, while perhaps not exact, we have as best as possible attempted to represent the SPP pilot rates through the various combinations of bill impacts at the maximum, some, and no adjustments levels.

represent other new pricing programs that the team viewed as potentially interesting. Additionally, the team felt it would be informative to understand how the SPP rates, modified to include the best possible savings as tested in this design, would fare against each other. Market response to a wide variety of other pricing programs could be estimated (see the sidebar on "Pricing Product Options"), and the products tested here are intended only as examples of the types of results that can be calculated for each product. The market simulation tool provided as an accompanying deliverable to this report allows analysts to explore anticipated customer response for every rate option that can be estimated from the CPMR database.

Please note that the eleventh option, the current rate (which could be a TOU rate, a non-TOU rate without a demand charge and a TOU rate with a demand charge, depending on the customer), is also used in this analysis of customer response to various market scenarios. Analysts can choose to include or exclude the current rate (listed as "none" in the market simulator that accompanies this report) in any market simulation, as well as set it as the default or opt-in option. If desired, analysts can also look at the share results for a number of different subgroups, including by the three different "current rate" subgroups noted above.

Table 6.1 – Base Pricing Options for Market Share Analysis

Rate Option	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9	Option 10	Option 11
Rate Type	**CPP-F (SPP)**	**CPP-F (Best savings)**	**TOU (SPP)**	**TOU (Best Savings)**	**CPP-V (SPP)**	**CPP-V (Best Savings)**	**Pure CPP-V**	**Pure CPP-V (Best Savings)**	**Pure CPP-F**	**Pure CPP-F (Best Savings)**	**Current Rate (TOU, Demand, Non-Demand)**
Bill Impact max adj. (20% - 5% savings) *	10%	20%	10%	20%	10%	20%	10%	20%	10%	20%	
Bill impact some adj. (10% savings – 5% higher bill) *	2.5%	10%	2.5%	10%	2.5%	10%	5%	10%	5%	10%	
Bill impact no adj. (5% savings – 15% higher bill) *	0%	5%	0%	5%	0%	5%	5% higher	5%	5% higher	5%	
On peak period (12-5, 12-6, 12-7, 1-6, 1-7, 2-6, Varies; none)	12-6	12-6	12-6	12-6	Varies	Varies	Varies	Varies	12-6	12-6	
On peak periods occur (Every weekday, Only on critical days, N/A)	Every weekday	Every weekday	Every weekday	Every weekday	Every weekday	Every weekday	Only on critical days	Only on critical days	Only on critical days	Only on critical days	
Number of critical days (0, 5, 10, 15, 20)	15	15	0	0	15	15	15	15	15	15	
Controls provided (Yes, No, N/A)	No	No	No	No	Yes	Yes	Yes	Yes	No	No	
Notice of critical days provided (N/A, day before, that morning)	Day before	Day before	N/A	N/A	That morning	That morning	That morning	That morning	Day before	Day before	

Exploring a Starting Point Market Scenario

Recall that the focus in this section of the report is to translate the specific preferences that customers have for individual rate features into estimates of the way that customers might respond to an offer to participate in such rate programs if they were available in the marketplace today. We care here, in other words, not just about the degree to which customers "like" or "don't like" specific pricing design features, but about estimating how customers would respond in the marketplace if they had an opportunity to sign up for a new TD pricing option that might be offered.

We begin this discussion by working through a simple market scenario. This scenario will give us the opportunity to explore two issues that are critical to understanding the final estimates of anticipated customer response that will be provided later in this section for a selected group of market scenarios:

1) sensitivity to rate design features

2) market-based adjustments to customer share-of-preference estimates

The simple rate design scenario that will be used here to explore these issues is one in which we assume that customers have to express a preference between one of two options: the rate they are currently on and

Estimating "Share of Preference"

The analytical approach used in this research presupposes that it is possible to estimate how much value individual survey respondents would assign to a new pricing program that can be defined by the features tested in the survey. Since we know how each respondent assigns value to each specific program feature, we can essentially add up the value each respondent would attach to the group of features that make up a specifically tested option. The sum of the individual values that each respondent would assign to a given pricing product is called the "total utility" for that product for that respondent (this total utility value is, essentially, a summary quantitative measure of the total value the customer would assign to that product). Given a choice among rate options, the analysis assumes that we can estimate how customers would go about making a choice by comparing the "total utility" values they would assign to each of the tested options. Customers are assumed to be more likely to prefer the option that has the higher calculated total utility. The analysis assumes that customers rarely prefer one option to the exclusion of all others. That is, they probably like one option more than the others (though sometimes there will be ties), but they usually like each option to some degree. As a result, the analysis distributes a given respondent's "preference" proportionally across the available options based on a logistic regression equation. For any given set of rate options, then, the logistic regression analysis yields an estimate of the share (or proportion) of a given respondent's preference that would be allocated to each option (as an example, a given respondent might have an 80% preference for Option1 and a 20% preference for Option 2). The analysis then treats the estimates of share of preference, once they have been weighted and aggregated across all customers as an estimate of the way that customer "share of preference" is distributed across the options. To say that Option A has a 50% share of preference, however, does not mean that 50% of all customers would choose that option in a "live" environment.

Please note that our prior analysis of the utilities achieved for each program building block and its respective levels did not include those customers that

familiar with, or the rate described as the CPP-F (SPP) defined in Table 6.1. Note that for purposes of this example we start with a scenario in which customers have to express a preference between these two options, meaning that there is no "starting point" or "default" condition (it is not the case that if they express no preference, then they are assigned to one or another condition; they are only assigned [on a proportional basis] to a condition based on the proportional distribution of their preference across the two options).

chose the "none" option (or by implication, their current rate) for all scenarios / products simulated.

Thus, without any preferences expressed, utilities cannot be calculated for these individuals (which was approximately 20% of our sample). However, when estimating share of preference, these individuals' preferences are taken into account, with their preferences for the current rate being expressed as additional share for the current rate.

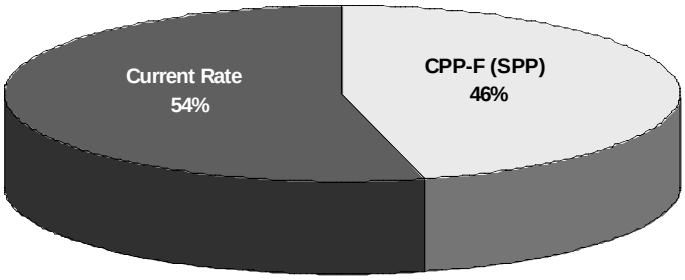
One result of having this fairly large number of respondents for which no utilities could be calculated (20%) in this research appears to be a flattening or reduction of the impact of changes in feature levels (for example, moving from 15 to 20 critical days) on overall share. This, and the issue of translating "share of preference" into "anticipated customer response" are taken up below.

We recognize that this situation is atypical and indeed unlikely in the "real world." Even so, we use this example because it represents the simplest, starting point case for market assessment because it means that we are not making any adjustments to account for decision-making inertia, risk avoidance, awareness, or any other issues, and allows us to understand initial customer preferences for different options and the ways in which those preferences vary depending on rate features.

As a result, it is important to recall for this section that the share of preference estimates provided are an indication of simple, initial estimates of the way that customers would assign preference to different choice options, assuming they were fully aware of each option and that their preferences were completely unconstrained by any other factor. As such, **these share of preference values are not intended to be "market share forecasts" and should NOT be viewed as estimates of "likely market share**." We take up issues of translating estimates of share of preference into best available estimates of anticipated customer response later in this section. The goal for now is simply to explore how sensitive unadjusted share of preference values are to variability in rate design.

Chart 6.1 below provides summary results for the situation described above: customers assign relative preferences to only two options (their current rate and the CPP-F SPP rate). In this scenario, the CPP-F rate achieves a 46% share of preference, while the current rate achieves a 54% share of preference.

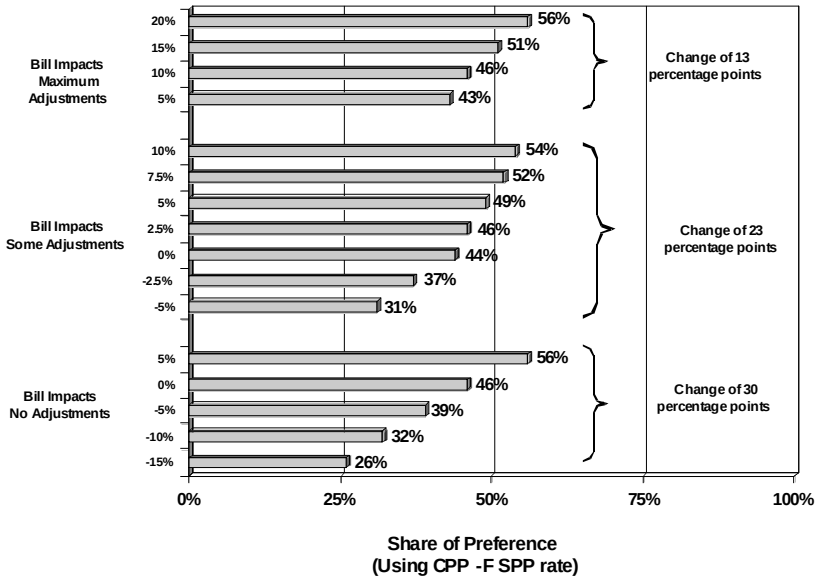
Chart 6.1 – Simple Share of Preference: CPP-F (SPP) vs. Current Rate



Sensitivity to Rate Program Design

The next question of interest is, how sensitive is the share of preference for the CPP-F SPP rate to changes in design features? We might expect that since the range in utility values was greatest for the "bill impact with no adjustments" feature, that changes in this feature would have the largest effect on share of preference for this option. From Chart 6.2, we see that this is in fact what happens (see Chart 6.2).

Chart 6.2 – Sensitivity to Differences in Bill Impacts



The change in share of preference when moving from the most valued level on the "no adjustments" feature (a 5% bill savings) to the least valued level (a 15% increase in bill) of this feature is larger than the change in share seen for either of the two other bill impact features. If instead of putting the bill impact for "no adjustments" at 0% for the CPP-F option, we put it at an increase of 5%, all other things equal[30], the share of preference for the CPP-F option decreases by 7 percentage points (from 46% to 39%). If we were to put the bill impact for no adjustments at a 10% increase in bill, we find the most dramatic affect. At this level, the share of preference for CPP-F drops by 14 percentage points (from 46% to 32%).

In total, the difference in share of preference from worst (least valued) to best (most valued) levels of the "bill impacts with no adjustments" feature is 30 points (from 26% to 56% share of preference). For "some adjustments" (going from -5% increase to 10% savings), this range is 23 points (from 31% to 54%), and for "maximum adjustments" (going from 5% savings to 20% savings) this range is 13 points (from 43% to 56%).

A review of this data indicates again that customers more highly value the avoidance of a potential negative outcome (i.e., the risk of an increase in their bill) than they value an equivalent positive outcome (i.e., the possibility of a bill reduction).

The reader will also note that several of the savings and bill increase levels tested for maximum, some, and no adjustments overlap. That is, we tested the impact of a potential 5% bill savings both for maximum adjustments as well as some and no adjustments. This design allows us to draw yet another interesting conclusion. Firstly, we see that the share for a 5% bill increase for maximum adjustments is 43% vs. 49% for some adjustments, or a difference of 6 percentage points. This trend also holds when looking at the impact on share for a 5% bill savings for no adjustments. In this case, the results are even more dramatic, with share increasing by 13% points when going from a 5% bill savings for maximum adjustments to a 5% bill savings for no adjustments.

A review of this data then suggests that the "bill impact with no adjustments" has the biggest impact on share not only because business customers more highly value the avoidance of a potential increase in their bill than a potential bill savings, but also because they more highly value the avoidance of having to make adjustments to their energy use behavior.

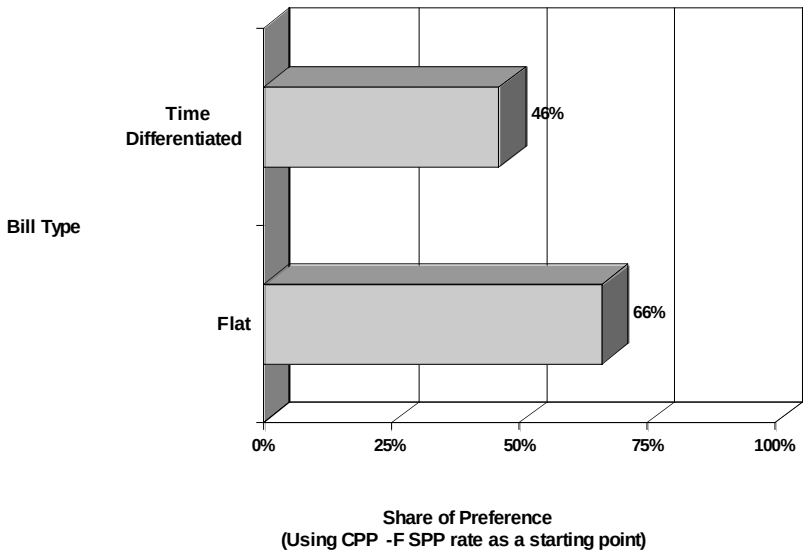
The next share of preference sensitivity issue to consider is the potential impact of changing from a time-differentiated rate to a flat rate. The reader will recall from the earlier discussion of the conjoint design that the design included the ability to model not only various different combinations of time-differentiated rates, but also flat rate bills by adding an additional level to some of the rate program building blocks – such as a level for "on-peak periods NEVER occur" for the "how often on-peak periods occur" building block. However, for analysis purposes, the billing type included in a rate program (time-differentiated or flat) was teased out of the five remaining program building blocks and an

[30] For the most part, this analysis is conducted by varying only one level of a single attribute at a time. Thus, when conducting a sensitivity analysis of the change in share for the different levels of bill impacts given some adjustments, for example, all other levels would be held constant while the different levels of this variable varied. However, due to constraints in our design which does not allow for greater bill savings (or lesser bill increases) at a lower adjustments level in a given product, this approach had to be modified somewhat. For example, in conducting this analysis for the "some adjustments" bill impact attribute, when estimating the share for a bill impact at -2.5% for some adjustments, we were forced to also change the bill impact for no adjustments from 0% to -2.50000001% in order that it might not violate this rule.

additional program feature "billing type" was created to more easily understand the impact of billing type on share.

Thus, Chart 6.3 explores the impact on share of changing from a time-differentiated rate (in this case the CPP-F (SPP) rate) to a flat rate. The data shows that share of preference increases by 20 percentages points when moving from a TD rate to a flat rate option. In fact, this data suggests that billing type is second only to bill impact in terms of the effect it can have on share.

Chart 6.3 – Sensitivity to Differences in Billing Type

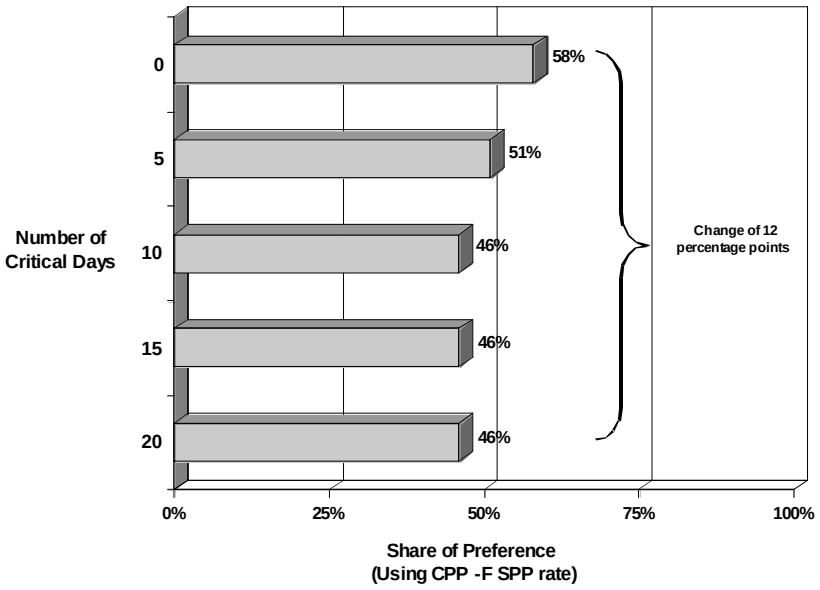


Unlike bill impact and billing type, share of preference appears to be relatively insensitive to changes in the number of critical days. In looking at the sensitivity customers have to the number of critical days, the drop in share of preference for moving from 0 to 5 days is the largest, at a drop of 7 percentage points. In total the drop in moving from 0 to 20 days is only 12 percentage points, suggesting customers are not hugely sensitive to the number of critical days included in a rate design and that nothing would be lost in terms of customer preference by the utility assigning the maximum number of critical days to the rate. It may seem curious; however, that critical days of 10, 15 and 20 could produce the same share of preference, particularly when 10 critical days was found to have more utility than either 15 or 20 days in our previous analysis. What, then, could be the cause of this? There are several logical explanations for this finding, albeit not immediately obvious:

1) Our previous analysis of the utilities for each feature of the rate program building blocks looked at *average* utilities across respondents. This analysis allows us to take each individual's utilities into account when calculating share, which can have dramatic results when the distribution of individual utilities are non-normal or, for example, skewed to each end of a distribution such that averaging them together makes them appear to be more in the middle of the distribution.
2) As described in the side-bar "Estimating share of preference" previously in this section of the report, the utilities achieved for each program building block and its respective levels did not include those customers that chose the "none" option (or by

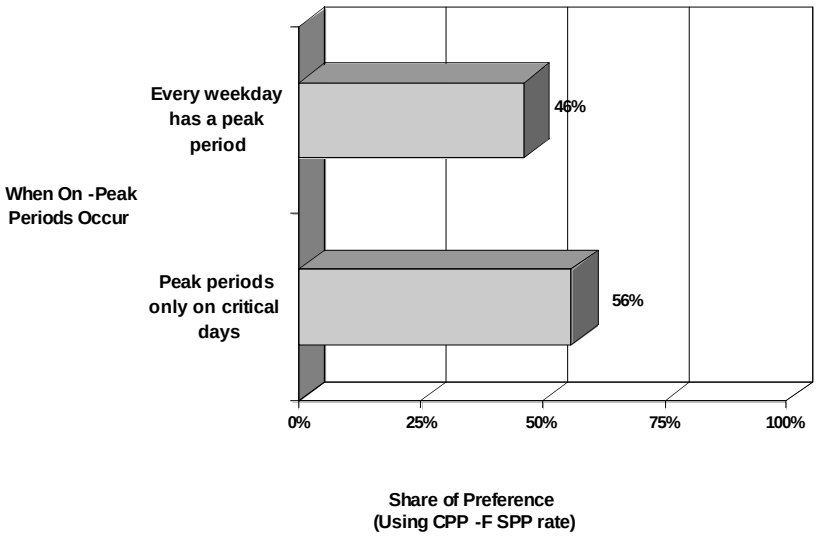
implication, their current rate) for all scenarios / products simulated. Because they did not select any of the products simulated it is not possible to calculate utilities for the various program building blocks and their respective features. This was true for a fairly large number of respondents (20%). However, when estimating share of preference, these individuals' preferences *are* taken into account, with their preferences for the current rate being expressed as additional share for the current rate. One possible result of this appears to be a flattening or a reduction in the impact of changes in feature levels (for example, moving from 10 to 20 critical days) on overall share. In other words, the less important features like "number of critical days" have less impact on share of preference because such a large percentage of the sample automatically have their share of preference assigned to the current rate regardless of the specific combinations of product features used to specify a product.

Chart 6.4 – Sensitivity to Differences in Number of Critical Days



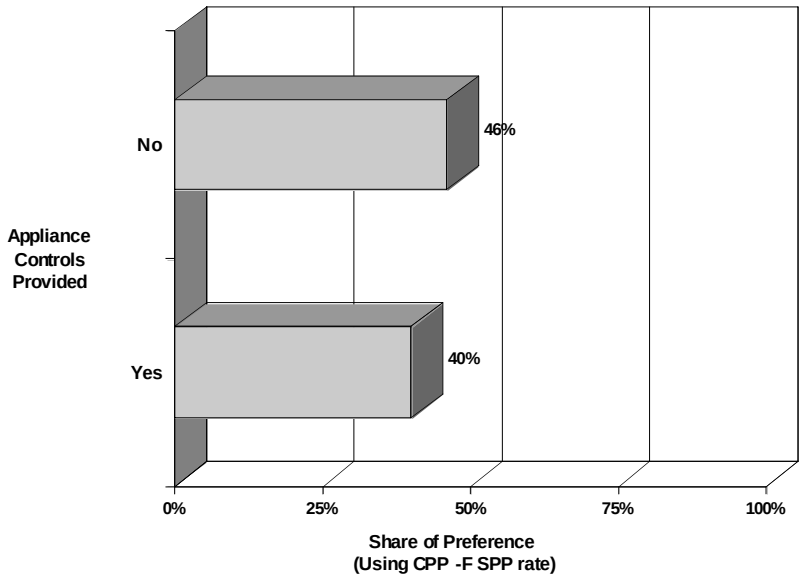
As the next issue in the sensitivity analysis, we consider the impact of moving from a CPP-F rate that has a TOU component to a "pure" CPP-F rate that has peak periods only on Critical Peak days and not on any every weekday basis. The results show that there is some positive impact of moving to a pure CPP-F rate option (see Chart 6.5).

Chart 6.5 – Sensitivity to Differences in When On-Peak Periods Occur



When we consider the impact on share of offering an equipment control system along with the rate, we find that share actually drops slightly (from 46% to 40%) when such a system is offered.

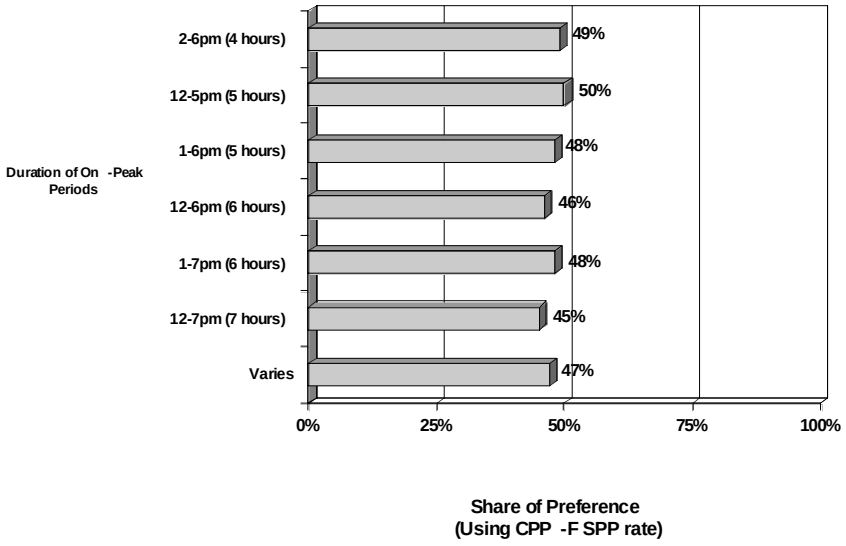
Chart 6.6 – Sensitivity to Differences in Inclusion of Equipment Control Systems



Next, we consider the sensitivity of share to changes in on-peak periods. If the peak periods start earlier or end later, how large of an effect does this have on share of preference? What effect does the actual duration of the on-peak period have on share of preference?

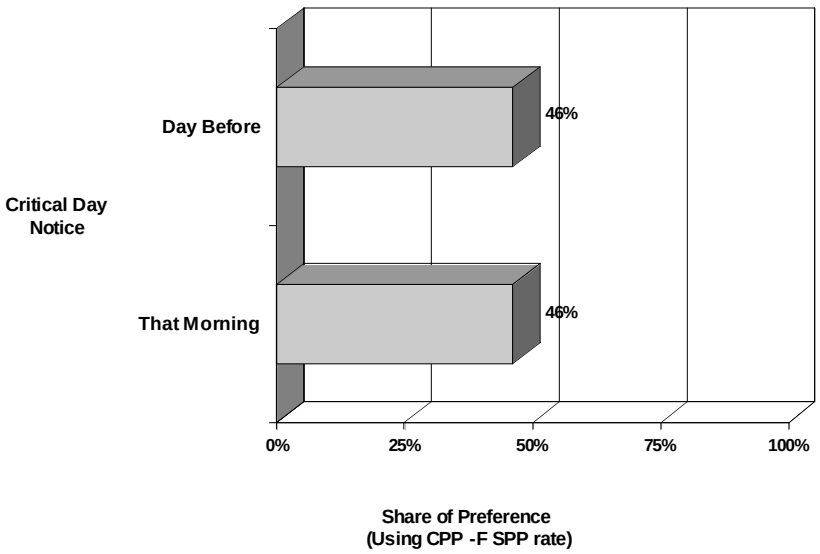
The data in Chart 6.7 indicate that share of preference is relatively insensitive to duration of on-peak periods. In fact the difference between share for the most preferred peak period and the least preferred peak period is only 5 percentage points. Furthermore, some of the differences in share between the various on-peak periods are so small (1-2%) that they could easily be accounted for by sampling error. Despite our previous analysis of the utilities that indicated that an on-peak period of 2-6pm was the most preferred, this is not found evident in the sensitivity analysis for the same reasons stated previously. In fact, this analysis suggests that there would be relatively little share lost in designing a rate with duration of 12-7pm.

Chart 6.7 – Sensitivity to Differences in Duration of On-Peak Periods



Lastly we come to the impact of critical day notice on share. As previously suggested by an analysis of the utilities for this feature, critical day notice has little, if any, impact on share. As shown in Chart 6.8, share is the same for both notice that occurs the day before or the morning of a critical peak day.

Chart 6.8 – Sensitivity to Differences in Critical Day Notice



In order to summarize the sensitivity analysis across the various features that can be used to construct a new time-differentiated pricing option, the team calculated share of preference estimates for each of several products that help to define the maximum and minimum preference shares that are possible for the time-differentiated rates tested in this work.

Chart 6.9 reports share of preference values for each of four different pricing options that, taken together, provide a sense for how much variability in share of preference is created by considering the most extreme differences in product features:

- The "worst possible TD[31]" rate is defined as the pricing option that has the least valued level on every product feature
- The "best other TD features/worst price" rate has the least attractive bill impact/savings values, but the most valued levels for a TD product on all of the non-price features
- The "best price/worst other TD features" rate has the highest savings levels across the board, but the least preferred levels on each of the other features
- The "best possible TD" rate has the most desired levels on every product feature for a TD rate

The results of this analysis indicate that the share of preference between the best-possible and worst-possible rates is huge (as we would expect) with the "best" rate program getting 66 percentage points more share than the "worst" possible program.

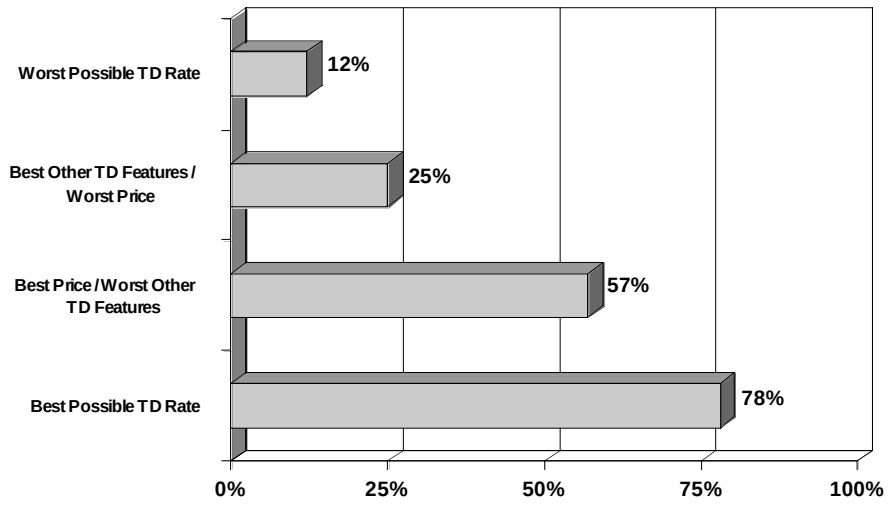
[31] Because of the interest in time differentiated rates only for the purpose of this report, the "best" possible features / rates in this chart only look at the best possible TD rates / features.

Furthermore, it appears that price / savings levels have a *substantially* larger impact on share than do the other non-price features. Adding all of the "best" non-price product features to the worst possible product in terms of savings offered, for example, improves its appeal by only 13 percentage points. However, adding all the best possible price / savings potentials to the worst non-price features can make the rate substantially more attractive, improving appeal by 45 percentage points. Then, by taking a "good" rate program in terms of its price / savings potential and then adding all the best possible non-price features to it, share can be increased by 21% (moving from 57% to 78%).

Changing all of the price / savings levels from best to worst, however, has an even larger effect. For example, moving from the "best" product to the product that has the worst savings / price levels but the best non-price levels loses 53 percentage points in share. However, moving from the best possible rate to a rate with the best savings levels but the "worst" other features loses only 21 percentage points.

In total, the maximum impact of savings/price variation vs. non-price program features in driving share of preference is something on the order of a 3:1 ratio. A maximum of 45-53 points in share of preference change can be attributed to changing from best to worst prices, while a maximum of 13-21 points of difference in share of preference change can be attributed to the impact of non-price program features.

Chart 6.9 – Sensitivity to "Best" and "Worst" Pricing Product Options



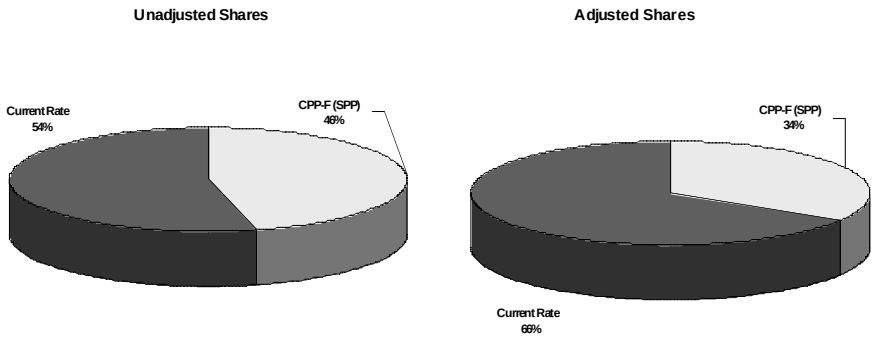
What then does Chart 6.9. and the sensitivity analysis tells us about the importance of price and non-price features on share of preference? Clearly, when considering TD rate programs only, price / savings level is the most obvious way to affect customer preference. When price is favorable, this works to capture most of the share possible, leaving the other features to have little impact on moving share. Including other favorable non-price features can have some impact on customer response but much less so than price / savings.

Estimating Customer Response to Baseline Rate Offering Scenarios

Now, let's turn to the issue of estimating how customers would respond in the marketplace, taking into account issues of risk avoidance, inertia, and awareness, if they had an opportunity to sign up for a new CPP-F pricing option that might be offered.

Chart 6.10 provides summary results for a scenario in which customers were on their current rate and given the opportunity to sign up for the CPP-F SPP rate. Once customer inertia and risk avoidance (see the discussion in the Methodology section of this report for a discussion of how these issues were accounted for), and initial preferences for the current rate are taken into account, the estimated likely share for the CPP-F SPP rate drops from 46% to 34% and the share of preference for the current rate increases from 54% to 66%.

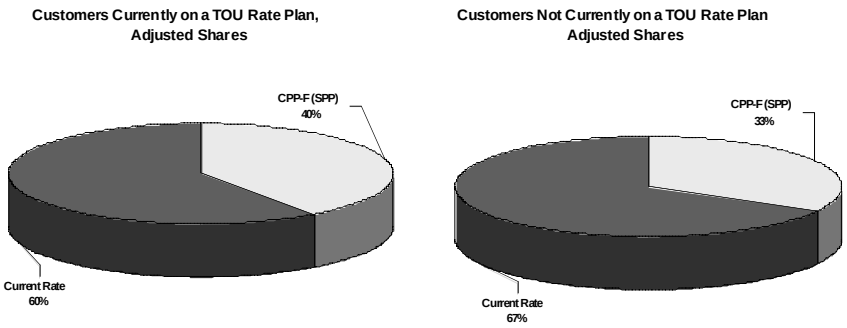
Chart 6.10 – Simple Share of Preference, Adjusted & Unadjusted; Starting Condition=Current Rate



The results reported above are for the customer population in total. How might these results differ by customers on different rate plans currently? Should we expect customers on one particular rate plan to be more or less receptive to the CPP-F (SPP) rate or might their preferences be the same? Through the use of the simulator that accompanies this report we can explore this difference, as well as many others. As an example, let's examine the differences in share of preference adjusted for risk and inertia for those customers currently on a TOU rate and for those that are not currently on a TOU rate.

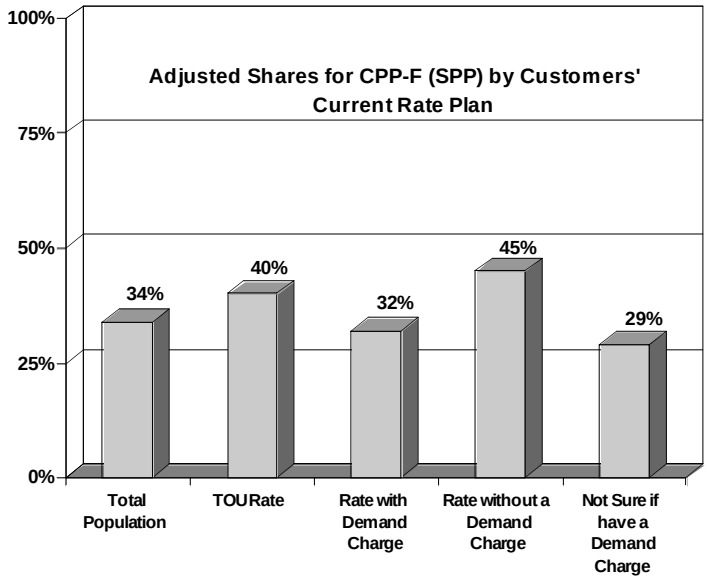
Chart 6.11 indicates that the difference between these two rate groups is fairly small, but in the direction one might expect – with those already on a TD rate showing more positive receptivity to another TD rate. We find that the CPP-F SPP receives 40% adjusted share among those currently on a TOU rate while it receives only 33% among those not already on a TOU rate.

Chart 6.11 – Simple Share of Preference, Adjusted Shares; by Customers' Rate Plan; Starting Condition=Current Rate



We can take this analysis yet a step further and examine the impact that being on a rate with a demand charge has on preference for the CPP-F SPP rate. As Chart 6.12 demonstrates, share of preference for the CPP-F SPP rate is somewhat larger among those who believe they are not currently on a rate with a demand charge.[32]

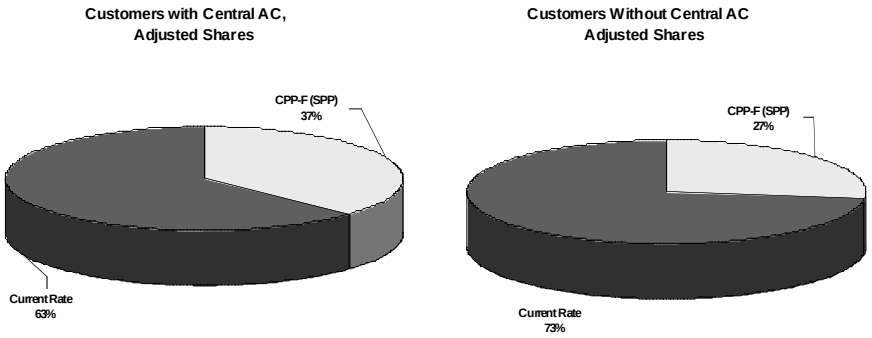
Chart 6.12 – Simple Share of Preference, Adjusted Shares; by Customers' Rate Plan Starting Condition=Current Rate



[32] As noted earlier, information on whether a customer was or was not on a rate with a demand charge was based on a self-report by the customer rather than the utilities' customer records.

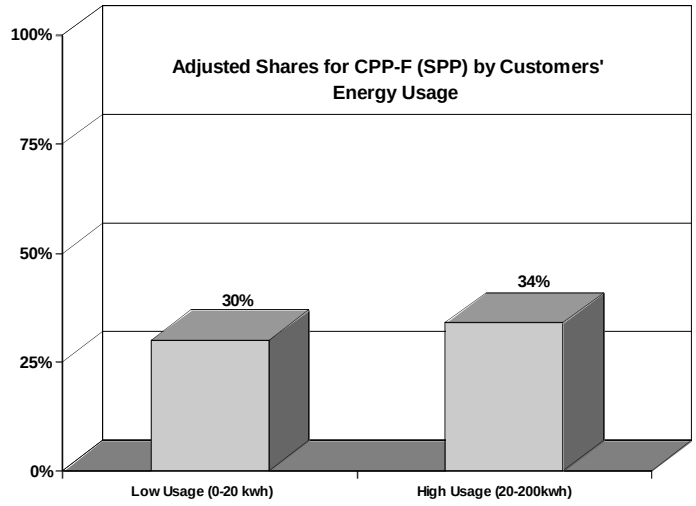
What might the results look like for those whose businesses pay to have their space climate controlled with central AC? Is their share of preference for this CPP-F SPP rate larger or smaller than those without central AC? In Chart 6.13 we see that share of preference for this TD rate is actually somewhat larger for those with central AC.

Chart 6.13 – Simple Share of Preference, Adjusted Shares; by CAC Use / Responsibility; Starting Condition=Current Rate



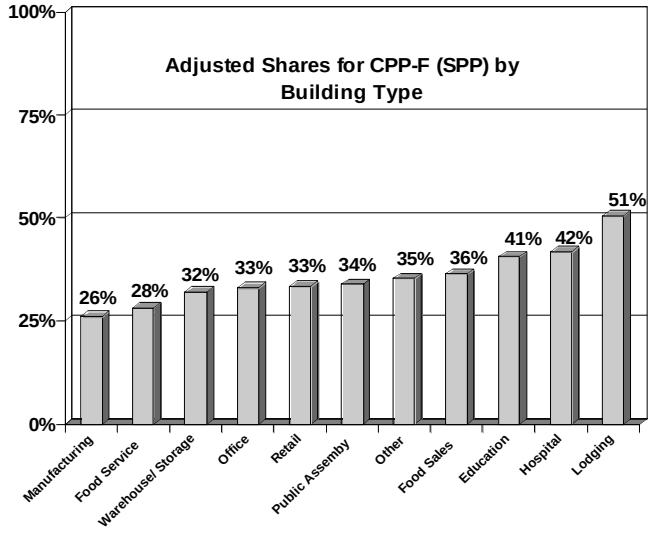
How might the share of preference for the CPP-F SPP rate be different for customers that have low electricity use vs. those with high electricity use? In Chart 6.14 we see that share of preference for this rate is nearly the same for both groups.

Chart 6.14 – Simple Share of Preference, Adjusted Shares; by Customers' Energy Usage; Starting Condition=Current Rate



Another subgroup of interest in this work has been building type, which can be thought of as somewhat of a proxy for industry. There are certainly some differences that appear here in share of preference for this rate, with lodging having the highest share of preference for the CPP-F SPP rate, followed by hospitals and educational buildings. Based on other analysis, it's not surprising to find that manufacturing has the lowest share of preference for this option.

Chart 6.15 – Simple Share of Preference, Adjusted Shares; by Building Type
Starting Condition=Current Rate



The research team was also interested in exploring differences in receptivity to time differentiated rates by climate zone as well as individual utility. In reviewing Charts 6.16 and 6.17 we see that differences in share of preference for this rate by climate zone and utility are very small.

Chart 6.16 – Simple Share of Preference, Adjusted Shares; by Climate Zone
Starting Condition=Current Rate

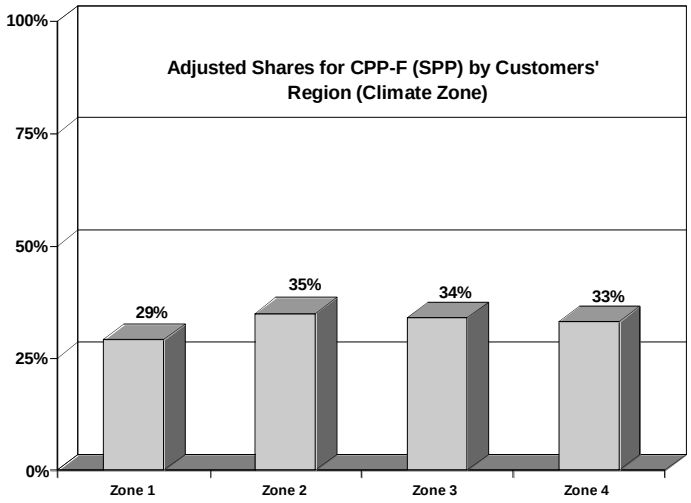
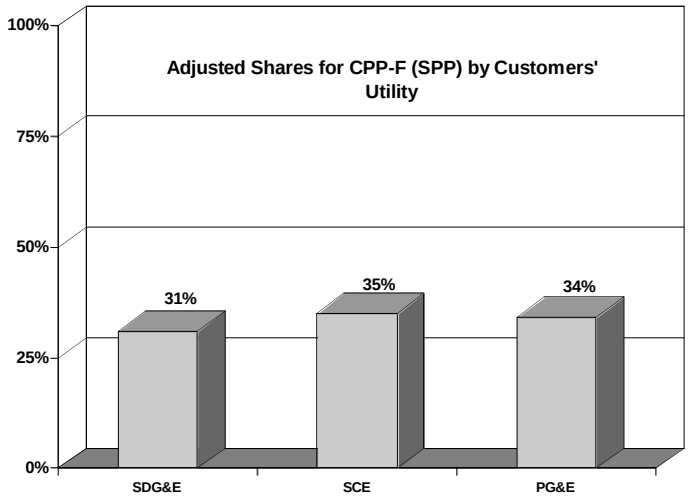


Chart 6.17 – Simple Share of Preference, Adjusted Shares; by Customers' Utility Starting Condition=Current Rate



There are many other rates for which the reader may wish to explore differences in subgroups for him or herself when using the simulator that accompanies this report, but for simplicity's sake we'll limit our presentation of the data for them in this report to the market scenario just described. From these results and an examination of the results by subgroup for all the market scenarios described in this report, we find the following trends:

- Those currently on a TOU rate tend to be more receptive to a new TD rate, regardless of the specific details of that rate. Their share of preference for the TD rates modeled tends to be larger than for those not currently on a TD rate, though the magnitude of this difference varies depending on the specific scenario being modeled.

- Those customers who believe they are not on a rate with a demand charge tend to more strongly prefer the TD rates modeled over their current rate. On the other hand, a higher proportion of those who believe their rate does include a demand charge prefer their current rate to any of the TD rates modeled. While the magnitude of this difference does vary depending on the specific set of products modeled, the trend is consistent. There does not appear to be any discernable patterns with regards to those who are not sure if their rate includes a demand charge or not.

- More businesses that have and directly pay for the central AC used by their business space tend to prefer TD rates to their current rate, regardless of the specific details of that rate, than those who do not have or pay for their central AC. The magnitude of this difference does vary depending on the specific set of products modeled, but the trend is consistent.

- Among building types, hospitals, buildings used for lodging, and buildings utilized for education related purposes seem more inclined to accept TD rates in general, without regard to the specifics of the plan. Notably, hospitals stand out as the group most likely to prefer CPP-V rates that include equipment control options.

- In situations where customers are offered the option to opt-in to any of the 10 TD rates tested in this report from the current rate, SCE customers are generally more inclined than their PG&E and SDG&E counterparts to select the TD rate plan.

- Among geographical regions, Zone 1 businesses are generally the least inclined to prefer TD rates in general, particularly CPP rates, regardless of configuration.

Now, setting aside the issue of differences in share of preference by population subgroups, let's return to our discussion of estimating how customers would respond in the marketplace if their default or starting condition was their current rate and they had the option to switch to the CPP-F SPP rate. In addition to the issues of customer inertia, risk avoidance, and preference for the current rate that will naturally impact choices customers make in the marketplace, we have the issue of awareness to contend with. While it is common and easy to assume for purposes of customer modeling that awareness of new options will be 100%, this is simply not realistic. For this reason, we have also provided estimates of anticipated market response that also account for the fact that some, but not all, customers are likely to be aware that they may have other than their default condition options. Since it is not possible to estimate awareness on a respondent-by-respondent basis, and since awareness will vary depending on the scale and effectiveness of the communication efforts, we have provided estimates for "High Awareness" (70% aware), "Moderate Awareness" (50%), and "Low Awareness" (30%) conditions.

Under a scenario in which the customers' current rate is the default, decreases in awareness will result in decreases in overall share for the TD rate. A lack of awareness of the option to opt-in to a time-differentiated rate would necessarily result in a larger number of customers remaining on their current rate. Thus, taking the market share estimate of 34% for the CPP-F SPP rate reported in Chart 6.10, we would expect this share to drop to 24% if there was 70% awareness, to 17% with 50% awareness, and to 10% with 30% awareness.

The remainder of this section investigates 36 other market scenarios using the 10 rate options specified in Table 6.1 and provides estimates of anticipated customer response that take into account inertia and risk avoidance factors (by making appropriate adjustments on a respondent-by-respondent basis to adjust for the impact of these factors), which account for different potential levels of market awareness of the pricing options available, and which take into account use of central AC for the business premise. These scenarios are grouped into four general types of scenarios:

- Market scenarios in which customers begin on their current rate and are given the option to opt-in to a single TD rate.
- Market scenarios in which the customer is placed on a TD rate and given the option to opt-out of that rate back on to their current rate.
- Market scenarios in which the customer is placed o a TD rate and given the option to opt-out of that rate on to a different TD rate.
- Market scenarios in which the customer begins on their current rate and are given the option to opt-in to two different TD rates.
- Market scenarios in which the customer begins on a TD rate and is given the option to opt-out of the rate back on to their current rate or another TD rate.

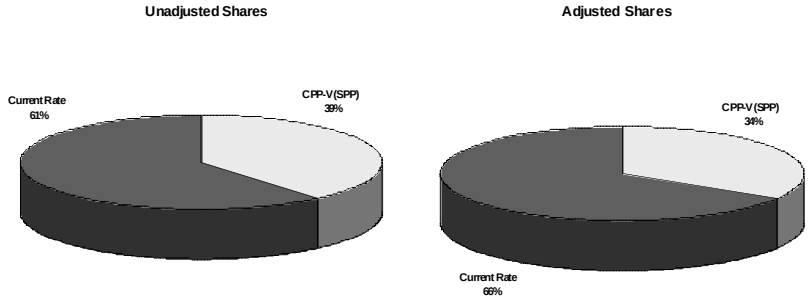
Again, there are numerous market scenarios that could be created, but for simplification purposes, this report will be limited to these 37. These scenarios were chosen with input from the three IOUs and other interested parties and were constructed using the following assumptions:

- In actual practice, any set of options offered in the marketplace may or may not include the current rate and, thus, the current rate appears in many, but not all of these scenarios.
- The starting condition could be today's rate or any of the new rates. Thus, many of the scenarios look at the take rates with both today's rate as the starting condition as well as some other rate as the starting condition.

Before reviewing each of the other 36 scenarios, it is worth repeating a bit of caution about how such results should be interpreted. The results obtained by this simulation exercise should not be interpreted as market share estimates, strictly speaking. In actual practice, there are many external factors that may limit market share that cannot be accounted for in a survey setting. We have attempted to account for these issues as much as possible, but recognize that any specific market implementation will have its unique complications and idiosyncrasies.

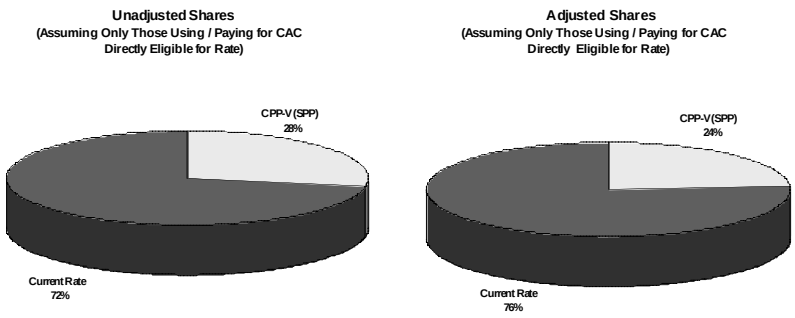
The next scenario investigates the anticipated customer response obtained if instead of allowing customers to opt-in to the CPP-F SPP rate, they were allowed to opt-in to the CPP-V SPP rate (again, these rates are described in Table 6.1). After adjusting for inertia and risk, the CPP-V SPP rate receives 34% share of preference, which is identical to what was received by the CPP-F SPP rate described in the previous scenario.

Chart 6.18 – Simple Share of Preference, Adjusted Shares; Starting Condition=Current Rate



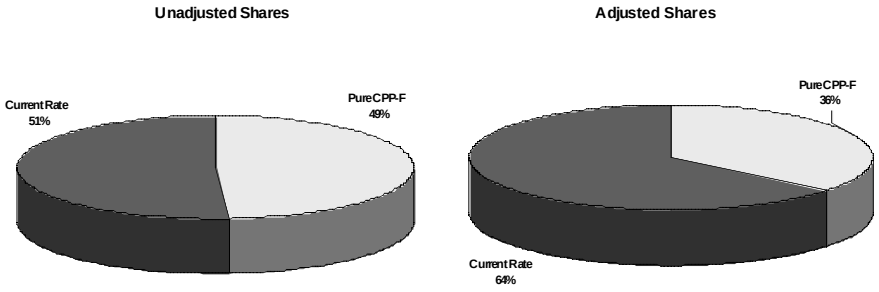
However, if the CPP-V rate required that business customers use and pay for central air conditioning (CAC) at their business premises (which would be used with the included equipment control system), this would result in a drop in share since only 66% currently use and pay directly for their CAC. Adjusting for risk and inertia, there is a 10 percentage point drop in share (to a 24% share) (See Chart 6.19).

Chart 6.19 – Simple Share of Preference, Adjusted Shares; Starting Condition=Current Rate



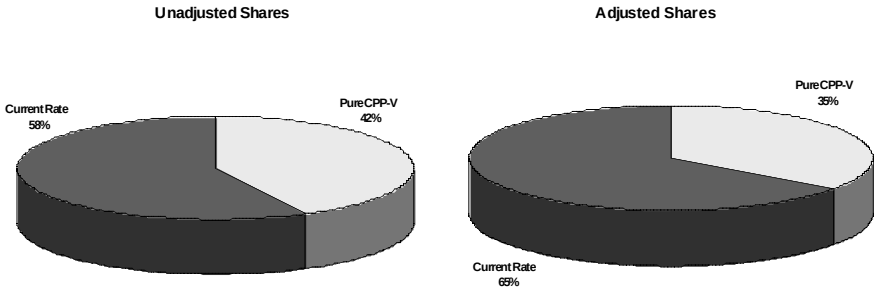
What would be the impact on share if each of these rates were modified such that the TOU component was removed? Chart 6.20 shows the resulting share if a "pure" CPP-F were offered to customers as an opt-in option. The resulting share of preference (36%), after adjusting for both inertia and risk, is nearly identical to that achieved by the CPP-F SPP rate (34%)

Chart 6.20 – Simple Share of Preference, Adjusted Shares; Starting Condition=Current Rate



Similarly, what would be the impact on share if the TOU component was removed from the CPP-V rate? Chart 6.21 shows the resulting share if a "pure" CPP-V were offered to all customers as an opt-in option. The resulting share of preference (35%), after adjusting for both inertia and risk, is also nearly identical to that achieved by the CPP-V SPP rate (34%)

Chart 6.21 – Simple Share of Preference, Adjusted Shares; Starting Condition=Current Rate



Note that there is relatively little variability in the share achieved for the CPP-F, CPP-V, "pure" CPP-F, and "pure" CPP-V rates tested here. The largest variance in customer response that does occur (with CPP-V) is driven by a scenario in which a significant portion of the population (34%) would not be eligible for the CPP-V rate if it required presence of central air conditioning on the business premise paid for by the customer.

What would happen if instead customers were given the option to opt-in to one of these time-differentiated rates constructed such that each offered the best possible savings (20% savings for maximum adjustments, 10% savings for some adjustments, and 5% savings for no adjustments)? The results are quite similar. Overall share, once adjustments are made for risk and inertia, is only marginally larger (by approximately 3-5 percentage points), and there is little variability between the CPP-F SPP rate, the CPP-V SPP rate offered to all, and the CPP-V rate offered only to CAC owners, with each achieving 39%, 37%, and 27% share respectively.

As noted previously, given a market scenario in which the current rate is the starting or default condition, decreases in awareness will result in reduced share for each of the TD rates. Table 6.2 summarizes these results.

Table 6.2 – Market Scenarios with Starting (Opt-in) Condition Set as Current Rate

Starting / Default Condition	Opt-in Condition	Share for T.D. Rate (Adjusted for Risk Avoidance and Inertia)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 70% Awareness)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 50% Awareness)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 30% Awareness)
Current Rate (CR)	CPP-F (SPP)	CPP-F - 34% CR - 66%	CPP-F - 24% CR -76%	CPP-F -17% CR -83%	CPP-F -10% CR - 90%
CR	CPP-F (Best Savings)	CPP-F -39% CR - 61%	CPP-F - 27% CR - 73%	CPP-F - 19% CR - 81%	CPP-F - 12% CR - 88%
CR	CPP-V (SPP)	CPP - 34% CR - 66%	CPP-V - 24% CR - 76%	CPP-V - 17% CR - 83%	CPP-V - 10% CR - 90%
CR	CPP-V (SPP-assumes available only to those with CAC)	CPP-V - 24% CR - 76%	CPP-V - 17% CR - 83%	CPP-V 12% CR- 88%	CPP-V - 7% CR - 93%
CR	CPP-V (Best Savings)	CPP-V - 37% CR - 63%)	CPP-V -26% CR - 74%	CPP-V - 19% CR - 81%	CPP-V - 11% CR - 89%
CR	CPP-V (Best Savings – assumes available only to those with CAC)	CPP-V - 27% CR - 73%	CPP-V - 19% CR - 81%	CPP-V - 14% CR - 86%	CPP-V - 8% CR - 92%
CR	Pure CPP-F	Pure CPP-F - 36% CR - 64%	Pure CPP-F - 25% CR - 75%	Pure CPP-F - 18% CR - 82%	Pure CPP-F - 11% CR - 89%
CR	Pure CPP-V	Pure CPP-V -35% CR - 65%	Pure CPP-V - 24% CR - 76%	Pure CPP-V - 17% CR - 83%	Pure CPP-V - 10% CR - 90%
CR	Pure CPP-V (Assumes available only to those with CAC)	Pure CPP-V - 25% CR - 75%	Pure CPP-V - 18% CR - 82%	Pure CPP-V - 13% CR - 87%	Pure CPP-V - 8% CR - 92%

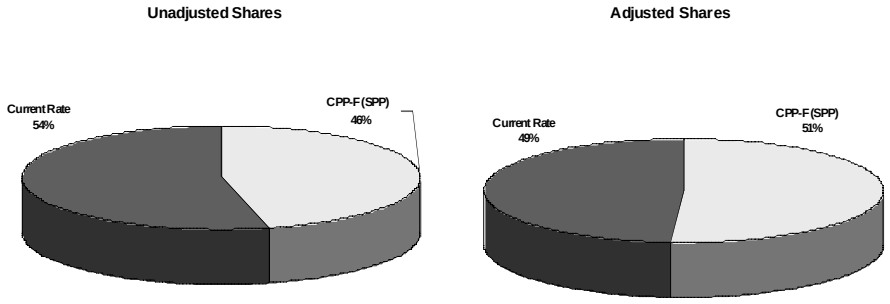
Thus, in a situation where customers would have the option to opt-in to one of these time-differentiated rates, we would expect any one of them to get about a third of electricity customers doing so, with the remaining two-thirds opting to stay with the current rate under a condition of 100% awareness of these options. Furthermore, as seen in Table 6.2 above, we would not expect a rate to attract much more share than this even if, in designing a very attractive rate the best possible potential savings were included, again, assuming 100% awareness. With more likely assumptions about awareness levels (50-70%, for example), opt-in rates are more in the 12-27% range.

Estimating Customer Response to TD Default Rate Offering Scenarios

Now, what if customers are first put on a time-differentiated rate and then given the option to opt-out of that rate and back onto the current rate? How is the share of preference impacted? Taking first as our example the CPP-F SPP rate (see Chart 6.22), as one might expect, the share of preference for this rate increases dramatically in this scenario, from a 34% share of preference when customers opt-in to the rate, to a 51% share of preference when customers must opt-out of the rate, a 17 percentage point increase.

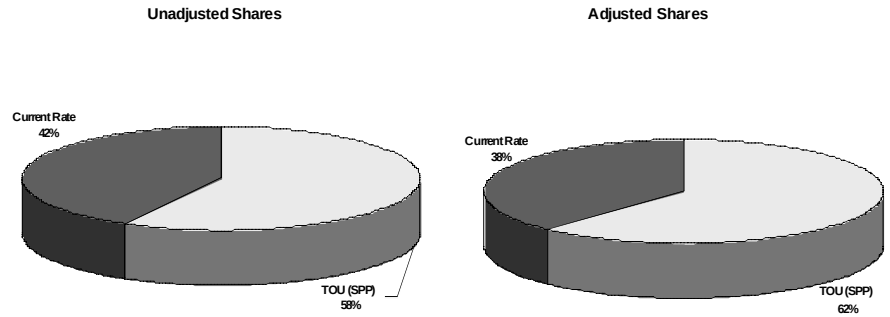
In scenarios such as this one where the TD rate is the default rate on which all customers are placed, a lack of awareness works to increase the share for these rates. In the case of the CPP-F SPP rate, if we were to assume 70% awareness, share would increase by 15 percentage points. If instead only 50% of customers were aware of the options available to them the resulting share would increase by 24 percentage points. A 30% awareness level would result in an increase of 34 percentage points.

Chart 6.22 – Share of Preference, Unadjusted and Adjusted
Starting Condition = CPP-F (SPP)



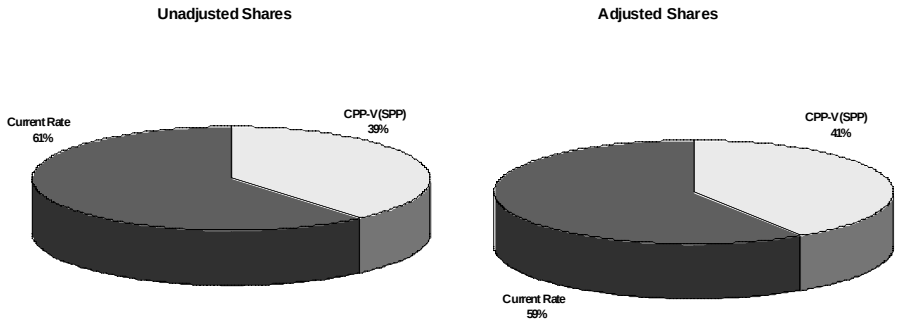
Now, if the rate on which customers are started on is instead the TOU SPP rate, the resulting share is somewhat larger than what is found for the CPP-F SPP rate. Setting the TOU rate as the default results in a share of preference that is 11 percentage points greater (62%) than the share of preference achieved by the CPP-F rate (51%).

Chart 6.23 – Share of Preference, Unadjusted and Adjusted
Starting Condition = TOU (SPP)



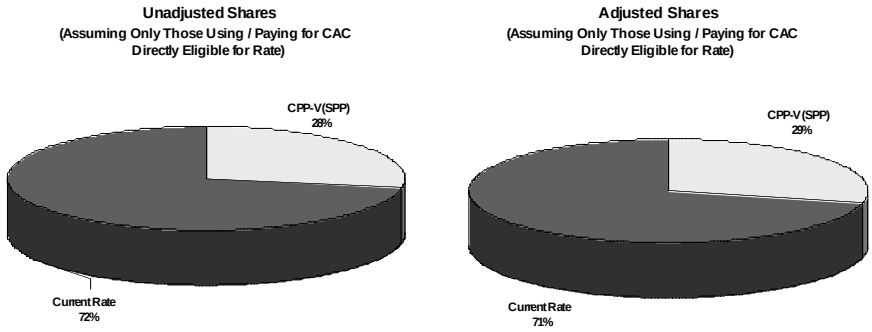
However, when the CPP-V SPP rate is set as the default or opt-out rate, the results are not as dramatic as what was seen when the CPP-F and TOU SPP rates were the default. Putting the CPP-V rate as the default does increase its share of preference, but only by 7 percentage points (from 34% to 41%).

Chart 6.24 – Share of Preference, Unadjusted and Adjusted
Starting Condition = CPP-V (SPP)



The increase in share is even smaller for the CPP-V rate if it is made available only to those businesses that use and pay for central AC at their business premises. When set as the default rate, its share increases only by 5 percentage points, increasing from 24% to 29%

Chart 6.25 – Share of Preference, Unadjusted and Adjusted
Starting Condition = CPP-V (SPP)



It is interesting to note that the share of preference the current rate garners when it is the default (65-76%) is larger than the share of preference any of the TD rates are able to garner. Given the large number of customers that expressed a preference ONLY for their current rate (20%), this finding is not surprising. Thus, it appears that the current rate has more value to more customers overall than any particular time-differentiated rate.

Again, what would the result be if the TD rate that customers were placed on was constructed such that each offered the best possible savings (20% savings for maximum adjustments, 10% savings for some adjustments, and no savings for no adjustments)? The results here are much more dramatic than what was seen when the current rate was the default or starting condition.

Overall share increases by 15-22 percentage points for each of these rates, with the largest boost in share going to the CPP-V SPP rate. Overall, given the importance of the savings feature to rate appeal, this feature works well to increase share and in this case is able to garner more share than when the current rate was the default. However, even with this increase in share, a stronger preference for the TOU rate remains, followed by the CPP-F and the CPP-V rates respectively.

As noted previously, given a market scenario in which a time-differentiated rate is the starting or opt-out condition, decreases in awareness will result in increased share for each of the TD rates. Table 6.3 summarizes these results.

Table 6.3 – Market Scenarios with Starting (Opt-in) Condition Set as TD Rate

Starting / Default Condition	Opt-in Condition	Share for T.D. Rate (Adjusted for Risk Avoidance and Inertia)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 70% Awareness)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 50% Awareness)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 30% Awareness)
CPP-F(SPP)	CR	CPP-F –51% CR – 49%	CPP-F-66% CR – 34%	CPP-F-75% CR – 25%	CPP-F-85% CR – 15%
CPP-F(Best Savings)	CR	CPP-F – 70% CR – 30%	CPP-F – 79% CR –21%	CPP-F – 85% CR –15%	CPP-F – 91% CR –9%
TOU(SPP)	CR	TOU – 62% CR – 38%	TOU – 73% CR – 27%	TOU– 81% CR – 19%	TOU – 89% CR – 11%
TOU(Best Savings)	CR	TOU – 78% CR – 22%	TOU – 85% CR – 15%	TOU – 89% CR – 11%	TOU – 93% CR – 7%
CPP-V(SPP)	CR	CPP-V –41% CR – 59%	CPP-V –59% CR – 41%	CPP-V –70% CR – 30%	CPP-V –82% CR – 18%
CPP-V(SPP-*assumes available only to those with CAC*)	CR	CPP-V –29% CR – 71%	CPP-V –40% CR – 60%	CPP-V –47% CR – 53%	CPP-V –55% CR – 45%
CPP-V(Best Savings)	CR	CPP-V – 63% CR – 37%	CPP-V – 74% CR – 26%	CPP-V – 81% CR – 19%	CPP-V – 89% CR – 11%
CPP-V(Best Savings-*assumes available only to those with CAC*)	CR	CPP-V – 44% CR – 56%	CPP-V– 51% CR – 49%	CPP-V – 55% CR – 45%	CPP-V – 59% CR – 41%

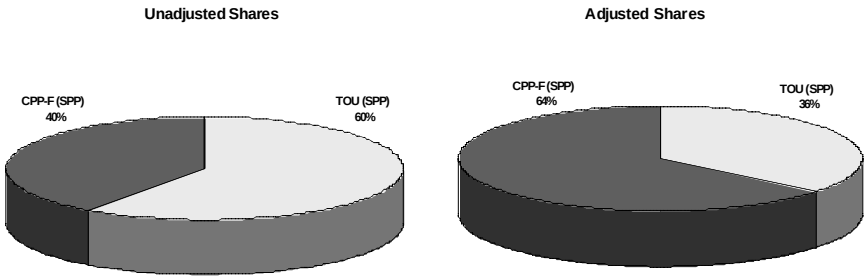
Thus, in a situation where customers are placed on a time-differentiated rate roughly resembling the SPP pilot rates but given the option to opt-out to their current inclining block rate, we would expect (at most) nearly two-thirds of customers to remain on the rate with about a third deciding to opt-out of the TD rate. Furthermore, depending on actual levels of awareness achieved, an even smaller percentage may choose to opt-out of the TD rate.

Up to this point the scenarios investigated here have assumed that the customers' current rate, whether the default rate or not, would be available. It's possible that the utilities may choose to not offer the current rate, but instead provide a TD rate as the default, with another TD rate as the opt-in option.

Let's one again investigate a market scenario in which the CPP-F SPP rate is the starting or default rate all customers are placed on, but rather than allowing customers to opt-in to the current rate, they are allowed to opt-in to another TD rate – in this case, the TOU SPP rate. Should we expect the share of preference for the CPP-F to increase? What share could we expect for the non-default option in this case?

In Chart 6.26 we see that the share of preference for the CPP-F rate is now 64% when the TOU rate is the only alternative customers can opt-in to, an increase of 13 percentage points.

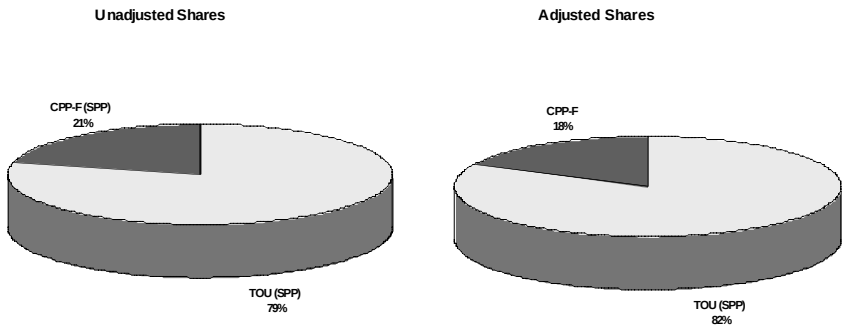
Chart 6.26 – Share of Preference, Unadjusted and Adjusted
Starting Condition = CPP-F (SPP)



Now, if instead, the TOU SPP rate were made the default, with customers given the option of choosing the CPP-F rate how many customers might we expect to choose to stay on that rate and how many could we expect to opt-out?

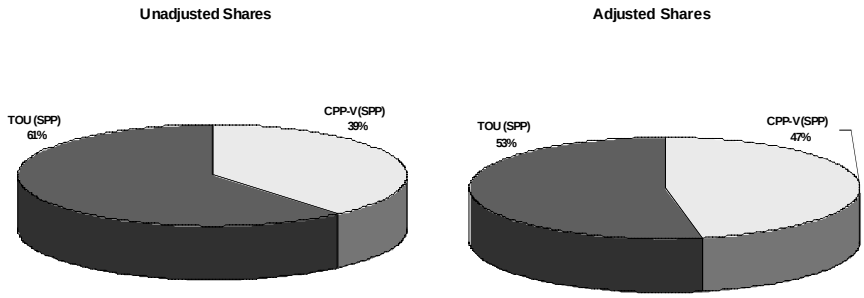
In Chart 6.27 we see that when the current rate is not offered as an option a much larger percentage of customers would choose to stay on the default TOU SPP rate – and, in fact, share for the TOU rate increases by 24 percentage points in this scenario. Furthermore, when the default rate is the TOU rate rather than the CPP-F rate in a scenario that does not include customers' current rates as an option, the percentage of customers remaining on the default rate also increases. The share of preference for the TOU rate, after adjusting for risk and inertia, is 82%, a full 22 percentage points greater than the share of preference obtained for the CPP-F rate when it was the default (see Chart 6.27).

Chart 6.27 – Share of Preference, Unadjusted and Adjusted
Starting Condition = TOU (SPP)



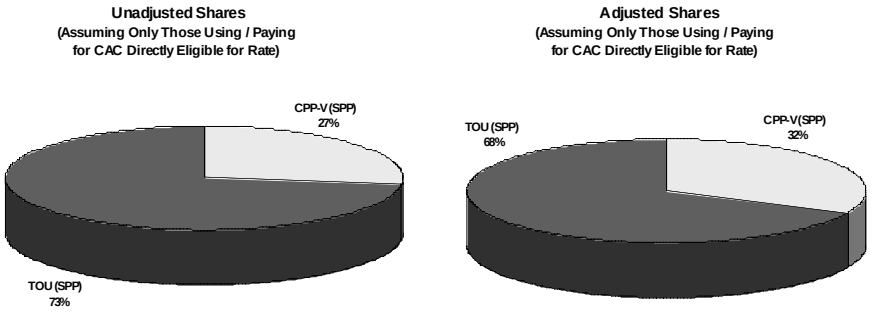
The results are not quite so dramatic if the CPP-V SPP rate is made the default, with customers given the option of choosing to opt-in to the TOU SPP rate. The CPP-V gains only 6 additional percentage points in share when the current rate is replaced with the TOU SPP rate as the opt-in option, with share of preference increasing from 41% to 47%. The TOU rate, being more preferred overall, attracts a fair number of customers to it, achieving a 53% share of preference.

Chart 6.28 – Share of Preference, Unadjusted and Adjusted
Starting Condition = TOU (SPP)



Now, if instead of making the CPP-V rate available to all it was available only to those business premises with central AC, the impact on the share of preference for the CPP-V rate is negligible. When customers are given the option to opt-in to the TOU SPP rate from the CPP-V rate (with the option of going back to their current rate no longer made available), we find that share increases only by 3 percentage points (29% to 32%). The greater preference for the TOU rate as well as the fact that approximately one-third of businesses do not have or pay for central AC for their business premises works to drive customers to this rate.

Chart 6.29 – Share of Preference, Unadjusted and Adjusted
Starting Condition = CPP-V (SPP)



If these rates were constructed such that each offered the best possible savings, the results are the same, only to a larger magnitude. The CPP-F and TOU rates increase to 86-90% share of preference when they are the default rate while the CPP-V rate increases to a 71% share of preference as the default rate.

Of course, in any scenario in which the current rate is not offered as a possible option, regardless of levels of awareness, 100% of all customers will be on a TD rate. In any case, reduced levels of awareness will result in an increase in the share of preference for whatever rate is the default. Table 6.4 summarizes these results.

Table 6.4 – Market Scenarios with Starting / Default Condition Set as a Time-Differentiated Rate; Current Rate not Provided as an Option

Starting / Default Condition	Opt-in Condition	Share for T.D. Rate (Adjusted for Risk Avoidance and Inertia)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 70% Awareness)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 50% Awareness)	Share for T.D. Rate (Adjusted for Risk, Inertia, and Awareness – 30% Awareness)
CPP-F(SPP)	TOU(SPP)	CPP-F – 64% TOU– 36%	CPP-F – 75% TOU – 25%	CPP-F – 82% TOU – 18%	CPP-F – 89% TOU (SPP) – 11%
CPP-F(Best Savings)	TOU(Best Savings)	CPP-V – 86% TOU – 14%	CPP-V – 90% TOU – 10%	CPP-V – 92% TOU – 7%	CPP-V – 96% TOU – 4%
TOU(SPP)	CPP-F(SPP)	TOU – 83% CPP-F – 18%	TOU – 88% CPP-F – 12%	TOU – 91% CPP-F – 9%	TOU – 95% CPP-F – 5%
TOU(Best Savings)	CPP-F(Best Savings)	TOU – 90% CPP-F – 10%	TOU – 93% CPP-F – 7%	TOU – 95% CPP-F – 5%	TOU – 97% CPP-F – 3%
CPP-V(SPP)	TOU (SPP)	CPP-V – 47% TOU – 53%	CPP-V – 63% TOU – 37%	CPP-V – 74% TOU – 26%	CPP-V – 84% TOU – 16%
CPP-V(SPP-*assumes available only to those with CAC*)	TOU (SPP)	CPP-V – 32% TOU – 68%	CPP-V – 42% TOU – 58%	CPP-V – 49% TOU – 51%	CPP-V – 56% TOU - 44%
CPP-V(Best Savings)	TOU (Best Savings)	CPP-V – 71% TOU – 29%	CPP-V – 79% TOU – 21%	CPP-V – 85% CR – 15%	CPP-V – 91% CR – 9%
CPP-V(Best Savings-*assumes available only to those with CAC*)	TOU (Best Savings)	CPP-V – 49% TOU – 51%	CPP-V – 54% TOU – 46%	CPP-V – 57% TOU – 43%	CPP-V – 61% TOU – 39%

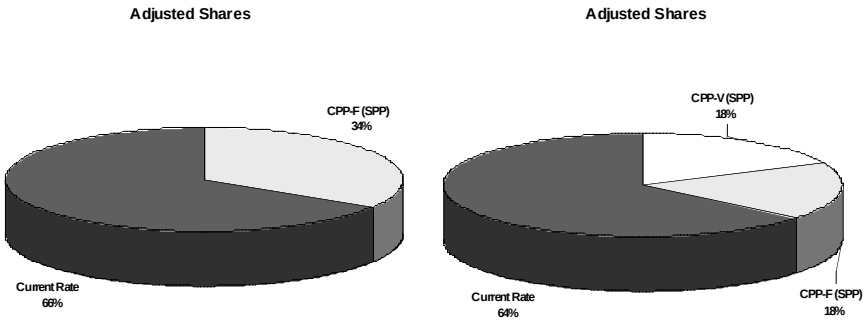
These results suggest that the number of customers (at most) that we could expect to stay on their default rate is 83% (assuming 100% awareness) when that default rate is the TOU SPP rate. If a TOU rate was constructed with even better savings potential, then this could be as high as 90% that would remain on the default TOU rate.

Estimating Customer Response to Multiple TD Rate Offering Scenarios

The next set of scenarios considers the impact of having all customers begin on their current rate and allowing them to opt-in to not just one, but two different time-differentiated rates. How many more customers, if any, would choose to opt-in to a TD rate if given two options?

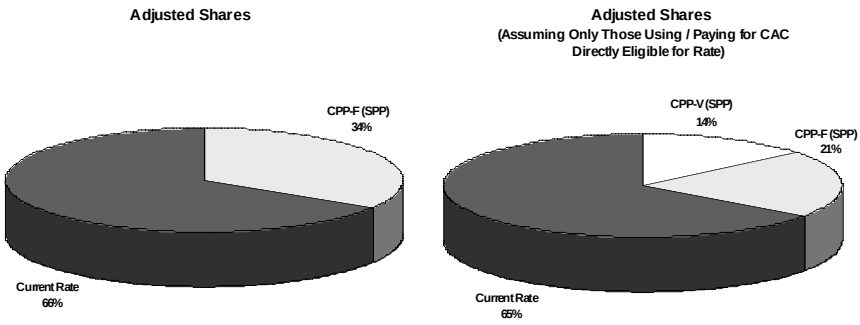
Recall that when given the option to opt-in to the CPP-F pilot rate, 34% would opt to do so, with 66% remaining on the current rate (assuming 100% awareness). How many more customers would opt-in to a TD rate if, in addition to the CPP-F SPP rate, the CPP-V SPP rate (assuming all customers are eligible) was also offered? As seen in Chart 6.30, offering a second time-differentiated rate increases the total number of opt-in switchers, but only by 2%. Furthermore, rather than attracting greater numbers of switchers, the CPP-V SPP rate acts to steal share from the CPP-F SPP rate.

Chart 6.30 – Share of Preference, Adjusted
Starting Condition = Current Rate



If, however, the CPP-V rate was only made available to those customers using and directly paying for the use of central AC at their business premises, this second TD rate only increases the total number of opt-in switchers by 1% (see Chart 6.31).

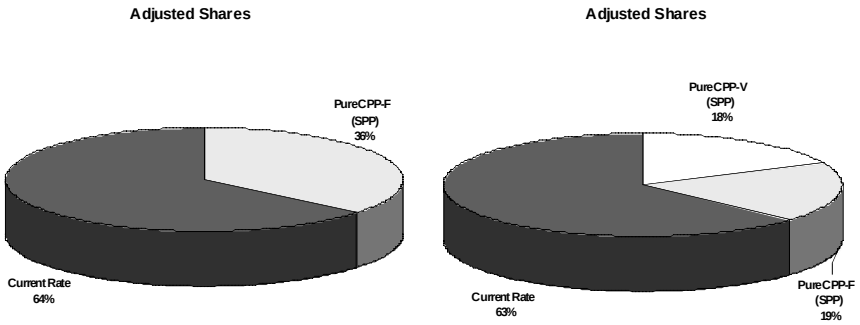
Chart 6.31 – Share of Preference, Adjusted
Starting Condition = Current Rate



Also recall that we previously reviewed the expected share of preference for a "pure" CPP-F rate (or one without a TOU component) if offered as an opt-in option. The share of preference for this rate was 36% assuming that customers' current rate was the default. How might the total number of customers choosing to opt-in to a TD rate change if a second rate was also offered – a Pure CPP-V rate that would be available to all customers?

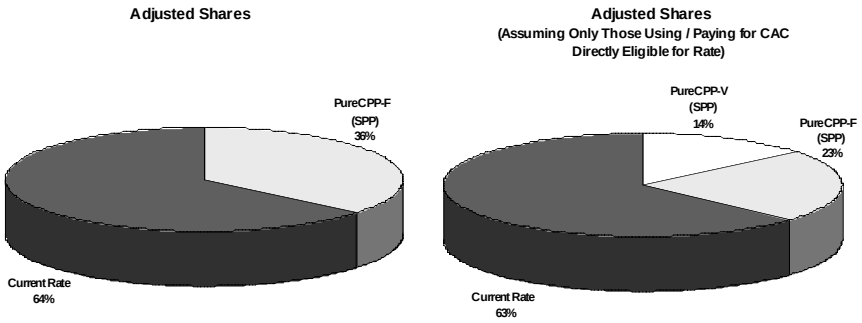
As seen in Chart 6.32, offering a second time-differentiated rate again increases the total number of opt-in switchers, but only by 1%. Furthermore, rather than attracting greater numbers of switchers, the Pure CPP-V SPP rate acts to steal share from the CPP-F SPP rate.

Chart 6.32 – Share of Preference, Adjusted
Starting Condition = Current Rate



If instead of making the Pure CPP-V rate available to all, it was available only to those premises that have and pay for central AC, how would the collective TD rate share be impacted? As seen in Chart 6.33, while the pure CPP-V rate loses some share, the pure CPP-F gains this lost share and the net impact of restricting eligibility for this rate is zero. Once again, offering a second time-differentiated rate increases the total number of opt-in switchers by only 1%.

Chart 6.33 – Share of Preference, Adjusted
Starting Condition = Current Rate



We could also look at what impact offering two TD rates constructed such that each offered the best possible savings (20% savings for maximum adjustments, 10% savings for some adjustments, and no savings for no adjustments). As expected, improving the savings potential for each rate increases the percentage of customers that would opt-in to a time-differentiated rate, but only by about 3-4 percentage points for any of the rates investigated here.

Table 6.4 summarizes these findings as well as the impact of less than perfect awareness which, in these scenarios, works to reduce the number of customers that would adopt a TD rate.

Table 6.4 – Market Scenarios with Starting or Default Condition Set as Current Rate with Two TD Rate Opt-in Options

Starting / Default Cond.	Opt-in Condition	Opt-in Condition	Share for T.D. Rates (Adjusted for Risk Avoidance and Inertia)	Share for T.D. Rates (Adjusted for Risk, Inertia, and Awareness – 70% Awareness)	Share for T.D. Rates (Adjusted for Risk, Inertia, and Awareness – 50% Awareness)	Share for T.D. Rates (Adjusted for Risk, Inertia, and Awareness – 30% Awareness)
Current Rate (CR)	CPP-F (SPP)	CPP-V (SPP)	CPP-F – 18% CPP-V – 18% CR – 64%	CPP-F – 12% CPP-V – 12% CR – 75%	CPP-F – 9% CPP-V – 9% CR – 82%	CPP-F – 5% CPP-V – 5% CR – 89%
CR	CPP-F (SPP)	CPP-V (SPP – *assumes avail. only to those with CAC)*	CPP-F – 21% CPP-V – 14% CR – 65%	CPP-F – 15% CPP-V – 10% CR – 75%	CPP-F – 11% CPP-V – 7% CR – 82%	CPP-F – 6% CPP-V – 4% CR – 89%
CR	CPP-F (best savings)	CPP-V (best savings)	CPP-F – 20% CPP-V – 19% CR – 61%	CPP-F – 14% CPP-V – 13% CR – 73%	CPP-F – 10% CPP-V – 9% CR – 80%	CPP-F – 6% CPP-V – 6% CR – 88%
CR	CPP-F (best savings)	CPP-V (best savings - *assumes avail. only to those with CAC*)	CPP-F – 24% CPP-V – 15% CR – 61%	CPP-F – 17% CPP-V – 10% CR – 73%	CPP-F – 12% CPP-V – 7% CR – 80%	CPP-F – 7% CPP-V – 4% CR – 88%
CR	Pure CPP-F	Pure CPP-V	Pure CPP-F – 19% Pure CPP-V – 18% CR – 63%	Pure CPP-F – 13% Pure CPP-V – 12% CR – 74%	Pure CPP-F – 9% Pure CPP-V – 9% CR – 82%	Pure CPP-F – 6% Pure CPP-V – 5% CR – 89%
CR	Pure CPP-F	Pure CPP-V (*assumes avail. only to those with CAC)*	Pure CPP-F – 23% Pure CPP-V – 14% CR – 63%	Pure CPP-F – 16% Pure CPP-V – 10% CR – 74%	Pure CPP-F – 11% Pure CPP-V – 7% CR – 82%	Pure CPP-F – 7% Pure CPP-V – 4% CR – 89%
CR	Pure CPP-F (best savings)	Pure CPP-V (best savings)	Pure CPP-F – 21% Pure CPP-V – 19% CR – 60%	Pure CPP-F – 14% Pure CPP-V – 14% CR – 72%	Pure CPP-F – 10% Pure CPP-V – 10% CR – 80%	Pure CPP-F – 6% Pure CPP-V – 6% CR – 88%
CR	Pure CPP-F (best savings)	Pure CPP-V (best savings - *assumes avail. only to those with CAC)*	Pure CPP-F – 25% Pure CPP-V – 15% CR – 60%	Pure CPP-F – 17% Pure CPP-V – 11% CR – 72%	Pure CPP-F – 12% Pure CPP-V – 8% CR – 80%	Pure CPP-F – 7% Pure CPP-V – 5% CR – 88%

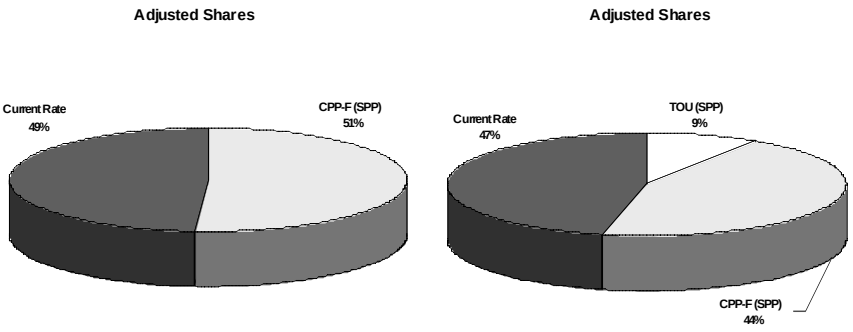
From these findings we could conclude that offering multiple products does not significantly increase the number of opt-in switchers when the current rate is the default rate. Given the combination of pilot rates tested here (and assuming only two were offered as modeled), the utilities could expect approximately two-thirds to remain on their current rate (assuming 100% awareness). However, each of the scenarios tested here looked only at adding a CPP-V or pure CPP-V rate as the second TD alternative. Previous results described in this report would suggest that offering the more desirable TOU SPP rate or the CPP-F SPP or pure CPP-F rates as the second alternative might increase the total number of opt-in switchers over and above the increases seen here.

That said, these scenarios were chosen as those most closely matching what program planners most seriously considering and if they desire to continue limiting their consideration to these scenarios, they will need to investigate whether the expense of offering multiple rates will justify the additional load reduction resulting from having a few more customers on time-differentiated rates.

Lastly, we again consider scenarios in which the current rate is *not* the default or starting condition, but rather the default is one of the time-differentiated rates. However, instead of offering customers just their current rate as an alternative, they are also offered a second TD rate as an alternative. Does giving customers a second alternative in this situation further reduce the number that will opt-out of TD rates entirely in favor of their current rate?

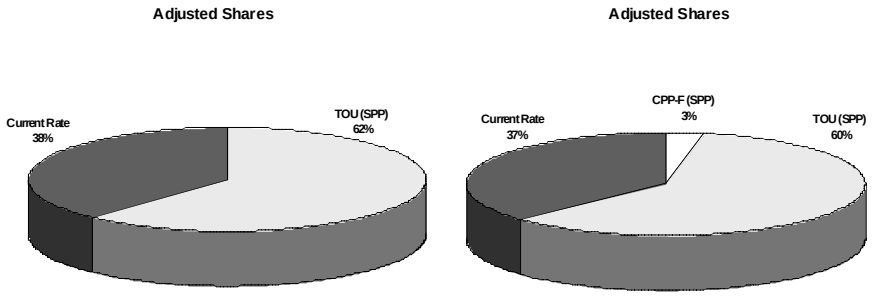
To investigate this, let's first take a situation in which the CPP-F SPP rate is the default rate and customers are allowed to opt-out of that rate and on to either their current rate or the TOU SPP rate. In Chart 6.34 we see that the percentage opting-out of a TD rate entirely is reduced by 2% when a second TD rate is offered. The TOU rate takes some of the share away from the CPP-F rate, obtaining a 9% share of preference, while the CPP-F share of preference drops from 51% to 44% by offering the TOU rate.

Chart 6.34 – Share of Preference, Adjusted
Starting Condition = CPP-F (SPP)



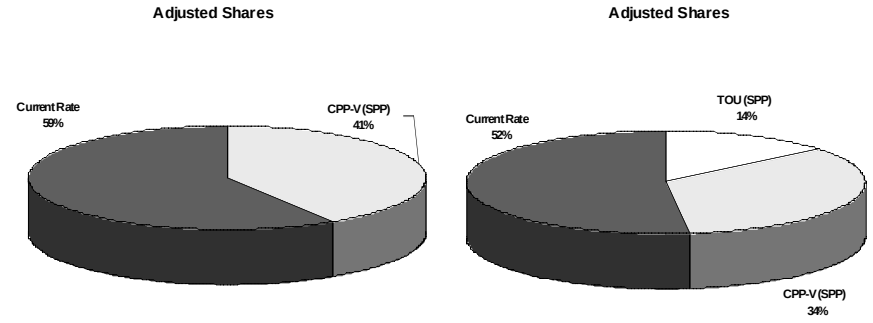
In a case where the TOU SPP rate is the default rate, offering the CPP-F SPP rate as well is about as effective in preventing customers from opting out to the current rate (see Chart 6.35). Offering this second rate only prevents an additional 1% from opting-out to the current rate. Furthermore, very few (3%) would opt out of the TOU rate to go on the CPP-F rate at all.

Chart 6.35 – Share of Preference, Adjusted
Starting Condition = TOU (SPP)



If the CPP-V SPP rate (made available to all) was offered as the default rate and customers were given the option to opt-in to either their current rate or the TOU SPP rate how might the total share of preference for a time-differentiated rate change? Reviewing Chart 6.36 we see the largest positive impact yet on total TD share from offering a second TD rate. The total share for time-differentiated rates in total increases by 8% when the TOU rate is offered in addition to the CPP-V rate.

Chart 6.36 – Share of Preference, Adjusted
Starting Condition = CPP-V (SPP)



However, given the possibility that only central AC users will be eligible for the CPP-V rate, what is the impact of offering a second TD rate in addition to the current rate? If, once again, the TOU SPP rate was offered as an opt-in option in addition to the current rate and assuming that those not eligible for the CPP-V rate would be started on the TOU rate instead, the total share of preference for the two TD rates combines increases dramatically – from 29% to 54%.

Chart 6.37 – Share of Preference, Adjusted Starting Condition = CPP-V (SPP)

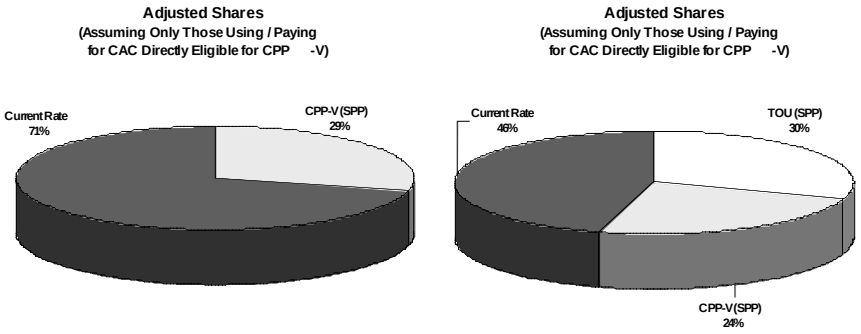


Table 6.5 summarizes these findings as well as the impact of less than perfect awareness, which in these scenarios works to increase the number of customers that would remain on the default TD rate.

Table 6.5 – Market Scenarios with Starting / Default Condition Set as TD Rate with Current Rate and Second TD Opt-in Rates

Starting / Default Cond.	Opt-in Condition	Opt-in Condition	Share for T.D. Rates (Adjusted for Risk Avoidance and Inertia)	Share for T.D. Rates (Adjusted for Risk, Inertia, and Awareness – 70% Awareness)	Share for T.D. Rates (Adjusted for Risk, Inertia, and Awareness – 50% Awareness)	Share for T.D. Rates (Adjusted for Risk, Inertia, and Awareness – 30% Awareness)
CPP-F (SPP)	Current Rate (CR)	TOU (SPP)	CPP-F – 44% TOU – 9% CR – 46%	CPP-F – 61% TOU – 6% CR – 32%	CPP-F – 72% TOU – 5% CR – 23%	CPP-F – 83% TOU – 3% CR – 14%
TOU (SPP)	CR	CPP-F (SPP)	TOU – 60% CPP-F – 3% CR – 37%	TOU – 72% CPP-F – 2% CR – 26%	TOU – 80% CPP-F – 2% CR – 19%	TOU – 88% CPP-F – 1% CR – 11%
CPP-V (SPP)	CR	TOU (SPP)	CPP-V – 34% TOU – 14% CR – 52%	CPP-V – 54% TOU – 10% CR – 36%	CPP-V – 67% TOU – 7% CR – 26%	CPP-V – 80% TOU – 4% CR – 16%
CPP-V (SPP – *assumes avail. only to those with CAC*)	CR	TOU (SPP)	CPP-V – 24% TOU – 30% CR – 45%	CPP-V – 37% TOU – 31% CR – 31%	CPP-V – 45% TOU – 31% CR – 23%	CPP-V – 53% TOU – 32% CR – 14%

From these findings we could conclude that offering multiple products when the default or starting rate is the CPP-F or TOU SPP rate does not significantly increase the number of customers remaining on a TD rate. In fact, we see only a 1-3% point reduction in the number of customers opting to go back on their original rate. Thus, given the combination of rates tested here the utilities could expect a little over a third to nearly half of customers to go back on their current rate (assuming 100% awareness) when offering a combination of these two rates.

However, offering multiple products when the default is the CPP-V SPP rate is more of a winning proposition, particularly if we are to assume that the CPP-V rate is only available to eligible premises with central AC. In these cases, we could expect that the number of customers remaining on a TD rate would increase by either 7% when the default CPP-V rate is available to all customers, or increase by 26% when it's available only to eligible premises. Given the combination of rates tested here, we could still expect nearly half of customers to go back on their current rate, assuming 100% awareness.

In either case, program planners will need to investigate whether the expense of offering multiple rates when a TD rate is the default or starting rate will justify the additional load reduction resulting from the additional customers on time-differentiated rates.

In Summary

The results generated from the analysis reported in this section lead to several conclusions:

- Price has the most dramatic effects on the proportion of customers likely to select a new TD rate offering. In cases where a rate plan is constructed with relatively unfavorable price savings potential, however, including very favorable non-price features could help to gain some share, though results will not be dramatic.

- Though not discussed at length in this report, billing type (flat vs. a time-differentiated rate) is an important rate feature driving share. Though no simulations were conducted for this report to look at the flat rate bill option specifically, the utilities produced by the discrete choice analysis suggest that this billing type is preferred over TD rate billing

- Given the limited number of scenarios tested in this analysis, regardless of whether customers are given the option to opt-in to one or two TD rates from their current rate, we could expect roughly 1/4 of customers to do so, regardless of the specific rates offered and assuming 70% awareness of these options. The percentage opting-in to a TD rate would, of course, necessarily decrease as awareness decreases and increase as awareness increases.

- When customers are placed on a TD rate as their default rate, we can expect roughly 2/3-3/4 of customers to remain on that TD rate, regardless of whether they are given a second TD rate option to opt-in to or not on the assumption that 70% are aware of their options, with the TOU SPP rate garnering the greatest share.

- Based on the limited number of rates tested here, under both opt-in and opt-out conditions, the specifics of whether the TD rate(s) offered are TOU rates or CPP-F rates do not have a dramatic effect on customer response; customer response is similar, in other words, regardless of the specific structure of the rate option (within the range of

plausible alternatives). There is a greater difference in response when offering a CPP-V rate (with share decreasing), particularly when only made available to those customers that use and pay directly for central AC.

- Preliminary analysis suggests that there are differences in response to TD rates depending on the customer's current rate type and AC use and ownership and, to a much lesser extent building type, utility and geographic region. Those currently on TOU rates, those on rates without a demand charge, and those that use and are responsible for their premise's central AC; hospitals, lodging and educational buildings tend to prefer the TD rates modeled here more than other customers. SCE customers seem to show a slight preference for TD rates over PG&E and SDG&E customers. Customers in climate zone are generally less inclined to prefer TD rates.

There are obviously many other market scenarios that could be investigated, with this report limited to only those deemed most pertinent given the feasibility of offering certain rate options and certain product portfolios. The reader is, however, invited to explore further the impact of offering these rates and others, as well as other product portfolios, in the market share simulator that accompanies this report.

Notes on the Use of the Simulator

Accompanying this report is a simulator which will allow the user to simulate up to three different alternative rate options and the current rate (represented by "none" in the simulator). The simulators labeled as Versions 1.3 and 1.4 are the final versions and were used to calculate the share of preference estimates described here. Version 1.3 will allow the user to estimate share for customers in all of California, while version 1.4 will allow the user to look at the results separately for the three California IOUs. When opening the simulator, which has been created in Excel, the user will have to click the button for "enable macros" for the simulator to run properly.

On the simulator sheet there are three columns for specifying the three alternative rate options, labeled alternative A, B, and C. Alternative A is automatically included in each simulation. Alternatives B and C will only be included if the box below each of the two columns, which reads "include in simulation" is checked.

To specify the rate options for simulation, type in the appropriate percentage for each of the three bill impacts. The valid range for each of the three bill impacts (maximum, some and no adjustments) can be seen in the upper left hand corner of the screen. Any percentage in the valid ranges can be simulated. If invalid percentages are entered for the bill impacts, the product will be ignored in the simulations. Please also note that a valid simulation requires the percentage bill impact to be higher for maximum adjustments than some or no adjustments, and higher for some adjustments than no adjustments. If this rule is violated, the simulator will not return a result for that product.

For the remaining rate features, the levels for simulation are chosen from a drop down menu. Please note that for the "notice of critical days provided" feature there is no option for "N/A" which would be appropriate for a TOU rate. The simulator will automatically flag the critical day-dependent features, setting them to "N/A" if the number of critical days is equal to zero. Also, though the simulator allows the user to enter 0 critical days and "only on critical days" for when on-peak periods occur, the simulator will not return a result for

that product and will present an error message that reads "Critical days must be greater than 0."

Before hitting the "run simulation" button at the top right of the screen, please note that there are options at the top middle of the screen for running uncalibrated shares, shares calibrated for stickiness only, and shares calibrated for stickiness and risk, which are selected from a drop down menu. The user may wish to look at all three to see the affect of each. Also, right below this is a drop down labeled "default." This option will allow the simulation to be run specifying "none" (or the current rate) or any of the three alternative rate options as the starting condition. How the inertia calibration is applied will depend on the rate specified as the default.

Below this is the selection for whether or not to adjust for AC ownership. Using this adjustment the preference shares can be calculated for a CPP-V rate that is only made available to those that use and directly pay for the central AC at their business premise.

The final level of adjustment that can be applied is level of awareness. The user can select 100%, 70%, 50% or 30%.

PLEASE NOTE: Given the complex nature of the simulator, we were unable to have the AC Ownership adjustment and the awareness adjustment be correctly applied when the default product is a CPP-V rate. The user should not rely on the figures reported here in these cases.

Once the "run simulation" button is hit, the program will automatically take the user to the results page. The top of the screen lists each of the rates simulated and the share of preference for each rate and for none (or the current rate). On the bottom portion of the screen, the simulator shows the share of preference for each alternative rate and none broken out by several different subgroups.

The user can then click on the "simulator" tab at the bottom of the screen to specify a new simulation.

Likely Takers of Select TD Rate Options

Gaining a better understanding of the types of businesses most likely to go on a TD rate can be helpful as the relevant parties think about the product portfolios that will be offered and their marketing efforts for these products. Profiling these customers can suggest both who to target as well as how to target them. For example, are those most interested in a TD rate more or less likely than the average business to have certain levels of electricity use? Are they more or less likely to occupy certain types of buildings or be involved in certain types of business activities?

This section of the report profiles the likely takers for five specific rate options (see Tables 6.6 – 6.10 below for this data) that were specified to be as close as possible to several of the rates used in the SPP as well as others currently under consideration, such as the "Pure" CPP-F and "Pure" CPP-V rates. Note that the analysis was not extended to the rates examined in this report simply for comparison purposes only – specifically the rates denoted as the "best savings" rates. These rates were left out because the objective of the analysis

was to determine if there were differences in the types of customers likely to be attracted to the types of rates that the three IOUs are most reasonably considering offering.

For this analysis a "likely taker" has been identified as the top 10% of customers with the highest utility scores for a given product. Characteristics that distinguish the "likely takers" for a particular rate are provided in the following tables, and these characteristics have been identified by the computation of an index value for each characteristic.

The index values were computed for each characteristic by dividing the percent of "likely takers" (as defined above) that have a characteristic of interest (i.e. the percent of "likely takers" that are PG&E customers) by the percent of all respondents with the characteristic (i.e. the percent of all respondents that are PG&E customers) and multiplying the result by 100. As the magnitude of difference increases (either positive or negative) between the resulting index value and 100 (which would indicate the two populations are the same), the more useful the characteristic is for identifying "likely takers." One can also look at this resulting index value, a ratio level statistic, as telling us the degree to which the likely takers are more or less prevalent in a particular subgroup of interest. Looking at the first row in Table 6.6 below we find a resulting value of 130 for PG&E. This would tell us that PG&E customers are 1.30 times more likely to exist as likely takers of the CPP-F SPP rate than they exist in the general California customer population.

While there are several unique differences that emerged between the groups of takers for each of the example rates used in this analysis, the most interesting finding here is the number of *similarities among* these groups of customers. These similarities can be grouped into the following categories:

- *Climate zone* – Takers of the TOU and CPP-F rates were somewhat more likely than the average customer to live in climate zone 2, especially if they are currently PG&E customers. Likely takers of the CPP-V, pure CPP-F or pure CPP-V rates were no more or less likely to live in climate zone 2.

- *Rate Plan* – Likely takers are, in some cases, nearly twice as likely to currently be on a TOU rate plan. The prevalence of likely takers on a TOU rate is even higher among the PG&E customer base. Likely takers of these TD rates are also more likely to indicate that they are not sure if their rate includes a demand charge.

- *Energy Use* – These TD rates tend differentially attract PG&E customers with low electricity usage (between 0-20kWh). The CPP-F and TOU rates also attract more low usage customers in climate zone 2.

- *Ownership and Occupancy* – Most likely takers have a slightly higher tendency to occupy only a portion of the building their business resides in.

- *Hours of operation* - Likely takers are also more inclined to operate more than 40 hours per week.

- *Electricity Management* –Likely takers of the CPP-F, TOU, and Pure CPP-F are also more apt to be using an energy management system than non-takers.

- *Conservation Behavior* – Most of the likely takers of these rates were more likely to have demonstrated a willingness to change / curb their electricity use when needed.

- *Building Age and Locations* – Likely takers of the Pure CPP-V and Pure CPP-F tend to occupy buildings that are between 10 and 30 years old. These businesses are also more prone to have 1-2 additional locations in California.

These similarities, as well as some unique differences between these groups of takers, can be found in the following five tables (Tables 6.6 – 6.10).

Table 6.6 – Most Likely Takers of the CPP-F Pilot Rate

	Indexed Values
Utility	
PG&E[33]	130
Climate Zone by Usage	
Zone 2, Low Usage	123
Climate Zone by Utility	
Zone 2, PG&E	165
Rate Plan by Utility	
PG&E, TOU Rate	252
PG&E, non-TOU rate, Don't know if it includes demand charge	150
Energy Usage by Utility	
Low Usage (0-20 kWh), PG&E	133
Interest in Fixed Price Premium Rate	
Low Interest	124
Own/Rent Status	
Rent	135
Building Occupancy – All, Partial, or None	
Occupy a portion of the building	123
Building Square Footage	
2,000 – 5,000 square feet	128
Type of Business Activity	
Retail Sales Floor	163
Use of Energy Management System	
Yes	147
Presence of "other" Major Electrical Equipment	
Yes (refrigeration, cooking, industrial equipment, etc.)	124
Electricity as % of Total Operating Costs	
10 – < 20%	194
Actions Taken in 2001 Crisis	
1 – 3	152
Actions Taken Since 2001 Crisis	
Less than during crisis, more than none	143

[33] Note that for Climate Zone and for the other attributes, the only categories that have been listed here are the ones for which the index value is significantly higher than 100 (meaning that the category is significantly more likely than average to appear among likely takers of the specified rate). If a category is not listed, that means that the category is "average" in its representation among likely takers.

Table 6.7 – Most Likely Takers of the TOU Pilot Rate

	Indexed Values
Climate Zone	
Zone 2	133
Rate Plan	
TOU	212
Non-TOU, don't know if have a demand charge	128
Climate Zone by Usage	
Zone 2, Low Usage	142
Climate Zone by Utility	
Zone 2, PG&E	196
Rate Plan by Utility	
PG&E, TOU Rate	307
PG&E, Non-TOU Rate, Don't know if have a demand charge	180
Interest in Equipment Controls	
Low interest	138
Type of Building	
Part of larger building, complex, or mall	123
Building Square Footage	
2,000 – 5,000 square feet	163
Use of Energy Management System	
Yes	163
Age of Structure	
10 -< 30 years	126

Table 6.8 – Most Likely Takers of the CPP-V Pilot Rate

	Indexed Values
Rate Plan	
TOU	182
Rate Plan by Utility	
PG&E, Non-TOU Rate, don't know if includes a demand charge	155
Energy Usage by Utility	
Low Usage (0-20 kWh), PG&E	121
Interest in Equipment Controls	
Moderate interest	167
Building Occupancy – All, Partial, or None	
Occupy entire building	121
Type of Business Activity	
Meeting Rooms	503
Weekly Hours of Operation	
60 hours or more	125
If Business has and pays for (A/C, Heat, etc.)	
Air Conditioning	123
Heat	121
Electricity as % of Total Operating Costs	
20% or more	212
Actions Taken in 2001	
1-3	138

Actions Taken Since 2001	
Less than during crisis, more than none	137

Table 6.9 – Most Likely Takers of the Pure CPP-V Rate

	Indexed Values
Rate Plan	
Non-TOU, rate includes a demand charge	121
Non-TOU / Don't Know if they have a demand charge	128
Rate Plan by Utility	
PG&E, TOU Rate	140
PG&E, don't know if rate includes a demand charge	180
Energy Usage by Utility	
Low Usage (0-20kWh), PG&E	133
Interest in Equipment Controls	
Moderate Interest	178
High Interest	193
Type of Building	
Part of larger building, complex, or mall	129
Building Occupancy – All, Partial, or None	
Occupy a portion of the building	127
If business has and pays for (A/C, heat, etc.)	
Heat	128
Type of Business Activity	
Office Work	152
Weekly Hours of Operation	
40-59 hours	131
Actions Taken in 2001 Crisis	
1-3	123
Age of Structure	
10 -< 30 years	126
Other California Locations	
1-2 Additional Locations	157

Table 6.10 – Most Likely Takers of the Pure CPP-F Rate

	Indexed Values
Rate Plan	
Non-TOU, rate includes a demand charge	126
Rate Plan by Utility	
SCE, rate includes a demand charge	150
Use of Energy Management System	
Yes	143
Presence of "other" Major Electrical Equipment	
Yes (refrigeration, cooking, industrial equipment, etc.)	138
Actions Taken in 2001 Crisis	
1-3	135
Actions Taken Since 2001 Crisis	
Less than during crisis, more than none	147

Age of Structure	
10 -< 30 years	125
Other California Locations	
1-2 additional locations	214

The team also reviewed the likely takers of the various rate plans, under a "best savings" scenario which offered the highest potential savings for the SPP rates analyzed above. The likely takers of the "best savings" rate plans exhibited some common characteristics:

- High energy usage for likely takers of all CPP - best savings rates
- Current rate plan tends either to be a TOU rate plan or a non-TOU rate plan that includes a demand charge
- Likely to have higher electricity costs as % of total operating costs (greater than 10% of total operating costs)
- Likely to have modified their energy use when needed in the past

Lastly, the team profiled the group of customers identified as non-takers. That is, for every option presented, they chose not to participate in the rate plan options presented. As Table 6.11 indicates below, there were few characteristics included in the survey that could be used to define this group. The group seems to have low interest ratings in equipment controls, TD rates, and fixed premium rates, does not have a history of changing their energy usage, and also tends to have demand charges as part of their bill.

Table 6.11 – Rate Option Non-Takers

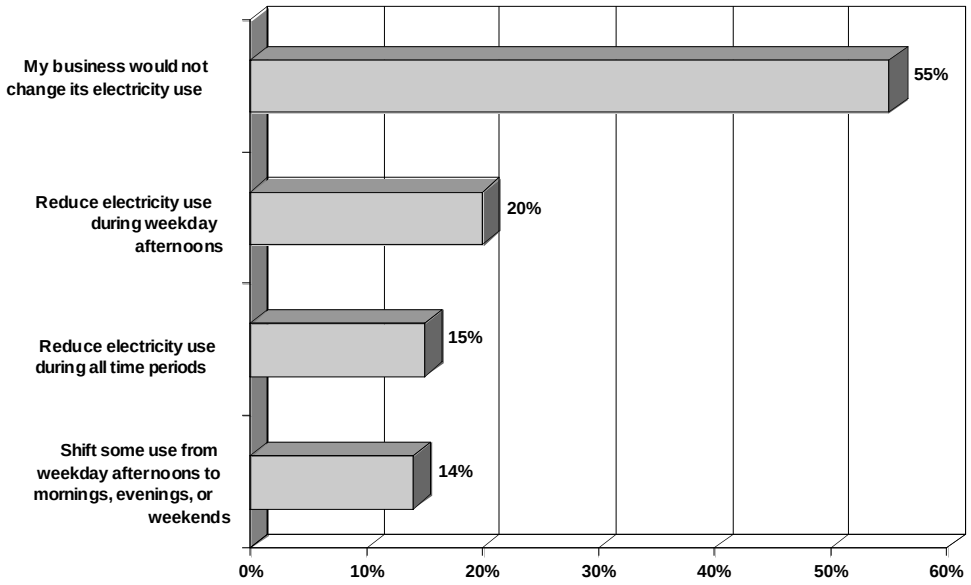
	Indexed Values
Climate Zone	
Zone 3	132
Rate Plan	
Non-TOU rate, includes a demand charge	130
Climate Zone by Usage	
Zone 3, Low Usage	141
Rate Plan by Utility	
SCE, Rate includes a demand charge	156
Interest in Equipment Controls	
Low interest	149
Interest in TD Rates	
Low interest	144
Interest in Fixed Premium Price Rate	
Low interest	137
Changed Behavior in 2001 Energy Crisis	
No	155

Detailed Findings: Likely Response to Time-Differentiated Pricing Plans

Obviously, in order for time-differentiated pricing to have the desired impact on load, business decision makers have to not only be willing to put their business on time-differentiated rates, but also respond to these rates by either reducing or shifting their electricity usage. While other SPP activities measure actual response, the CPMR survey asked customers how they think they might respond under these pricing options.

These results indicate that a majority, or 55%, think they would not change their electricity use if they were on time-differentiated pricing plans. This is in stark contrast to the residential customer research, which found only 15% unwilling to change how they use electricity.

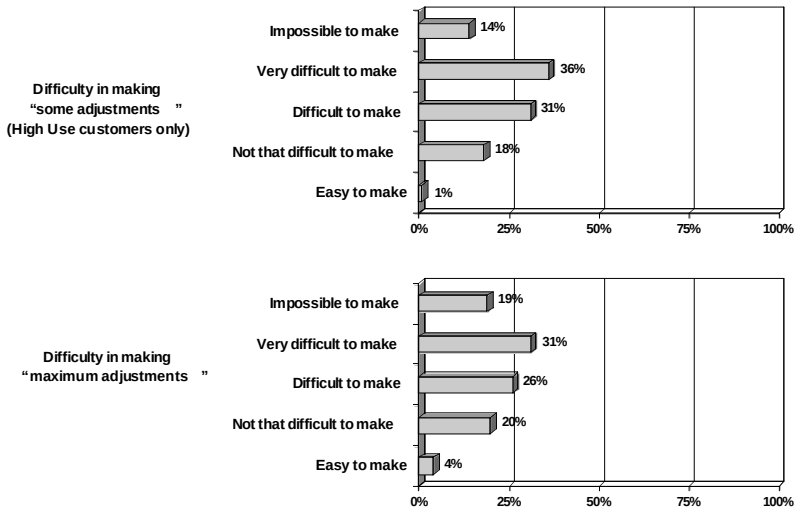
Chart 7.1 – Actions Most Likely to Take Under Time-Differentiated Pricing Plans



QDCB. Which of the following actions would you be likely to take if your business at [ADDRESS] was under these kinds of electricity pricing plans? (multiple selection) n=1002

Furthermore, approximately half the respondents indicated that making "some" or "maximum" adjustments to their electricity use would be impossible or very difficult to make.

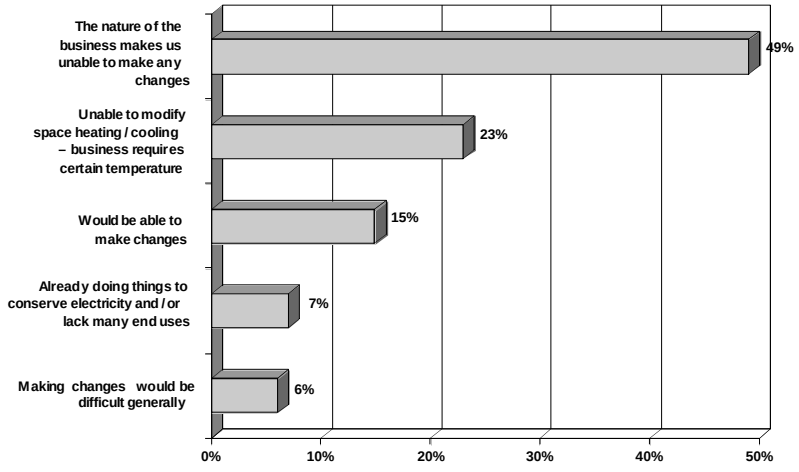
Chart 7.2 – Difficulty in Making "Some" or "Maximum" Adjustments in Electricity Use



QDC1/QDC3. Thinking about how difficult it might be to make some (DC1) / maximum (DC3) adjustments in your electricity use at th is location on both PEAK and CRITICAL weekday afternoons, would you say these types of changes would be: n=124, DC1; n=1002, DC3

Many high use customers feel they have limited ability to change the way they currently use electricity given the nature of their business (see Chart 7.3).

Chart 7.3 – Difficulty in Making "Some" or "Maximum" Adjustments in Electricity Use



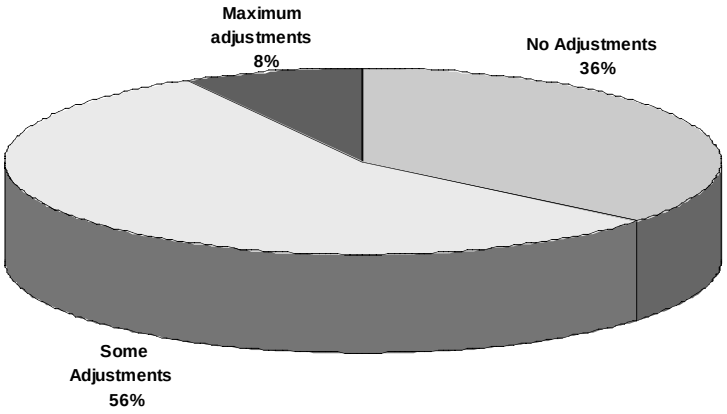
QDC2. What would be the most difficult thing about making these types of changes in electricity use? (multiple response) n=124 (High use customers only)

Some of the difficulties cited by high use customers included:

- Limited control over guest / tenant electricity usage
- Usage is based on customer demand; greatest demand during weekday afternoons
- Certain equipment / lighting needs to be kept running at all times
- Usage is based on demand of manufacturing process
- Cannot compromise comfort of customers / patients / students / employees

Despite the fact that half of the respondents felt that "some" adjustments would be impossible or difficult to make, a little over half sill anticipate making some adjustments, while 36%indicate they would make no adjustments at all.

Chart 7.4 "Adjustments" to Electricity Use Most Likely to Make



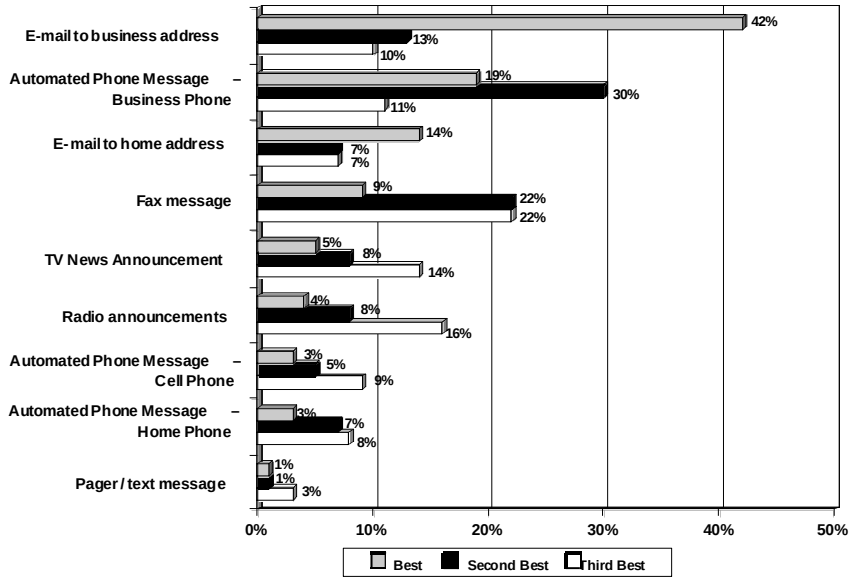
QDC4. Which of the types of changes do you think this location business would be able to save money on its electric bill: maximum adjustments, some adjustments, or no adjustments; n=1002

Bearing in mind that these questions were asked of respondents before describing the exact nature of the benefit or penalty they could incur in the conjoint section of the survey, these findings suggest that many businesses will be resistant to changing current electricity use behaviors regardless of a price signal. That is *not* to say that an appropriate price signal that either provides enough of a benefit for changing electricity use or a penalty for not doing so does not exist. But, rather, general promises of money savings or increase in prices is not in and of itself enough of a driver to spur businesses into thinking about changing current business practices.

Preferred Notification Methods for CPP Days

A majority of respondents felt the best method for notifying them of a critical pricing day was to contact them directly at their business – via either email or the business phone.

Chart 7.5 – Preferred CPP Day Notification Methods



Q69. What would be the best way to get this notice to you? Ple ase select one option from each of the columns below to indicate the best ways to notify you about oncoming critical days. n=1002

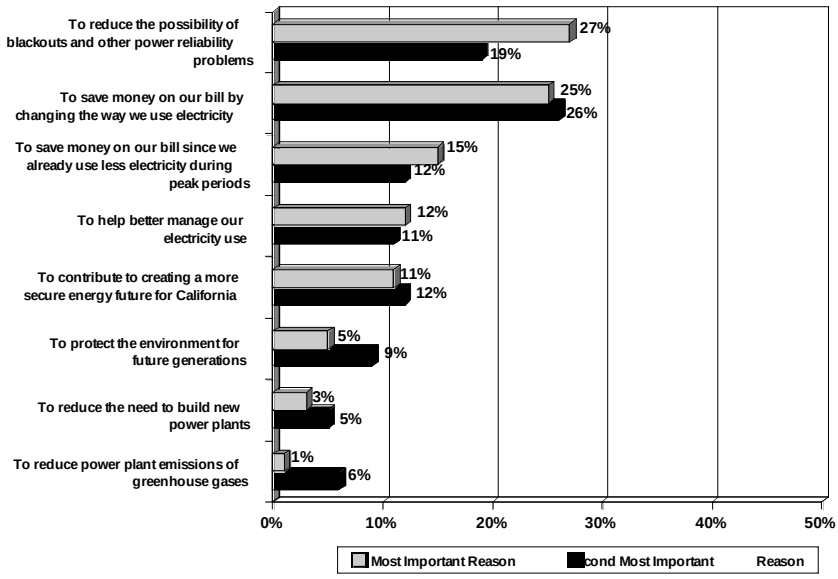
Reasons for Signing Up for a Time-Differentiated Pricing Plan

For the purposes of this research, respondents were given a description of time-differentiated pricing options that were purely descriptive, with no attempt made to "sell" respondents on the idea. Looking forward, however, it will be important for the utilities to understand how to communicate to customers about these pricing plans using the value propositions that are most compelling in terms of generating interest.

In looking at the value propositions tested, the two with the greatest importance could be seen as having the greatest impact to a business' bottom line – reducing the possibility of blackouts (with blackouts having financial impacts in terms of lost sales, manufacturing /production time lost, etc) and saving money by changing the way electricity is used by the business, with a little over half of the respondents selecting one of these two reasons as most important. The two other "money savings" value propositions are next most important here though much less so than the two just cited. One might postulate that "saving money on our bill since we already use less during peak periods is probably infrequently the case for most businesses.

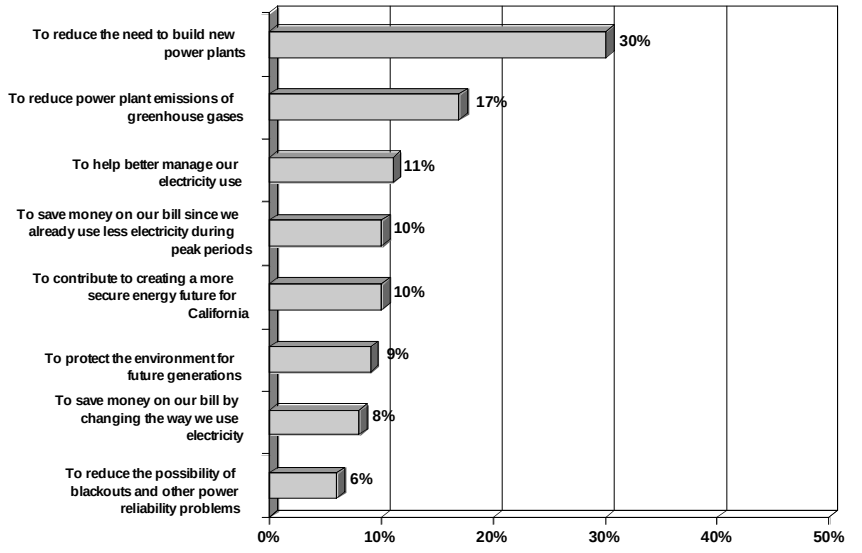
Those reasons with the least direct impact on a business' bottom line, but with direct impact on the overall "common good" were considered the least important in terms of reasons to sign up for a TD pricing plan. Furthermore, though not tested directly, we might also postulate that the end benefit of some of these reasons may be less understood (like the impact of building more and more power plants) or their consequences not immediate or tangible (reducing power plant emissions of green house gasses), thus resulting in them being considered less important than those with direct financial impact.

Chart 7.6 – Most Important Reasons for Signing Up for a TD Pricing Plan



Q66/Q67. Please choose the reason that would be **most / next most** important to you when you think about signing up your business for such a pricing plan. n=1002

Chart 7.7 – Least Important Reasons for Signing Up for a TD Pricing Plan



Q68. And, please choose the reason that would be **least most** important to you when you think about signing up for such a pricing plan. n=1002

These results are also suggestive of the *types* of value propositions that might work best when communicating about these pricing options, with a combination of savings messages

coupled with power reliability messages potentially working best as the primary messaging to “sell” businesses on these pricing plans.

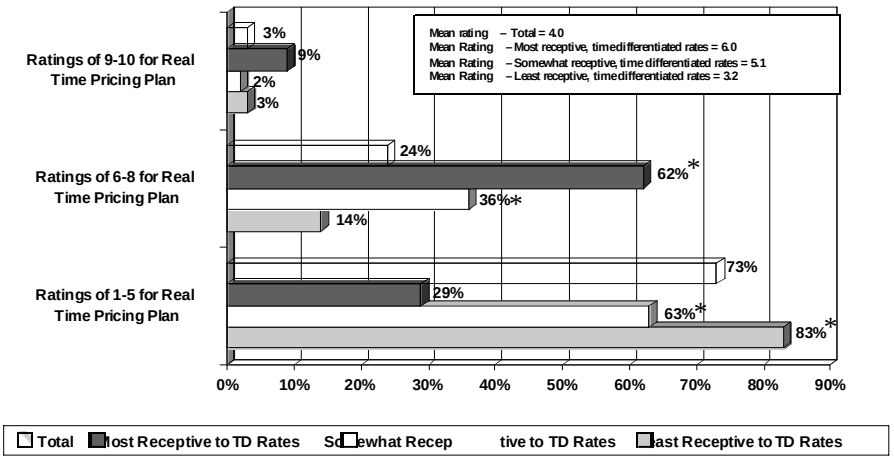
Detailed Findings: Reactions to Other Pricing Plans

After considering the various TD and fixed price / premium rate options, respondents were then asked to consider an alternative pricing option not tested as part of the discrete choice conjoint tasks – a real time pricing plan.

Overall, there was little interest in signing up for a real time pricing plan with the majority (73%) giving such a plan ratings of 5 or lower on a ten-point scale and with only 3% indicating strong interest (ratings of 9-10) in such a plan. Such ratings do not, however, account for the inertia that would work to keep customers on a real-time pricing plan if placed on that plan initially and only given the option to opt out.

Receptivity to a real-time pricing plan also appears somewhat correlated to interest in time-differentiated plans. As shown in Chart 8.1, those most receptive to the idea of a time-differentiated pricing plan are also significantly more receptive to a real-time pricing plan, suggesting a potentially greater receptivity to change, risk and uncertainty in general among this set of respondents.

Chart 8.1 – Interest in a Real Time Pricing Plan



* Differences significant at the 95% confidence level

Q71. How likely would you be to sign up your business for a real time pricing program? (1=No chance I would sign up the business for a real time pricing plan; 10=I would definitely sign up the business for a real time pricing) n=1002

Detailed Findings: Distinguishing "Likely Takers" of Equipment Control Systems

As with our initial investigation into customer interest in TD rates, an easy place to begin this discussion would be to ask ourselves what kinds of businesses, generally speaking, would be interested in using equipment control systems at their businesses? How similar are these "likely takers" to other customers? And, assuming there are certain subgroups that find equipment control systems more appealing than others, how similar are these groups of customers to those that were most interested in TD pricing?

This section takes up the question of what types of customers would be most likely to consider adopting equipment control systems if these were made available to customers as part of a time-differentiated pricing plan.

The Data Used in This Analysis

To explore the issue of the types of customers would find equipment control systems most appealing, the team focused on responses to three specific equipment control options that customers evaluated[34], in addition to their evaluation of the various options presented in the discrete choice tasks. These options were designed to be representative of the continuum of offerings under consideration from basic, moderate, and extensive controls; low, medium and high price; and low, medium and high monthly bill impact; and different levels of system programming/activation. Customers were asked to rate their likelihood of purchasing each of these equipment control device options if they were made available to them. These three options are presented in Table 9.1.

Table 9.1 – Equipment Control System Options Used in Taker Analysis

	Option 1	Option 2	Option 3
Monthly Cost	$10	$20	$40
How Extensive Controls are	Basic	Moderate	Extensive
Impact on Monthly Summer Electric Bill	5%	10%	15%
System Programming & Activation	Utility programs to customer's specs	Utility programs / customer can override	Utility programs / customer can override

Customers rated each option on a scale from 1 to 10 where 1 meant "No chance I would purchase" and 10 meant "I would definitely purchase." Using respondents' ratings to each of these options, an additive index was created that summed each person's rating for each of the three options to yield a single value. This index, then, measures a customer's general interest in adopting or purchasing equipment control systems if they were made available, rather than to a specific type of equipment control system.

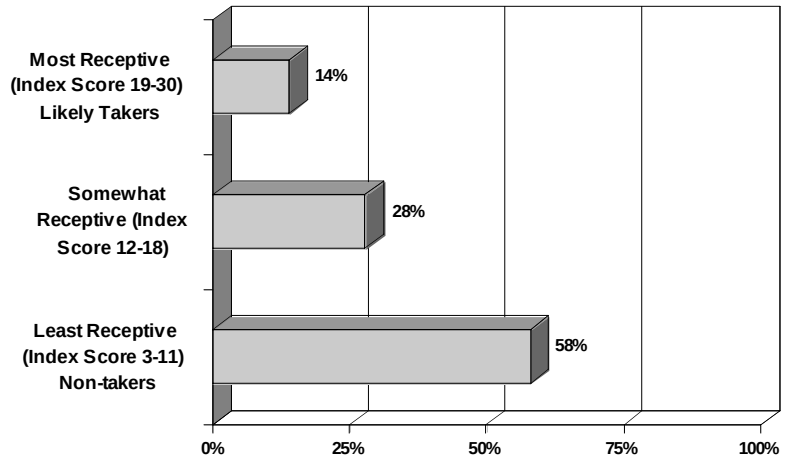
[34] Please note that only those customers that indicated they pay for the air conditioning used at their business premise directly (Q12), or paid for at least a portion of this air conditioning expense directly (in the case of building managers / owners – Q35) were asked these questions.

This index was computed for each respondent by adding together their ratings for each of the three equipment control system options. Thus, each person was assigned an index score ranging from 3 to 30 (the range of values possible for this index, where a score of "3" meant they rated each option a "1" on the interest scale and a score of "30" meant that they rated each option a "10" on the interest scale). Respondents were then separated into groups that ranged from likely takers/most receptive to non-takers/least receptive. Those with a receptivity score of 19 or higher (roughly equivalent to giving each option a score of roughly 6.5 or higher on average on the 10-point scale) were allocated to the likely takers/most receptive group to equipment control systems. Those with receptivity scores of 11 or less were allocated to the non-takers/least receptive group.

It should be noted that the score required for classification as a likely taker in this exercise is somewhat less stringent than what is typically used to define "likely takers" (typically ratings of 8 to 10 are used). Overall, there is a general lack of strong interest among customers in installing equipment control systems. For this reason, the definition of a "likely taker" was expanded to provide sufficient data for analysis.

Chart 9.1 reports the sizes of each of these groups. It is important to note here that while Chart 9.1 indicates that 14% of the respondents in the current study are likely "takers" for equipment control systems, this is not to suggest that this is the percentage of customers that we could expect to adopt any type of equipment control system offered.

Chart 9.1 – Receptivity to Equipment Controls System



WTP1-WTP3. If a controls system were available to you now with the sp ecific configuration listed below, how likely do you think you w ould be to purchase that option? (1=No chance I would purchase for this location; 10=I would definitely purchase for this location) n=6 35

In fact, the percentage of customers that would be likely to adopt a given equipment control system may well be larger or smaller than 14% depending on how it was designed, whether it was bundled or marketed with a significantly appealing TD rate option, etc. However, regardless of what specific equipment control system we may want to look at later, we would expect that those customers defined here as most likely "takers" of equipment control

systems would tend to make up the largest part of the likely taker group for any such option.

Now the question becomes, how, if at all, do these most likely takers differ from non-takers, and are these differences important?

Distinguishing Most Likely Takers from Non-Takers

Table 9.2 details the differences between the "takers" and "non-takers" for equipment control systems. Some of the highlights of these differences include:

- Like those most receptive to TD pricing options, likely takers of equipment control systems tend also to be more open to new products and services generally. Those most interested in equipment control systems were significantly more interested in each of the three alternative pricing options explored in this study (TD, premium fixed price per hour and real-time pricing) and they tended to be more risk accepting when exploring new products and services.

- Likely takers of equipment control systems are more likely to imagine making adjustments to their energy use than the non-takers. Furthermore, likely takers are more likely to imagine they would reduce their electricity consumption during all time periods, even if rates would be higher only during weekday afternoons on a TD rate plan.

- Likely takers tend to manage electricity use for multiple business locations that have employees working at those locations. Non-takers, on the other hand, are more likely to indicate that they do not have employees working at the business location. Non-takers also tend to be responsible for fewer total locations and / or work for businesses that consist of only one location.

- Likely takers are somewhat more likely to be using packaged air conditioning units at the business premise for which they are responsible.

Table 9.2 – Differences between those Most and Least Receptive to Equipment Control Systems

	Most Likely Takers / Most Receptive to Equipment Control Systems	Most Likely Non-Takers / Least Receptive to Equipment Control Systems
Interest in Other Types of Rates / Equipment Controls Systems		
ost receptive to TD rates[35]	26%[36]	5%
east receptive to TD rates	29%	83%
ost receptive to Fixed price premium rate[37]	39%	11%
east receptive to Fixed price premium rate	36%	75%
nterest in real-time pricing plan (mean rating)	5.5[38]	3.2
Behavioral Differences		
aximum adjustments to electricity use expected to be very difficult to make	17%	35%
ome adjustments to electricity use expected to be not that difficult to make	42%	10%
/ould expect to reduce electricity during all time periods if on a TD plan	31%	13%
Number of Employees / Locations		
o employees working at location	1%	12%
0+ employees working at location	49%	28%
wn / manage the building but do not occupy it	<1%	6%
o other locations worldwide	44%	66%
other worldwide location	28%	9%
umber of locations respondent is responsible for in U.S. (mean number of loc.)	51.1	10.3
Equipment Use		
se packaged air conditioning units	87%	72%
esidential type room air conditioner	3%	14%
hermostat turned off during normal operating hours in the summer	3%	14%

[35] Calculated index; see "Detailed Findings: General Interest in Time-Differentiated Pricing" for calculation
[36] All differences between the two groups are significant at the 95% confidence level.
[37] Calculated index; see "Detailed Findings: General Interest in Fixed Price at a Premium Pricing" for calculation
[38] Mean ratings on a 10-point scale; 1=No chance would sign up, 10=Definitely would sign up

Detailed Findings: Understanding Customer Response to Specific Equipment Control System Features

There are various features that program planners might use to create alternative C&I equipment control system options. One of the goals of this research was to understand how customers think about each of the components or "building blocks" that could be used to construct this design. For example, how important is the potential savings that could be achieved monthly through the use of these controls? How much of a savings do customers need to see for the equipment control system to be seen as valuable? Is this potential savings from using the device more or less important to customers than the fixed cost per month for owning the device? Are customers willing to accept a device that is not free? How much are they willing to pay? In terms of the extensiveness of the controls, is more necessarily better? Most assume that customers need appliance control systems that are convenient and easy to use – but does this really translate into a preference for a utility-programmed appliance control?

In order to determine how to design an equipment control system that has the best chance of being adopted by customers, it is important to understand first how customers respond to each of the individual equipment control system building blocks that could be part of this "package." Once this is understood, we can use this to inform us how to create attractive system options.

Identifying the Equipment Control System "Building Blocks"

The research team selected the following set of building blocks from which to construct the various equipment control system options.

- Extensiveness of the system: This equipment control system building block involved describing for customers both the complexity of the equipment control system as well as the number of different types of equipment that could be controlled with the device. The types of controls included:
  - Basic Controls: Described as including simple air conditioning thermostat controls
  - Moderate Controls: Described as including controls for both AC and lighting systems, with simple on/off or single thermostat settings and timers only.
  - Extensive Controls: Described as including controls for AC systems, lighting systems and refrigeration systems if appropriate with multiple operational settings for different times of the day

- Monthly cost for the system – Basic System: This building block defines the monthly price customers could expect to pay for a basic equipment control system. This component varies from:
  - $5 / month
  - $10 / month
  - $15 / month
  - $20 / month

- Monthly cost for the system – Moderate System: This building block defines the monthly price customers could expect to pay for a moderate equipment control system. This component varies from:

- $15 / month
- $20 / month
- $25 / month
- $30 / month

- Monthly cost for the system – Extensive System: This building block defines the monthly price customers could expect to pay for an extensive equipment control system. This component varies from:
  - $20 / month
  - $30 / month
  - $40 / month
  - $50 / month

- Impact on monthly summer electric bill: This building block described the monthly savings possible for using the equipment control system. The potential savings ranged from:
  - 5% / month
  - 10% / month
  - 15% / month

- How the equipment control system would be programmed and activated: This building block specifies who will program the control, to whose specifications the control will be programmed, and the degree to which the customer will be able to override the control's programmed settings. More specifically, this component includes the following options:
  - Customer programs the system
  - Utility programs the system to customer's specifications
  - Utility programs the system to their specifications, and the customer can override
  - Utility programs the system to their specifications but the customer is not allowed to override

Next, we can explore how much value customers assigned to each of these building blocks. This analysis is quite similar to that of the TD pricing program building blocks described in a previous section of this report. The team also used discrete choice analysis here to understand customer preferences for each of these equipment control system components. For a more detailed description of the discrete choice methodology employed, please see the Methodology section of this report.

How Customers Value Each of the Equipment Control System "Building Blocks"

One important question to answer here is, how much do customers care about each of the various options within each building block? That is, we might expect them to prefer a 15% savings potential to a 10% savings potential, but how much more do they really like 15%? With regard to the complexity of the system do customers more highly value basic, moderate or extensive controls?

Secondly, which of these building blocks do they care most about? We might assume that the savings potential would be most important to customers, but is that really the case? Are there other building blocks deemed more important?

As with our analysis of the TD rates in the previous chapter of this report, the data used to answer these questions are generated from the analysis of the discrete choice tasks.

Survey respondents[39] were asked to react to a series of choice tasks that contained various combinations of the equipment control system building blocks. Through statistical analysis, we are able to translate the preferences they express into a set of "utilities". Again, "utility" is the statistical term for what, in plain language, we would describe as the mathematical representation of the value respondents place on each of the levels or options within a building block.

These "utilities" or measures of attractiveness or importance have no absolute interpretation in the real world but represent an estimate of the relative value of each of the different levels of the building blocks.

To begin, let's take a look at the utilities for the extensiveness of the system which are provided in Table 10.1. In this table are the average utility values across all respondents in the survey. The utility for basic controls is 1.37, for moderate it is 0.11, while it is negative 1.48 for extensive controls. Note that the utility value for a basic control system option is both positive and the largest value in the table. This tells us that customers value basic control systems the most, followed by moderate control systems. Extensive control systems have a large negative value indicating that they are valued the least.

Table 10.1 – Utility Values for Extensiveness of Equipment Control System

Extensiveness of Control	Utility
Basic	1.37
Moderate	.11
Extensive	-1.48

Next, we explore response to the monthly cost building block. In Table 10.2 the utility values across monthly costs for basic, moderate and extensive equipment control systems are compared.

- Customers are most sensitive to increases in monthly price from the entry level or base price regardless of the type of equipment control system. Unsurprisingly, when looking at the utility values for each type of control, we see that the smallest monthly cost has the largest value to customers. Furthermore, the drop in the utility when going from the lowest priced system to the next lowest priced system (regardless of whether this is a basic, moderate, or extensive system) is larger than any other drop in value.

- Customers are the most sensitive to changes in price for the extensive equipment control system than for any other system. In reviewing the utilities for the extensive control system we see that this system has larger drops in utility values for each respective increase in monthly cost than for either the basic or moderate control system. Thus, customers are more sensitive to price increases for the extensive system than for either the basic or moderate systems, quite possibly because some the price points for the extensive system are larger than for either of the two other systems (with price points going up to $40 and $50).

[39] Please note that only those customers that indicated they pay for the air conditioning used at their business premise directly (Q12), or paid for at least a portion of this air conditioning expense directly (in the case of building managers / owners – Q35) were asked these questions.

Table 10.2 – Utility Values for Monthly Cost of the System

	Monthly Cost	Utility
Monthly Cost for **Basic** Equipment Control System	$5	.68
	$10	.09
	$15	-.26
	$20	-.51
Monthly Cost for **Moderate** Equipment Control System	$15	.57
	$20	.13
	$25	-.21
	$30	-.49
Monthly Cost for **Extensive** Equipment Control System	$20	.79
	$30	.15
	$40	-.30
	$50	-.65

Table 10.3 reports the utilities associated with monthly summer bill savings. The reader will note that, similar to the evaluation of savings potential for the various TD rates, the choices evaluated in the survey by customers were not percentages. Rather, respondents were shown absolute dollar value bill impacts that were calculated based on their monthly utility bills in order to simplify the presentation for respondents. This allows us to evaluate the degree to which the value respondents attached to these savings levels were driven on the one hand by the percentage value of the savings offered, and separately, by the size of their electric bill. The analysis can ask the question, in other words, if a 15% savings level is "worth more" to the respondent for whom that percentage savings levels means saving $150 than it does to the respondent for whom it means saving $75? Table 10.3 lists the utilities for both the percentage savings impact as well as what we label as the dollarmetric impact (that is, the utility associated with the simple size of the respondent's bill).

Table 10.3 – Utility Values for Monthly Bill Savings

	Monthly Savings	Utility
Monthly Summer Bill Savings (Total Impact)	5%	-.82
	10%	-.02
	15%	.83
Monthly Summer Bill Savings (Dollarmetric Impact)	5%	-.02
	10%	.00
	15%	.02
Monthly Summer Bill Savings (Percentage Impact)	5%	-.79
	10%	-.02
	15%	.81

From Table 10.3 we find that:

- Most of the value associated with monthly summer bill savings comes from the percentage statement of the savings (5%, 10%, 15%) though a very small additional value is attached to higher savings values by those businesses with higher bills (that is, those with higher bills like higher savings levels.)

The value that customers attach to the various options for system programming and activation are reported in Table 10.4. From this table we find that:

- Customers more highly value options that give them the most control. Within this feature we find that customers prefer the option to program themselves, followed by the utility handling the programming, but allowing the customer to override the settings.

- A system that gives customers the least amount of control by having the utility program it and not allowing for the customer to override any programmed settings is the least valued. In fact, when looking at the absolute value of the utility for this option (2.95) we see that it is larger than the absolute value of the utility for the most preferred option "customer programs" (1.34). This would indicate that customers' dislike for this option is stronger than their preference for the most preferred option.

- The range from the largest positive utility value (1.34) to the largest negative value (-2.95) is larger than for any of the other equipment control building blocks which gives us some indication of the importance or contribution of this building block to customers' preference for a equipment control system option.

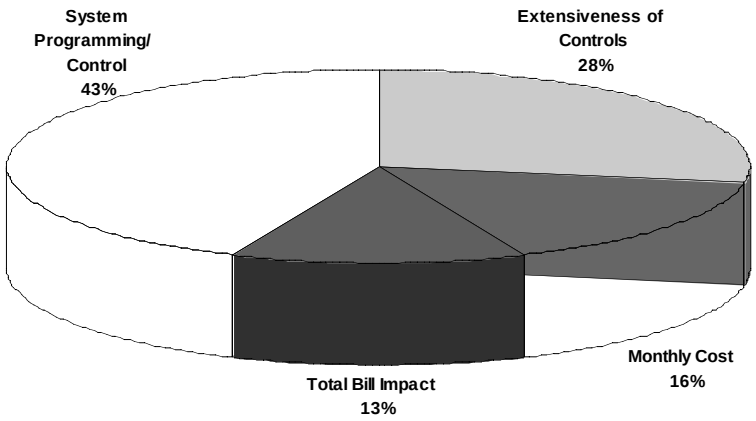
Table 10.4 – Utility Values for System Programming & Activation

System Programming & Activation	Utility
Customer programs	1.34
Utility programs to customers' specs	0.50
Utility programs, but customer can override	1.12
Utility programs but customer cannot override	-2.95

Chart 10.1 presents a summary of the relative importance of each of the equipment control system features tested in driving overall customer preference for a control system. The percentages for each component in the chart represent the relative contribution of each towards a customer's stated preference for a given option. The chart indicates that 43% of customer preference for a given option is driven by the features chosen in the system programming and control component. Approximately 28% of customer preference is driven by the extensiveness of the controls. A relatively small percentage of customer preference is driven by monthly cost of the system (16%) and total bill impact they could expect to see when using this system (13%).

Thus, to change the way an equipment control system is constructed by changing the percentage of savings realized by the customer will have a much smaller effect on customer preference for the option than a change in how the system is programmed and controlled, how extensive the controls are, or the monthly cost of the controls.

Chart 10.1 – Relative Importance of Equipment Control System Features



Given the greater importance attached to features with a financial impact when constructing TD pricing programs, it may seem surprising to find that potential savings and monthly cost are least important overall for the design of equipment control systems. However, respondents are not being inconsistent, seemingly suddenly unconcerned with financial outcomes. There will certainly be some customers who will be more motivated by features with a financial impact – primarily a desire to produce some savings on their electricity bill through the use of the least expensive system available. However, for many more customers, the other two components, dealing with issues of customer control and potentially complex equipment control systems, were simply much more important than the potential for monthly savings or a relatively small monthly cost.

Understanding Customer Variability in Preference for Specific Product Features

The previous section of this report described, on average, how customers responded to the various components or building blocks of an equipment control system. But, the question remains, however, of whether there are certain groups of customers who respond to these different components in ways that are substantially different from others. To answer this question, the team looked at various different customer segments defined by, for example, climate zone, utility, electricity usage, rate type, type of building, number of people working at the premise, building square footage, etc. The way in which utility or value was assigned to each level of the various equipment control systems were then compared across these different groups.

Detailed Findings: Understanding Customer Response to Specific Equipment Control System Features

The goal of this analysis is to identify any patterns in the way different customer groups assigned value to the product features. Do customers on a rate that includes a demand charge, for example, more highly value certain components of an equipment control system than do those businesses on a rate that does not include a demand charge? Do customers in different climate zones respond differently to the various components?

If customers are different in the way they evaluate the various equipment control system components, then this might have implications for how the marketplace will be approached. It is possible, for example, that different combinations of equipment control system features may be appropriate for certain customer segments and, in order to achieve adoption of these systems from a larger percentage of the customer population, it may be necessary to offer a couple of different options.

The next several tables enumerate the basic firmographic differences (by utility provider, climate zone, energy use, and current rate) found in how customer subgroups assign value to the equipment control system features.

Table 10.5 suggest several relevant differences among the customers of each of the three utilities. PG&E and SDG&E customers appear to more highly value a basic control system than do SCE customers. And, while not valuing a moderate control system as much as a basic system, SCE customers do value it more than PG&E or SDG&E customers. PG&E & SDG&E customers also appear to be somewhat more price sensitive, finding the entry level price for an extensive control system more valuable than SCE customers. Similarly, PG&E and SDG&E find a potential 15% bill saving more valuable than do SCE customers. SDG&E customers also more highly value a system in which the utility would handle the system programming for them.

Table 10.5 – Variation in Utilities by Utility Provider

Utility Provider	Basic Control	Moderate Control	Monthly Cost for Control $20 (Extensive)	Monthly Cost for Control $50 (Extensive)	Total Bill Impact 15%	Sys. Programming Utility Prog to Customer Specs
PG&E	1.54	.03	.82	-.70	.87	.43
SCE	1.11	.23	.72	-.60	.70	.49
SDG&E	1.49	.06	.87	-.71	1.02	.70

Table 10.6 indicates there were a few differences across climate zone in terms of preferences or value given to the specific programming and activation options for an equipment control system. Customers in climate zones 1 and 4 value a system that they can program themselves more than do other customers. Climate zone 4 customers also attach more value to a system that the utility programs but allows the customer to override the settings and, consequently, attaches more negative value to a system that does not allow this override.

Table 10.6 – Variation in Utilities by Climate Zone

Climate Zone	Sys. Programming Customer Programs	Sys. Programming Utility Programs & Activates / Customer Can	Sys. Programming Utility Programs / Customer Cannot

		Override	Override
1	1.91	.92	-3.40
2	1.16	.98	-2.60
3	1.30	1.15	-2.90
4	1.93	1.78	-4.20

Table 10.7 shows a very consistent preference among high energy use customers (those using 20-200kW[40]) for potential savings that could be realized with the system as well as a greater desire to maintain control over their energy use.

Table 10.7 – Variation in Utilities by Energy Use

Energy Use	Total Bill Impact 15%	Sys. Programming Customer Programs	Sys. Programming Utility Programs & Activates / Customer Can Override	Sys. Programming Utility Programs / Customer Cannot Override
High (20-200kW)	1.13	1.64	1.43	-3.70
Low (0-20kW)	.78	1.29	1.07	-2.80

Total number of other California locations and total building square footage occupied by the business could also be thought of as proxies for total energy use and, in fact, the findings (found in Tables 10.8 and 10.9) are similar. As the total number of California locations increases and the total square footage occupied increases, so does the perceived value of potential bill savings increase.

Table 10.8 – Variation in Utilities by Number of Other California Locations

Number of Other CA Locations	Total Bill Impact 15%
0	.73
1-2	.84
3-9	1.11
10+	1.17

Table 10.9 – Variation in Utilities by Square Footage

Building square footage	Total Bill Impact 15%
2,000 or less	.64
2001-5000	.89
5001-10,000	.97
10,000+	.99

[40] Please note that for SDG&E "high" was classified as usage of 20-100kW.

In Table 10.10 we see a similar pattern of value attached to potential bill savings and maintaining control over energy use among those customers currently on a TOU rate. Those customers currently on a TOU rate more strongly value potential bill savings that could be realized with the system as well as the ability to maintain control over their energy use through programming it themselves or by being able to override settings when needed.

Table 10.10 – Variation in Utilities by Current Rate

Current Rate	Total Bill Impact 15%	Sys. Programming Customer Programs	Sys. Programming Utility Programs & Activates / Customer Can Override	Sys. Programming Utility Programs / Customer Cannot Override
TOU	1.29	1.90	1.52	-4.05
Non-TOU / Demand Charge	.88	1.30	1.22	-3.01
Non-TOU / No Demand Charge	.77	1.41	1.05	-2.91
Non-TOU / DK if Demand Charge	.71	1.20	.98	-2.67

The next series of tables look at how the value customers attach to each of the system features varies by variables related to the operation or management of the business premise.

The type of building in which a business is housed (free standing, or part of a larger building or complex) appears to play a role in how the features of such an equipment control system is perceived. In Table 10.11 below we see that potential savings and the ability to maintain control over the programming and activation over such a system is valued more highly among those businesses that reside in a free standing building.

Table 10.11 – Variation in Utilities by Type of Building

Type of Building	Total Bill Impact 15%	Sys. Programming Customer Programs	Sys. Programming Utility Programs / Customer Cannot Override
Free standing w/ occupied space	.91	1.53	-3.26
Part of larger building or complex	.76	1.16	-2.67

Some of the customers in the survey were building managers only and, as such, did not occupy the space for which they had energy management responsibility – though they did have responsibility for the energy consumption at the building and paid for these expenses directly. While there are a small number of respondents who fall into this category (N=19), and as a result, their responses should be interpreted with caution, there are some interesting patterns within this group. The overriding theme in Table 10.12 on the following page is that, regardless of the feature in question (extensiveness of the control system, the monthly cost, potential bill savings or type of system programming and activation) building managers do not ascribe a great deal of value to any of the equipment control system features tested. That is, we would expect that modifications made to the specific features of a potential equipment control system would have little impact overall on preferences for building managers.

Table 10.12 – Variation in Utilities by Building Ownership

Own / Rent / Manage Premise	Basic Control	Ext. Control	Monthly Cost $5 (Basic)	Monthly Cost $20 (Basic)	Monthly Cost $20 (Ext.)	Monthly Cost $50 (Ext.)	Total Bill Impact 15%	Sys. Programming Customer Programs	Sys. Programming Utility Programs & Activates / Customer Can Override	Sys. Programming Utility Programs / Customer Cannot Override
Own – May or May Not Occupy	1.44	-1.61	.64	-.48	.83	-.68	.99	1.68	1.28	-3.45
Rent - Occupy	1.38	-1.46	.72	-.54	.79	-.64	.74	1.19	1.05	-2.74
Manage – Don't Occupy	-.16	.15	.21	-.16	.24	-.20	.54	-.25	.30	-.38

Table 10.13 – Variation in Utilities by Weekly Hours of Operation

Weekly hours of operation	Basic Control	Extensive Control	Monthly Cost $5 (Basic)	Monthly Cost $20 (Basic)	Monthly Cost $15 (Moderate)	Monthly Cost $30 (Moderate)	Monthly Cost $20 (Extensive)	Monthly Cost $50 (Extensive)
<40 hours / wk	2.27	-2.09	1.04	-.77	.85	-.73	1.02	-.83
40-59 hours / wk	1.34	-1.48	.68	-.51	.57	-.49	.80	-.66
60+ hours / wk	1.26	-1.38	.63	-.47	.53	-.46	.74	-.61

A few relevant differences were also found among customers depending on the number of hours per week the premise is open for business. Table 10.13 on the prior page shows that those premises open for fewer than 40 hours per week show a stronger preference for a basic equipment control system and appear to be more price sensitive, showing a stronger preference for the entry level price for every level (basic, moderate, or extensive) of system and a stronger dislike for the highest price system at every level. One might postulate that, given this reduced number of operating hours, these decision makers may be assuming that the return on such an investment will be less and, thus, may be less able to justify the expense of the system.

Customers also appeared to value program features differently depending on the percentage of their total costs that consist of electricity costs (see Table 10.14 below). Those for whom electricity costs make up less than 10% of their total electricity bill placed more value on the extensiveness (basic, moderate, extensive) of the equipment control system used, with a greater preference for the basic system. While those customers for whom electricity costs make up 10% or more of their total operating costs also expressed a preference for a basic system over an extensive system, they were less negatively predisposed to the extensive system. Overall, the feature related to the extensiveness of the system is less important in terms of driving preference for an equipment control system for those who spend more on electricity as a percentage of their total costs.

Table 10.14 – Variation in Utilities by Electricity Costs as a Percentage of Total Operating Costs

Electricity Costs as a % of Total Operating Costs	Basic Control	Extensive Control
<5%	1.52	-1.61
5 - <10%	1.47	-1.52
10 - <20%	.89	-1.17
20%+	.92	-1.07

The next series of tables look at how the utilities or value for each of the system features varies by differences in end uses and energy use management. In looking at the relatively few differences in terms of end uses it was found in Tables 10.15 – 10.17 that:

- Customers that use and pay directly for their AC and hot water use tend to value the entry level price for the equipment control system less than those customers without these end uses. Furthermore, the price of the system has less of an impact overall on preference for a particular system than other features.

- Those that use and pay directly for their heating, on the other hand, do value the entry level price for an extensive system more than those that do not have this end use to manage, with this feature having a bigger impact on overall preference for an equipment control system.

- Customers responsible for their hot water and heating use also more strongly value potential savings from use of the system. No such difference was detected for those customers responsible for their AC use.

Detailed Findings: Understanding Customer Response to Specific Equipment Control System Features

Table 10.15 – Variation in Utilities by AC Use / Responsibility

AC Use / Responsibility	Monthly Cost $5 (Basic)	Monthly Cost $20 (Basic)	Monthly Cost $20 (Extensive)	Monthly Cost $50 (Extensive)
Have & pay for AC	.68	-.50	.79	-.65
Don't have / Don't pay for AC	2.29	-1.71	1.59	-1.30

Table 10.16 – Variation in Utilities by Hot Water Use / Responsibility

Hot Water Use / Responsibility	Monthly Cost $15 (Moderate)	Monthly Cost $30 (Moderate)	Total Bill Impact 15%
Have & pay for Hot Water	.55	-.47	.86
Don't have / Don't pay for Hot Water	.65	-.56	.73

Table 10.17 – Variation in Utilities by Heating Use / Responsibility

Heating Use / Responsibility	Monthly Cost $20 (Extensive)	Monthly Cost $50 (Extensive)	Total Bill Impact 15%	Sys. Programming Customer Programs
Have & pay for Heat	.80	-.66	.85	1.37
Don't have / Don't pay for Heat	.63	-.52	.56	.92

Those customers already using an energy management system had a stronger preference for a basic system that would leave them with the most control over their energy use.

Table 10.18 – Variation in Utilities by Energy Management System Use

Energy Management System Use	Basic Control	Extensive Control	Sys. Programming Customer Programs	Sys. Programming Utility Programs & Activates / Customer Can Override	Sys. Programming Utility Programs / Customer Cannot Override
Use such a system	1.53	-1.61	1.64	1.31	-3.42
Don't use	1.24	-1.38	1.11	.98	-2.60

Likewise, those that currently own a standby or backup energy system also expressed a stronger preference for an equipment control system that would leave them with the most control over their energy use. Additionally, they expressed a somewhat stronger preference for an entry level priced moderate system and the potential savings from such a system.

Table 10.19 – Variation in Utilities by Standby / Backup Energy System Use

Own a Standby / Backup Energy System	Monthly Cost $15 (Moderate)	Monthly Cost $30 (Moderate)	Total Bill Impact 15%	Sys. Programming Customer Programs	Sys. Programming Utility Programs & Activates / Customer Can Override	Sys. Programming Utility Programs / Customer Cannot Override
Yes	.72	-.62	1.03	1.75	1.58	-3.87
No	.56	-.48	.81	1.29	1.07	-2.85

Detailed Findings: Estimating Market Potential – Equipment Control Systems

Up to this point, the discussion has revolved around customer preference for, or value of, various features or components of an equipment control system. This section will now move beyond this investigation of the various pieces of such a system to gain an understanding of how preferences for these various pieces would work together in a whole product and how it might translate into share of preference for a given product.

Specifically, this section will investigate:

- Several different equipment control options and how changes in these options affects customer acceptance
- Sensitivity of customer acceptance to changes in the specific features that might be offered in an equipment control system
- Estimates of anticipated customer response for each of the example equipment control systems against the alternative of no equipment control system.
- Estimates of differences in anticipated customer response for equipment control systems among various customer subgroups of interest.
- Likely customer response assuming perfect awareness - 70%, 50%, and 30% customer awareness.

The reader will note that the discussion here on estimating market potential for the equipment control systems under consideration will be a good deal more simplified than parallel discussion in previous sections for the time-differentiated pricing programs. There are two reasons for this. First, as noted in the methodology section, no inertia or risk avoidance factors were applied to the forecasts of anticipated customer response to the control options. These adjustments were deemed unnecessary because of respondents' greater familiarity with making these types of product adoption decisions. Second, the analysis proceeded on the assumption that, at most, each utility would offer only one equipment control system in the marketplace. Thus, this discussion will take up the expected customer response for scenarios in which only one such product is offered. Lastly, the analysis assumed that customers would not be required to use such a system, so the default or starting "condition" in every scenario is one in which the customer does not currently have an equipment control system (that is, all scenarios assume that customers must "opt-in" to installing a control system).

The Example Equipment Controls Products Used in this Section

The remainder of this discussion will focus on the 14 specific offering scenarios displayed in Table 11.1. For the purposes of this report, we have identified these fourteen for discussion on the basis that they represent a reasonable range (from basic to extensive) of products that the utilities may consider offering.

The products included here in this report are intended only as examples of the types of results that can be calculated for each product. There are numerous other options that could be constructed from the features and levels tested in this research (in fact, there are 2,304 different products that could be constructed from the features explicitly tested in this design, and even more if we interpolate beyond the explicit savings values, etc. tested in the design). The reader may wish to build their own products using the market simulator that accompanies this report.

Table 11.1 – Base Equipment Control System Options for Market Share Analysis

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
How Extensive Controls are (Basic, Moderate, Extensive)	"Best" Basic	Basic	Basic	Basic	Basic ("worst" controls best other)	"Best" Mod.	Mod.	Mod.	Mod. ("worst" controls best other)	"Best" Ext.	Ext.	Ext.	Ext.	Ext. ("worst" controls" best other)
Monthly Cost 6($5.00 to$50.00)	$5	$10	$10	$10	$5	$15	$15	$15	$15	$20	$30	$30	$20	$20
Bill impact (5% to 15%)	15%	10%	10%	5%	15%	15%	5%	10%	15%	15%	10%	10%	15%	15%
System Prog./Control (Customer Programs; Utility Programs to Customer Specs; Utility Programs – Customer can / can't override	Cust. Prog.	Cust. Prog.	Utility Prog./ Cust. override	Cust. Prog	Utility Prog./ No override	Cust. Prog.	Cust. Prog.	Utility Prog./ Cust. override	Utility Prog/ No override	Cust. Prog.	Cust. Prog.	Utility Prog./ Cust. override	Utility Prog./ Cust. override	Utility Prog. No override

To begin then, we will explore the preferences customers express when they have the option to either purchase a basic equipment control system, or not purchase anything at all. In this case (and in all the scenarios to be investigated), we assume that customers are given the option of one equipment control system to purchase (that is, there are not several options from which they have to choose) and that it is not a required acquisition for the rate plan that they've signed up for.

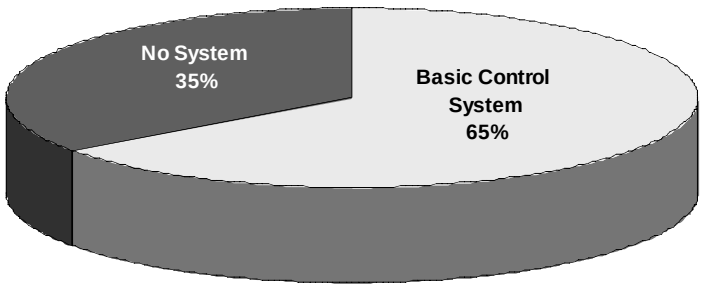
Before beginning our examination of market response to each of the basic control options, it is worth repeating how such results should be interpreted. As previously noted in our discussion of market response to the TD rate options, the share of preference results obtained here should not be interpreted as direct estimates of likely market share. That is to say, if option 1 received a 50% share of preference, that would not mean that 50% of all customers would choose that option in a "live" marketplace. There are many other external factors that can constrain customers from making choices based on their stated preferences that cannot be accounted for here and that may impact market share.

The discrete choice analysis is based on the assumption that all potential customers were aware of, fully informed about, and had access to the relevant options. To account for different levels of awareness of the systems once introduced customer share of preference estimates are provided that have been adjusted for different assumptions regarding awareness. More specifically, estimates have been calculated for "high" awareness (70%), "moderate awarness" (50%) and "low" awareness (30%).

Note again, however, that the analysis of share preference for the equipment control systems does not consider customer inertia or risk aversion that were incorporated into the previous discussion for the various TD rates investigated. These adjustments were considered unnecessary because customers typically have more experience with purchasing equipment control types of products and would not be excessively influenced by inertia or risk avoidance.

We will begin by investigating the share of preference for a basic equipment control system that the customer programs, that can generate 15% savings for $5 per month. Our initial examination of the utilities for the different building blocks of the equipment control features revealed that customers prefer a basic system, at the lowest price, highest savings that gives them the most programming control. Thus, it is not surprising that this initial scenario, basic control option 1, achieves the highest share of preference (65%) compared to all the other system options. In this scenario, 35% opt not to acquire an equipment control system. Within this option, share for the equipment control option decreases accordingly as awareness decreases.

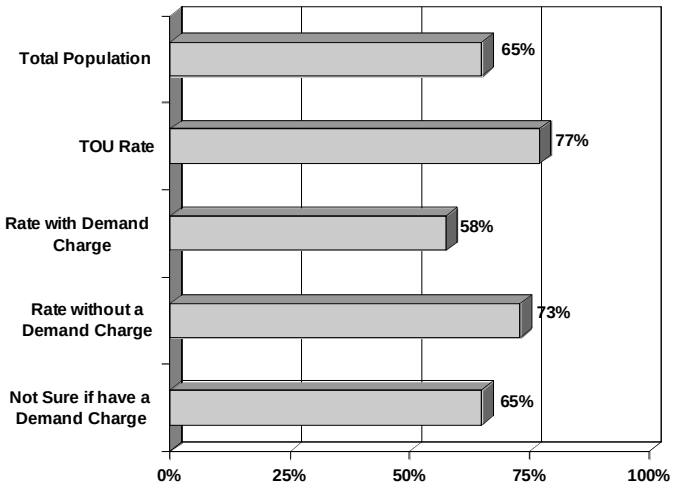
Chart 11.1– Simple Share of Preference, Unadjusted for Awareness



The results reported above are for the customer population in total. How might these results differ by customers on different rate plans currently? Should we expect customers on one particular rate plan to be more or less receptive to using equipment control systems? Through the use of the simulator that accompanies this report we can explore this difference, as well as many others. As an example, let's examine the differences in share of preference for those customers currently on various different rate plans.

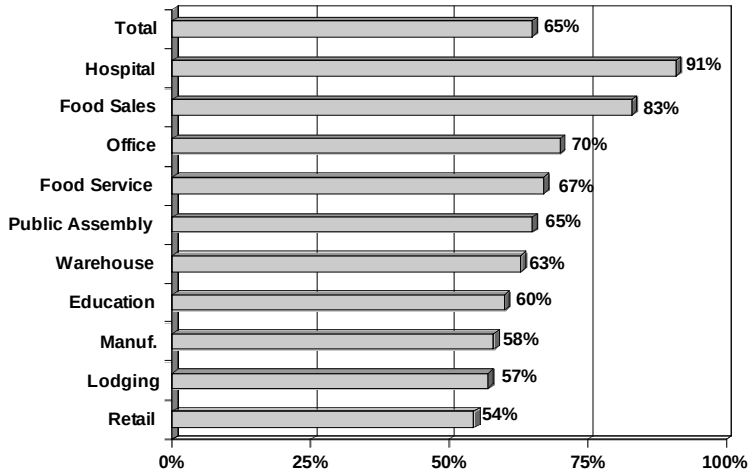
Chart 11.2 indicates that the share of preference for equipment control system option 1 is larger for those on a TOU rate plan and for those on a rate plan without a demand charge.

Chart 11.2– Simple Share of Preference by Rate Plan, Unadjusted for Awareness



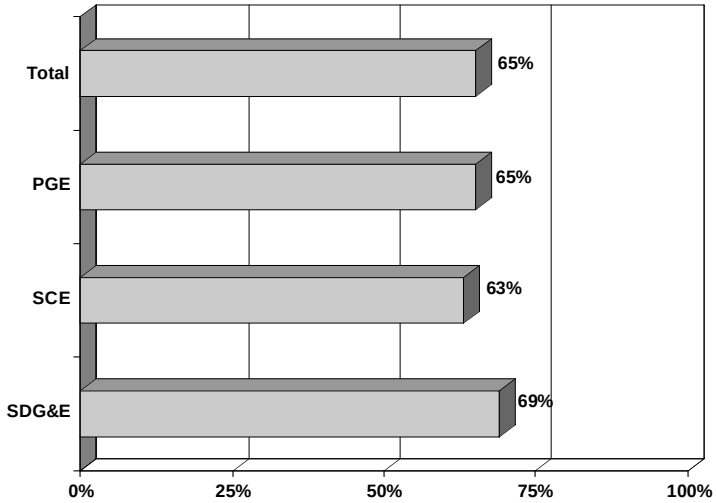
What might share of preference look like if we analyze the data by building type? Do the product configurations appeal more to some building types than others? Chart 11.3 demonstrates share of preference for basic equipment control option 1 by building type. Here we note that share of preference for this option is larger for those in hospital, food sales, and office buildings.

Chart 11.3– Simple Share of Preference by Building Type, Unadjusted for Awareness



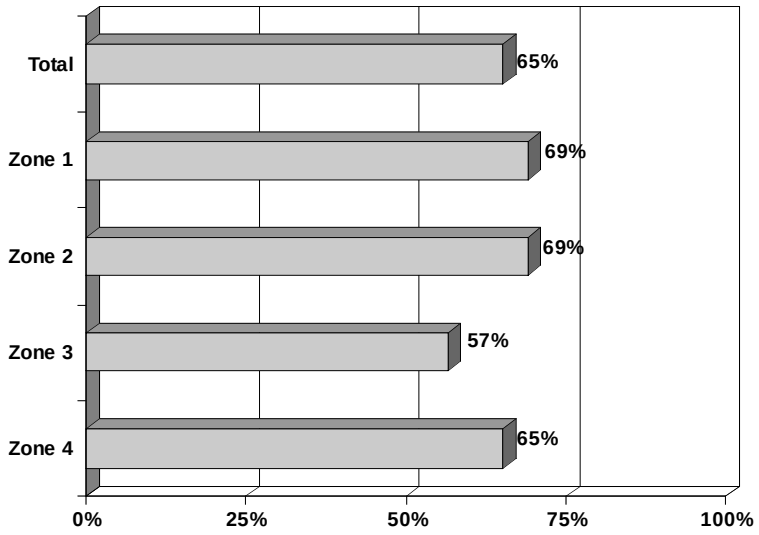
What do we find if we look at the results by utility? Does the share of preference for this option vary by utility? Chart 11.4 illustrates share of preference for this option by utility. As Chart 11.4 demonstrates, there is little variation by utility.

Chart 11.4– Simple Share of Preference by Utility, Unadjusted for Awareness



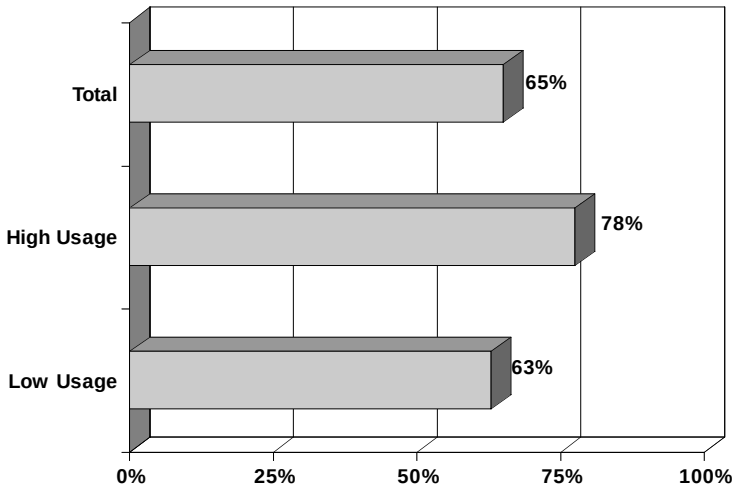
Next we look at the results by climate zone. As Chart 11.5 below illustrates, the share of preference for those in zone 3 is somewhat smaller compared to the other climate zones.

Chart 11.5– Simple Share of Preference by Zone, Unadjusted for Awareness



Finally, what do the results look like if we analyze them by electricity use, those who have a high demand (20-200kW) compared to those with low usage (0-20KW)? The share of preference for companies with high usage is much larger than the low usage companies.

Chart 11.6– Simple Share of Preference by Electricity Use, Unadjusted for Awareness



There are many other market scenarios for which the reader may wish to conduct similar subgroup analyses using the simulator that accompanies this report, but for simplicity's

sake we'll limit our discussion of subgroups in this report to the first basic equipment control system described above. Though we have not presented the data here, from an examination of the share of preferences for each of the equipment control options described in this report by subgroup we find the following trends:

- Those currently on a TOU rate tend to be more receptive to equipment control options overall. The magnitude of difference does vary depending on the specific set of products modeled, however. The product options that offer customer programming control and higher savings reveal on average a share of preference of 20-24% higher for those on a TD rate. This difference is less dramatic for extensive controls systems with share of preference for those currently on a TOU rate plan being 10% higher than those not on such a rate, overall.

- While the magnitude of difference does vary depending on the specific set of products modeled, overall, those customers in hospitals, food sales, office, and food services buildings appear to be more receptive to equipment control options, with hospitals generally being the most receptive to such options.
    - For hospitals the share of preference is 20-30% higher on average than the total for the products modeled here, except when the product is utility programmed with no customer override.

- Those companies with high electricity usage (20-200kW[41]) tend to be more receptive to equipment control options generally when compared to those who have low electricity use (0-20kW).

- Those in zone 3 tend to be less receptive overall to all of the basic equipment control system options. Those in zone 4 tend to be less receptive to options which specify for utility programming with no customer override.

- There are no notable differences in preferences for equipment control system options by utility.

Next, we can continue to examine customer reactions (for the customer population in total) to other basic equipment control system options.

The basic equipment control system in option 2 (Table 11.1) is nearly identical to option 1 but it generates slightly less savings for a higher monthly cost (10% savings for $10 per month). We would expect the share of preference to decrease in this scenario, but the question is, by how much? By decreasing the savings amount and increasing the cost per month, share of preference drops from 65% to 58% with 42% opting to not purchase a system.

The basic control system in option 3 is also quite similar to option 2, with the only change being that the utility programs and activates the system with a customer override. As noted earlier, customers prefer options that give them the most control, thus we would expect the share of preference to drop compared to option 2. By taking some control away from the customer, share of preference drops from 58% to 55%, with 45% opting to not purchase a system.

[41] 20-100kW for SDG&E

The basic control option 4 gives the customer programming and activation control but only offers a 5% bill savings at a monthly cost of $10. The resulting share of preference for option 4 is 52%, which is only slightly lower than the share of preference for option 3 which offered greater savings. Option 4 offers greater customer programming control which appears to partially offset the drop in savings from option 3.

The last basic option, option 5, is nearly identical to option 1 except that the utility programs and activates the system and the customer cannot override it. This option illustrates how share of preference is affected to a greater extent by how a system is programmed and controlled than by the level of savings or monthly cost of the system. We would expect the share of preference to decrease with this change in the system. And, in fact, it does. By changing this feature in this way, share is decreased by nearly one-third, going from 65% to 33% (assuming perfect awareness).

Table 11.2 – Simple Share of Preference: Basic Equipment Control System Options vs. No System

	Option 1	Option 2	Option 3	Option 4	Option 5
low Extensive Controls are Basic, Moderate, Extensive)	Basic Control "Best"	Basic Control	Basic Control	Basic Control	Basic Control "Worst Programming / Best Other"
lonthly Cost ($5.00 to$50.00)	$5	$10	$10	$10	$5
ill impact (Total) 5% to 15%)	15%	10%	10%	5%	15%
ystem Prog./Control Customer or utility rograms/Customer or utility pecs/Can or cannot override)	Customer programs to customer specs	Customer programs to customer specs	Utility programs & activates/ customer can override	Customer programs to customer specs	Utility programs & activates/ customer cannot override
hare of Preference Total Population) Against the alternative of no ppliance controls)	65%	58%	55%	52%	33%
hare of Preference djusted for Awareness Total Population) Against the lternative of no appliance ontrols) 70% 50% 30%	46% 33% 20%	41% 29% 17%	38% 27% 16%	37% 26% 16%	23% 17% 10%

In looking at the moderate control options, we would expect share of preference to be lower overall as our earlier investigation of the utility or value assigned to moderate controls was much lower than for basic controls. And, in fact, that is exactly what we find in Table 11.3.

The share of preference for these four options ranges from 56%-28% assuming perfect awareness of these options in the marketplace. Less than perfect awareness will of course reduce these figures accordingly as reported in Table 11.3.

Moderate control option 6, which includes programming by the customer, and a potential for 15% monthly savings at a monthly cost of $15 (the best possible savings and monthly cost for a moderate control option), achieves a 56% share of preference against the option of purchasing nothing at all. If we were then to change the method of system programming and control for this system to "utility programs and activates without customer override," which is the least desirable method (option 9), share of preference would decrease from 56% to 28%.

Now, the other two options, options 7 and option 8 provide scenarios with varying amounts of savings and degrees of programming control. Option 7 presents a similar set of features to option 6 but with a reduction in potential savings from 15% to 5% savings and customer programming. With this configuration, option 7 achieves a 46% share of preference compared to 56% for option 6 which offered higher savings. Option 8 is also similar to the best moderate control option 6, but savings is reduced from 15% to 10% and rather than allowing the customer to program the system him or herself, the utility programs and activates it with a customer override. Changing the system thusly reduces share of preference even further from 56% to 44% for option 8. Again, we see that a program that offers more appeal in terms of customer control will achieve a higher share of preference even with lower savings than a plan with higher savings but less customer control.

Table 11.3 – Simple Share of Preference: Moderate Control Options vs. No Control

	Option 6	Option 7	Option 8	Option 9
How Extensive Controls are (Basic, Moderate, Extensive)	Moderate Control "Best"	Moderate Control	Moderate Control	Moderate Control "Worst Programming/ Best Other"
Monthly Cost ($5.00 to$50.00)	$15	$15	$15	$15
Bill impact (Total) (5% to 15%)	15%	5%	10%	15%
System Prog./Control (Customer or utility programs/Customer or utility specs/Can or cannot override)	Customer programs to customer specs	Customer programs to customer specs	Utility programs/customer can override	Utility programs/ cannot override
Share of Preference (Total Population) (Against the alternative of no appliance controls)	56%	46%	44%	28%
Share of Preference Adjusted for Awareness (Total Population) Against the alternative of no appliance controls) 70% 50% 30%	39% 28% 17%	32% 23% 14%	31% 22% 13%	19% 14% 8%

Detailed Findings: Estimating Market Potential – Equipment Control Systems

In looking at the extensive control options, we would expect share of preference to be lower overall as our earlier investigation of the utility or value assigned to extensive controls was much lower than for either basic or moderate controls. And, in fact, that is exactly what we find in Table 11.4.

The trend in share of preference for the extensive control options is similar to those in basic and moderate control options. Specifically, the options that offer the most customer programming control and the largest amount of savings gain the largest share of preference (Options 10 and 13).

Table 11.4 – Simple Share of Preference: Extensive Control Options vs. No Control

	Option 10	Option 11	Option 12	Option 13	Option 14
How Extensive Controls are (Basic, Moderate, Extensive)	Extensive Control "Best"	Extensive Control	Extensive Control	Extensive Control	Extensive Control "Worst Programming / best other"
Monthly Cost ($5.00 to$50.00)	$20	$30	$30	$20	$20
Bill impact (Total) (5% to 15%)	15%	10%	10%	15%	15%
System Prog./Control (Customer or utility programs/Customer or utility specs/Can or cannot override)	Customer programs to customer specs	Customer programs to customer specs	Utility programs/customer can override	Utility programs/ customer can override	Utility programs/ cannot override
Share of Preference (Total Population) (Against the alternative of no appliance controls)	46%	37%	36%	42%	20%
Share of Preference Adjusted for Awareness (Total Population) Against the alternative of no appliance controls) 70% 50% 30%	32% 23% 14%	26% 18% 11%	25% 18% 11%	30% 21% 13%	14% 10% 6%

A summary of the results for all products investigated appears in Table 11.5. Across the fourteen product scenarios examined, a clear preference emerges for the systems with basic controls that allow customer programming. The systems receiving the largest share have been highlighted in Table 11.5.

Table 11.5 – Summary of Simple Share of Preference: All Options vs. No Control

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
How Extensive Controls are (Basic, Moderate, Extensive)	"Best" Basic	Basic	Basic	Basic	Basic ("worst" controls best other)	"Best" Mod.	Mod.	Mod.	Mod. ("worst" controls best other)	"Best" Ext.	Ext.	Ext.	Ext.	Ext. ("wors control best other)
Monthly Cost 6($5.00 to$50.00)	$5	$10	$10	$10	$5	$15	$15	$15	$15	$20	$30	$30	$20	$20
Bill impact (5% to 15%)	15%	10%	10%	5%	15%	15%	5%	10%	15%	15%	10%	10%	15%	15%
System Prog./Control (Customer Programs; Utility Programs to Customer Specs; Utility Programs – Customer can / can't override	Cust. Prog.	Cust. Prog.	Utility Prog./ Cust. override	Cust. Prog	Utility Prog./ No override	Cust. Prog.	Cust. Prog.	Utility Prog./ Cust. override	Utility Prog/ No override	Cust. Prog.	Cust. Prog.	Utility Prog./ Cust. override	Utility Prog./ Cust. override	Utility Prog. No overrid
Share of Preference (Total Population) (Against the alternative of no appliance controls)	65%	58%	55%	52%	33%	56%	46%	44%	28%	46%	37%	36%	42%	20%
Share of Preference Adjusted for Awareness (Total Population) (Against the alternative of no appliance controls)														
70%	46%	41%	39%	37%	23%	39%	32%	31%	19%	32%	26%	25%	30%	14%
50%	33%	29%	28%	26%	17%	28%	23%	22%	14%	23%	18%	18%	21%	10%
30%	20%	17%	16%	16%	10%	17%	14%	13%	8%	14%	11%	11%	13%	6%

Sensitivity Analysis to Variations in Product Features

Another way to investigate how customers might respond to modifications in the design of an equipment control system is to look systematically at the impact on the share of preference from changing one feature while holding the other features constant.

With this technique we can answer questions about how sensitive the share of preference for an equipment control system is to changes in the monthly cost of the system. All other things being equal, would we expect to see a large or small decrease in share if price was increased from $5 monthly to $10 monthly for a basic control system? Would we see more or less of a decrease in share if we increased the price from $10 to $15? The answer to these questions and more can be seen in Charts 11.7-11.11. In Charts 11.7–11.9 savings or bill impact has been held constant at 10%, and system programming and control is held constant at "customer programs to own specs" in order to look at the impact of a change in monthly cost on share of preference for a basic, moderate and extensive control system option.

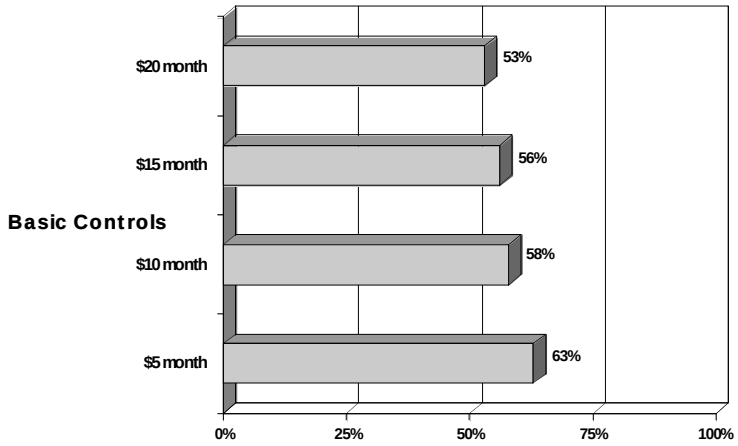
These charts reveal that there is relatively little sensitivity to changes in price for moderate control systems than for basic or extensive control systems. However, there is not a great deal of sensitivity to changes in monthly cost, regardless of the type of equipment control system considered. More specifically, the sensitivity analysis reveals:

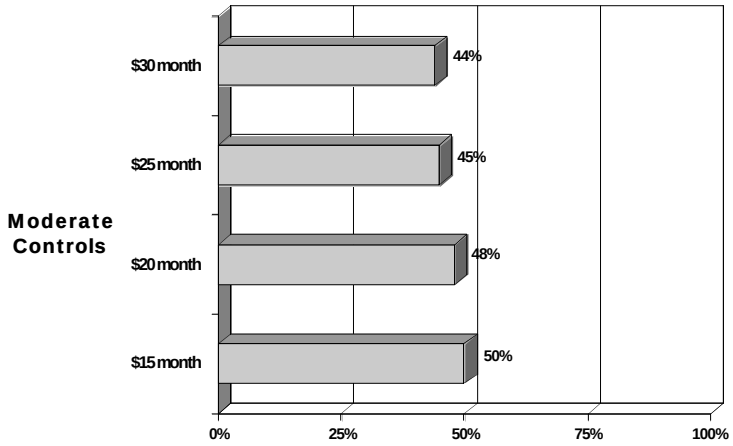
- For the basic and extensive control systems, customers appear to be most sensitive to price increases that are above and beyond the lowest monthly cost ($5 for Basic and $20 for Extensive) with demand dropping most from the lowest price point to the next price increase. Share of preference continues to drop but by smaller percentage increments for each consecutive price increase. Overall, 10 percentage points in share is lost when going from the cheapest monthly price to the most expensive.

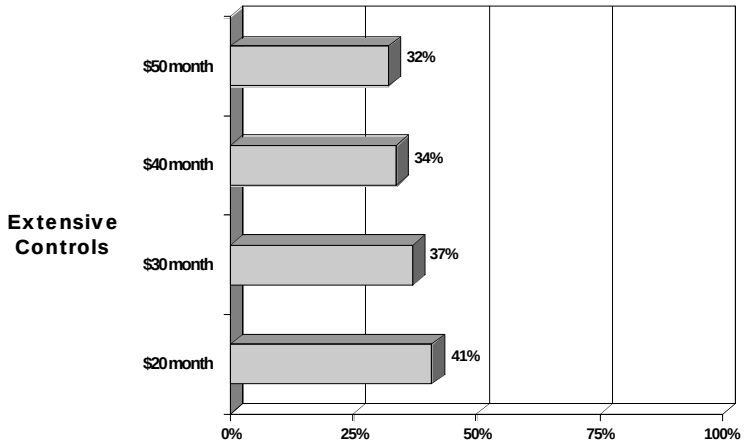
- For moderate controls the drop in share of preference is slightly less across all price points compared to the basic or extensive control systems. That is, only 6 percentage points of share is lost when going from the lowest price point ($15) to the highest price point ($30).

- At equivalent monthly costs (for example, $20) share of preference is highest for the basic equipment control system. There was price point tested that was common to each of the three types of control systems – basic, moderate, and extensive -- $20. When looking at the share of preference at the $20 price point for all three types of systems, we see that share of preference is highest for the basic control system, followed by the moderate control system.

Charts 11.7 to 11.9 – Sensitivity to Differences in Price (Holding Bill Impact at 10% and Programming at Customer Programs to Own Specs)





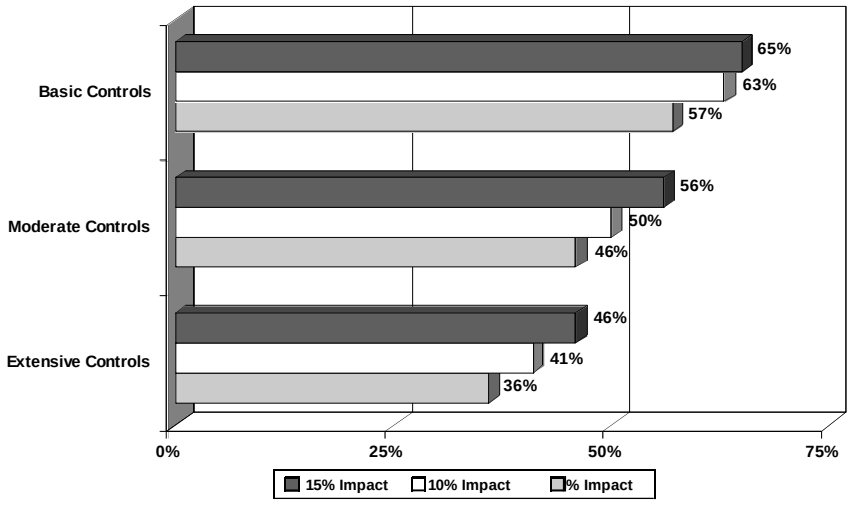


Now, by fixing price at the lowest level for each equipment control option (Basic=$5, Moderate=$15, and Extensive=$20) and programming at customer programmable, the impact of monthly savings on share of preference can be examined. Those results are presented in Chart 11.10 and reveal a similar pattern for the impact of increased savings across all three levels of equipment controls. There is a 2% to 6% decrease in share preference as the bill impact shifts to the next lower level.

The information presented in Chart 11.10 reveals that:

- There is not a great deal of sensitivity to changes in savings levels, regardless of the type of equipment control system considered. Share of preference for each type of equipment control system decreases by only a few percentage points as savings decreases. The impact on share of preference is slightly less for the basic controls compared to the moderate or extensive options but it is not significant (8 percentage points total loss in share of preference compared to 10 percentage points lost for the moderate or extensive options when moving from the highest to lowest savings potential).

Charts 11.10 – Sensitivity to Differences in Bill Impact (Holding Cost at Lowest Level and Programming at "Customer Programs")



Finally, how much do changes in system programming and control impact share of preference? All other things being equal, would we expect to see a large or small increase

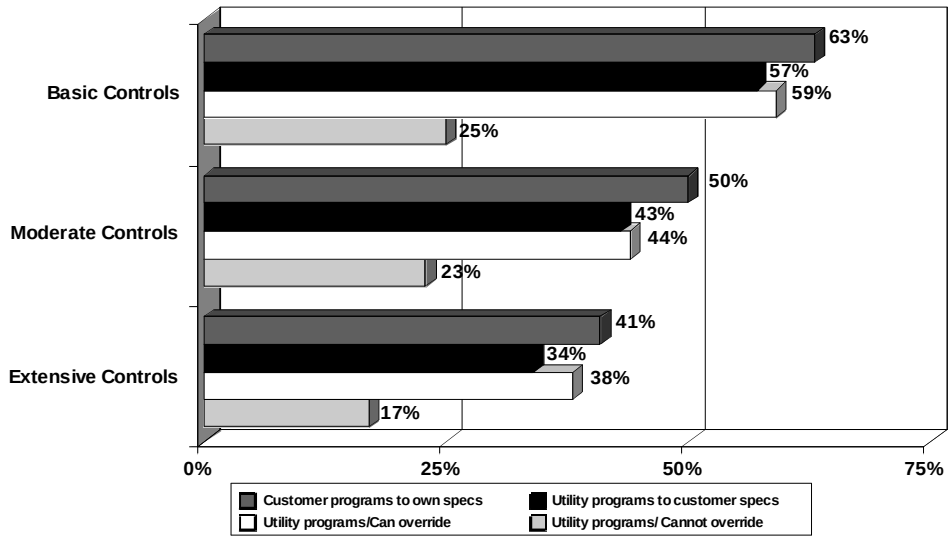
or decrease in share if the type of programming used were changed from utility programmed and activated without customer override to customer programmed?

For this analysis, cost for each product is held constant at the lowest amount for each type of equipment control while the savings potential is held constant at 10%. The results presented in Chart 11.11 reveal the following:

- Customers are very sensitive to changes in how the control systems are programmed and activated, with the biggest drop in share of preference occurring for the options in which the utility programs and activates the system and does not allow the customer to override the settings.

- Customers are most sensitive to changes in this feature for the basic control options. In reviewing Chart 11.11, we see that for the basic equipment control options there is a drop of 38 percentage points when going from a system that gives the customer the most control (customer programmed and activated) to going to a system in which the customer has the least amount of control (utility programmed and activated without customer override). However, for the moderate and extensive control options, this same change results in a drop of 24-27 percentage points in share of preference.

Charts 11.11 – Sensitivity to Differences in Programming/Activation (Holding Cost at Lowest Level and Billing Impact at the mid-level 10%)



In Summary

The results generated from the simulations investigated here lead us to several conclusions.

Detailed Findings: Estimating Market Potential – Equipment Control Systems

- The system features with the biggest impact on share are the type of control system offered (basic, moderate, extensive) and the type of programming and activation offered. The biggest changes in share of preference can be seen when manipulating these two features, where the preferred features are a basic appliance control that allows the customer to program and activate the system herself.

- The monthly fee and potential savings features have much less of an impact on customer preference for a particular system. However, the amount of savings does have a positive impact when combined with a product configuration that offers more customer programming control.

- Based on these findings, it is not surprising that options 1 and 2 achieved the largest share of preference, achieving 65% and 58% share. However, options 3, 4, and 6 are also appealing (with 55%, 53%, and 56% share, respectively).
    - Taking awareness into account, however, will necessarily reduce the share of preference here, depending on whether one assumes high, moderate or low levels of awareness of these systems.

- Results here further suggest that extensive control options similar to the ones tested here, and to a lesser extent, moderate control options (with the exception of the "best" moderate controls option) would achieve a much smaller share of preference than a similar basic option.

Notes on the Use of the Simulator

Accompanying this report is a simulator which will allow the user to simulate up to three different alternative equipment control systems. The final version of the simulator (labeled as Version 1.1) was the one used to calculate the share of preference estimates described here. Version 1.2 is also available for the user who wishes to look at results by the three utilities separately.

The simulator is quite similar in form to the one created to explore the various pricing rate designs. There are three columns for specifying up to three different alternative systems, labeled alternative A, B, and C. Alternative A is automatically included in each simulation. Alternatives B and C will only be included if the box below each of the two columns, which reads "include in simulation" is checked.

The type of control option (basic, moderate, or extensive) is chosen from a drop down menu. To specify the monthly cost and bill impact, type in any number within the valid range stipulated in the upper left hand corner of the "simulator" sheet. If invalid numbers are entered in for monthly cost or bill impact, the product will be ignored in the simulations, returning a 0% share of preference. Please be sure to enter both the $ and % signs as appropriate. The type of activation and control for the system can be chosen from a drop down menu. At the top of the simulator, the user can also specify the awareness assumption – 100%, 75%, 50%, or 30%.

Unlike the rate design simulator, the equipment control system simulator will not include options to calibrate for risk or inertia or AC ownership (all respondents completing this exercise used and paid directly for their AC use). Once the "run simulation" button is hit, the program will automatically take the user to the results page. The top of the screen lists each of the options simulated and the share of preference for each and for none, or the percentage of customers that would not purchase. On the bottom portion of the screen, the simulator shows the share of preference for each alternative and none broken out by seven

different subgroups. Bases sizes for some subgroups may be smaller than desirable and in these cases notes to this effect can be found at the bottom of the simulator. The user can then click on the "simulator" tab at the bottom of the screen to specify a new simulation.

Likely Takers by Select Equipment Control Options

Gaining a better understanding of the types of customers most likely to purchase a given equipment control system will be very helpful as program planners develop their marketing efforts for these products. Profiling those most likely to purchase an equipment control system option can be helpful in terms of understanding both who to target as well as how to target these potential customers. For example, are those businesses most interested in these systems more likely to have their business reside in a free standing building or one that is part of a larger building or complex / mall? Are likely takers more or less likely to come from certain industries?

This section of the report profiles the likely takers for each of the most plausible options evaluated – that is, the systems identified as either "best" or "worst" have not been included here.

Typically, a "likely taker" is identified as the top 10% of customers with the highest utility scores for a given product. Ten percent is used as a cut-off point because it is a conservative estimate of those we could consider most likely to purchase the product. However, because sample sizes are small, this analysis identifies a "likely taker" as the top 20% of customers with the highest utility scores for a given product in order that we might have enough cases for analysis.

The index values were computed for each characteristic by dividing the percent of "likely takers" (as defined above) that have a characteristic of interest (i.e. the percent of "likely takers" that are PG&E customers) by the percent of all respondents with the characteristic (i.e. the percent of all respondents that are PG&E customers) and multiplying the result by 100. As the magnitude of difference increases (either positive or negative) between the resulting index value and 100 (which would indicate the populations are equal), the more useful the characteristic is for identifying "likely takers." One can also look at this resulting index value, a ratio level statistic, as telling us the degree to which the likely takers are more or less prevalent in a particular subgroup of interest. Looking at the first row in Table 11.6 below we find a resulting value of 124 for PG&E. This would tell us that PG&E customers are 1.24 times more likely to exist as likely takers of basic control option 2 than they exist in the general California customer population.

The reader will remember that our total sample size for this research was 1,002 cases. However, only those that indicated they use and are responsible for paying for their central AC evaluated the equipment control system products. This requirement reduced our sample size to 635 qualified businesses. Through the course of this product evaluation a significant proportion of these 635 (29% or 185 cases) indicated they would not choose an equipment control system in any scenario presented. Because this 29% never selected an equipment control system that they would purchase, no utility scores exist for these respondents. Given this, our analysis of likely takers using the highest utility scores for a given product is reduced to 450 cases.

In addition to identifying likely product takers, at the end of this section is a short profile of these 185 "non-takers."

Likely Takers – Basic Equipment Control System Options

There were some fairly interesting and consistent patterns identified in terms of the similarities among the likely takers for the three most plausible basic equipment control system options tested in this report.

In fact, the likely takers for option 2 ($10, 10% savings, utility programs and activates w/customer override) were nearly identical to the takers for option 3 ($10, 10% savings, customer programs the system). Thus, all other things being equal in options 2 and 3, a system that allowed the customer to program and activate it and one that allowed the utility to program and activate it with a customer override would attract essentially the same types of customers.

Option 4 was similar to option 3 except that a smaller savings potential was offered (5% instead of 10%). Changing this one feature resulted in a set of likely takers that appeared to be a subset of the takers for options 2 and 3.

The profiles for two of these three these products have been provided in Tables 11.6 – 11.7 for illustration purposes.

Overall, the key similarities among those interested in a basic equipment control system like options 2 and 3 included the following (Table 11.6):

- This system appeared to differentially attract more customers from PG&E generally, and in particular those in climate zone 2, and those customers that are not currently on a TOU rate.
- These equipment controls systems tend to capture the interest of those who would otherwise have little interest in such systems generally and who tend to have little interest in TD rates.
- Businesses most interested in these equipment control systems are more likely to have their business occupy only a portion of the existing building, and this building is most often part of a larger office building or complex. The building occupied among likely takers tends to be less than 10 years old.
- These systems appear to differentially attract buildings classified as manufacturing, offices, and public assembly.
- These options seem to attract businesses that do not have a history of making modifications to their energy use behavior.

Table 11.6 – Most Likely Takers – Option 2
(Basic, $10, 10% Bill Impact, Utility programs/activates with customer override, 28% Share of Preference at 50% awareness)

	Indexed Values[42]
Utility	
PG&E	124
SCE	69
Utility by Climate Zone	
PG&E, Zone 2	145
Utility by Rate	
PG&E, non-TOU Rate	128
SCE, non-TOU Rate	67
Utility by Energy Usage	
SCE, Low usage	47
Overall Interest in Equipment Control Systems	
Low Interest	116
Overall Interest in TD Rates	
Low Interest	130
Type of Building	
Part of a larger building / office complex / mall	122
Building Occupancy	
Occupy entire building	80
Building square footage	
2,000 or less	44
2,000 – 5,000	181
Age of Building Structure	
<10 years	185
Building Type – Self Identified	
Retail	23
Manufacturing	162
Building Type – Utility Identified	
Office	145
Public Assembly	246
Retail	27
Action Taken During 2001 Crisis	
Yes	80
Number of Actions Taken During 2001 Crisis	
None	159
Actions Taken Since 2001	
None	154

[42] These index values are created by dividing the percentage of likely takers in the category of interest by the percentage of population that falls into the category interest and multiplying this value by 100. This produces a ratio level statistic. Figures over or under 100 indicate that the % likely takers in the category of interest appears more frequently / less frequently that in the population for that category. Taking the first line of the table as an example, PG&E are 1.24 times more likely to be likely takers of option 2 than appear in the population at large.

The likely takers of a basic equipment control system that offers nearly the same features but only a 5% savings potential have the following characteristics:

- This system appeared to differentially attract more customers from PG&E, climate zone 2.
- It also tends to capture the interest of those who would otherwise have little interest in such systems generally.
- Likely takers are also more likely to have their business occupy only a portion of the building they occupy and they more frequently occupy a space between 2,000-5,000 square feet.
- This system also differentially attracts buildings classified as manufacturing and office buildings.
- These options seem to attract businesses who do not have a history of making modifications to their energy use behavior but that are currently using an energy management system.

Table 11.7 – Most Likely Takers – Option 4
(Basic, $10, 5% Bill Impact, Utility programs/activates with customer override, 26% Share of Preference at 50% awareness)

	Indexed Values
Utility by Climate Zone	
PG&E, Zone 2	173
Overall Interest in Equipment Control Systems	
Low Interest	121
Building Occupancy	
Occupy a portion of the building	133
Building square footage	
2,000 or less	70
2,000 – 5,000	166
Building Type – Self Identified	
Retail	28
Manufacturing	151
Building Type – Utility Identified	
Office	158
Retail	39
Action Taken During 2001 Crisis	
Yes	81
Number of Actions Taken During 2001 Crisis	
None	152
Actions Taken Since 2001	
None	152
Use an Energy Management System	

Yes	142

The two plausible moderate control systems tested in this report differed in terms of their bill impact (10% vs. 5%) and the type of programming and activation they included (utility programming and activation with customer override vs. customer programming). While the share of preference for these two products are nearly identical, these two differences do produce two fairly distinct likely taker groups, unlike what was found for the basic control systems tested.

The only similarities between these two groups of moderate equipment control system likely takers included the following:

- Both moderate control systems seemed to differentially attract business customers from climate zone 4.
- Likely takers for both systems are less likely to be on a rate that includes a demand charge.
- Customers with 3-9 other California locations are also differentially attracted by these two moderate equipment control systems.

The profiles for these two products have been provided in Tables 11.8 and 11.9 for illustration purposes.

The likely takers for a moderate control system at a price of $15 per month, offering a 10% monthly bill savings, with a control system programmed and activated by the utility with a customer override have the following additional characteristics (Table 11.8):

- This system appeared to differentially attract more customers from PG&E and low use customers in climate zone 4. However, it attracts less customers from SCE and low use customers in climate zone 2.
- These equipment controls systems tend to capture the interest of those with moderate interest in such systems overall.
- Likely takers are more likely to have their business occupy the entire building in which the business resides and are less likely than the general population to have their business take up 2,000 square feet or less of space.
- This system also differentially attracts those businesses that operate 60 hours or more a week and currently use a backup or standby energy system.

Table 11.8 – Most Likely Takers – Option 7
(Moderate, $15, 10% Bill Impact, Utility programs/activates with customer override, 22% Share of Preference at 50% awareness)

	Indexed Values
Climate Zone	
Zone 4	243
Utility by Climate Zone	
PG&E, Zone 4	349
SCE, Zone 2	29
Climate Zone by Electricity Usage	
Zone 2, Low (0-20kW)	61
Zone 4, Low (0-20kW)	258
Bill includes a demand charge	
Yes	74
Overall Interest in Equipment Control Systems	
Low Interest	69
Moderate	139
Building Occupancy	
Occupy entire building	126
Building square footage	
2,000 or less	67
Building Type – Utility Identified	
Office	71
Primary Business Activity	
Healthcare	167
Number of Hours of Operation Weekly	
60+ / week	133
Own Backup / Standby Energy System	
Yes	234
Other California Locations	
None	66
3-9 other locations	261

The likely takers for a moderate control system at a price of $15 per month, offering a 5% monthly bill savings, with a control system programmed and activated by the customer have the following additional characteristics (Table 11.9):

- Likely takers are more likely to have their business occupy only a portion of the building in which the business resides and are more likely than the general population to have their business take up 2,000-5,000 square feet of business space.

- Likely takers of a system like this one are more likely to work in a building that is 10-30 years old and use an energy management system to help control their electricity usage.

- This system also attracts customers that have a history of and a willingness to make modifications to their energy use behavior, with more indicating that they had taken action during the 2001 energy crisis, taking 1-3 different actions to help cut back on their energy use.

Table 11.9 – Most Likely Takers – Option 8
(Moderate, $15, 5% Bill Impact, Customer Programs & Activates, 23% Share of Preference at 50% awareness)

	Indexed Values
Climate Zone	
Zone 4	179
Zone 2	81
Bill includes a demand charge	
Yes	59
No	213
Building Occupancy	
Occupy only a portion of the building	124
Building square footage	
2,000 – 5,000	157
Age of Structure	
10 - <30 years	125
Use Energy Management System	
Yes	132
Other California Locations	
3-9 other locations	236
Action Taken During 2001 Crisis	
Yes	122
Number of Actions Taken During 2001 Crisis	
None	40
1-3	175
Actions Taken Since 2001	
None	40

The three plausible extensive control systems tested in this report differed in terms of their monthly cost ($20 vs. $30), the potential bill impact (10% vs. 15%) and the type of programming and activation they included (utility programming and activation with customer override vs. customer programming). While the share of preference for these three products are nearly identical (18%, 18%, and 21% respectively), these differences do produce very different groups of likely takers. In fact, there is no one characteristic that can be pointed to as shared across the three sets of likely extensive system takers. However, there are some similarities that can be identified when looking at only a couple of products at once.

The only similarities between the two groups of likely takers for extensive system options 11 and 12 ($30/month; 10% savings; customer program vs. $30/month 10% savings; utility program/activate) included the following:

- Likely takers of these two products are less likely to be working for businesses with only 1-24 employees working at the business location.
- These systems differentially attract businesses that are already using an energy management system to control their electricity use.

The only similarities between the two groups of likely takers for extensive system options 11 and 13 ($30/month; 10% savings; customer program vs. $20/month; 15% savings; utility program/activate) included the following:

- These likely takers are more likely to be on a rate that does not include a demand charge and are likely not to include those that are not sure if their rate includes a demand charge. These likely takers are even more likely to be PG&E customers that are on a rate without a demand charge.
- These customers are less likely to indicate that they have low overall interest in equipment control systems.

And, finally, the similarities between the two groups of likely takers for extensive system options 12 and 13 ($30/month 10% savings; utility program/activate vs. $20/month; 15% savings; utility program/activate) included the following:

- This set of likely takers are less likely to include low electricity use businesses in climate zone 2.
- This set of takers are less likely to include businesses whose primary business activity is office work.

The profiles for these three products have been provided in Tables 11.10 – 11.12 for illustration purposes.

The key defining characteristics of the most likely takers for option 11 includes the following:

- This system appeared to differentially attract more customers that are not on a rate with a demand charge generally, and more specifically PG&E customers not on a demand charge.
- These takers are less likely than the general business customer population to have only 1-24 employees working at the location in question.
- When allowing the customers to classify their building type themselves, we find that likely takers of this rate tend to include more hospitals than the general population. However, when relying on the utility's classification of the building type, hospitals do not appear more often as likely takers and likely takers are less likely to be an office

building.

- This group of takers has moderate interest in control systems generally and are more likely to indicate they currently use an energy management system.

- These options seem to attract businesses who have a history of making modifications to their energy use behavior.

Table 11.10 – Most Likely Takers – Option 11
(Extensive, $30, 10% Bill Impact, Customer Programs, 18% Share of Preference at 50% awareness)

	Indexed Values
Type of Rate	
Non-TOU, No Demand Charge	184
Non-TOU, with a Demand Charge	68
Non-TOU, DK if have a Demand Charge	74
Utility by Rate Type	
PG&E, No Demand Charge	218
Overall Interest in Equipment Control Systems	
Low Interest	78
Moderate	143
Number working at Location	
1-24 employees	75
Building Type – Self Identified	
Hospital	393
Building Type – Utility Identified	
Office	34
Use Energy Management System	
Yes	131
Action Taken During 2001 Crisis	
Yes	114
Number of Actions Taken During 2001 Crisis	
None	61
1-3	150
Actions Taken Since 2001	
Less	132
None	61

The key defining characteristics of the most likely takers for option 12 includes the following:

- Likely takers for extensive control option 12 are less likely to have low electricity use businesses in climate zone 2.

- These businesses are more likely to have between 25-49 people working at the business location in question for this survey, and are more likely to work for businesses that have

multiple locations in California.

- This control system differentially attracts customers whose primary business activity is health care treatment.
- This group is more likely to indicate that it uses an energy management system and that it has other major electrical equipment besides space heating and cooling systems and water heating.
- These options seem to differentially attract businesses that do not have a history of making modifications to their energy use behavior.

Table 11.11 – Most Likely Takers – Option 12
(Extensive, $30, 10% Bill Impact, Utility programs/activates with customer override, 18% Share of Preference at 50% awareness)

	Indexed Values
Climate Zone by Electricity Usage	
Zone 2, Low (0-20kW)	78
Utility by Rate	
SCE, Non-TOU Rate	74
Number Working at Location	
1-24	85
25-49	226
Other California Locations	
0	78
1-2	180
Primary Business Activity	
Office Work	47
Health Care Treatment	241
Use Energy Management System	
Yes	152
No	69
Use of Other Major Electrical Equipment (i.e. refrigeration, cooking, industrial / manufacturing, etc.)	
Yes	141
No	72
Action Taken During 2001 Crisis	
Yes	85
No	194
Number of Actions Taken During 2001 Crisis	
None	142
Actions Taken Since 2001	
None	142

The key defining characteristics of the most likely takers for option 13 includes the following:

- These businesses are less likely to reside in climate zone 2, particularly low electricity use customers in climate zone 2. This product, however, does differentially attract low electricity use customers in climate zone 4.

- This product differentially attracts those customers that are currently on a rate that does not include a demand charge, and it also differentially attracts PG&E customers that are on a rate that *does* not include a demand charge.

- This is the only product tested in this report that attracts a greater number of customers with high interest generally in equipment control systems.

- This group of likely takers includes more customers with 10,000 or more square feet of business space and includes more buildings identified by the utilities as a hospital. These likely takers are less likely than the general population to indicate that their primary business activity is office work.

- These businesses tend to open 60 or more hours a week, pay directly for hot water heating and own a backup or standby energy system.

Table 11.12 – Most Likely Takers – Option 13
(Extensive, $20, 15% Bill Impact, Utility programs/activates with customer override, 21% Share of Preference at 50% awareness)

	Indexed Values
Climate Zone	
Zone 2	81
Climate Zone by Electricity Usage	
Zone 2, Low	61
Zone 4, Low	200
Rate Type	
Rate does not include a Demand Charge	181
Customer Doesn't Know if Rate Includes a Demand Charge	62
Utility by Rate Type	
PG&E, No Demand Charge	230
PG&E, Customer Doesn't Know if Rate Includes Demand Charge	44
Overall Interest in Equipment Control Systems	
Low Interest	50
High Interest	250
Overall Interest in TD Rates	
Low Interest	81
Building square footage	
10,000+	167
Building Type – Utility Identified	
Hospital	500
Primary Business Activity	
Office Work	46
Hours of Operation	
60+	128
Hot Water User	
Use / Pay Directly For	114
Own Backup / Standby Energy System	
Yes	207
Other California Locations	
No other locations	78

Lastly, the team profiled the group of customers identified as non-takers (185 customers in total). That is, for every option presented, they chose not to purchase the equipment control options presented. As Table 11.13 indicates below, there were few characteristics included in the survey that could be used to define this group. The biggest defining characteristic is, unsurprisingly, a lack of interest in equipment control systems generally.

Table 11.13 – Equipment Control System Non- Takers

	Indexed Values
Overall Interest in Equipment Control Systems	
Low Interest	160
Moderate	23
High	4
Overall Interest in TD Rates	
Low Interest	125
Moderate	41
Building Occupancy	
Occupy a portion of the building	75
Building square footage	
2,000 or less	125
Use Energy Management System	
Yes	62
No	122

APPENDIX

Questionnaire

Discrete Choice Design – Rate Program Design

Discrete Choice Design – Equipment Control System Options

Weighting Matrix