Final Report

Information Display Pilot

California Statewide Pricing Pilot

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Executive Summary

California's consideration of the deployment of dynamic electricity pricing rates, as well as the installation statewide of an advanced metering infrastructure, represents a substantial investment if undertaken. A key question is, will electric customers understand these rates and manage their use in response to them?

The Information Display Pilot Project was conducted from August to October 2004, to consider the incremental benefits of providing customers with useful information when on critical peak rates. The key hypothesis is that customers will respond more readily to critical peak price signals if they receive useful and frequent information reminding them of when the price is high, and how much customer-specific bill savings may result from choices in thermostat settings, running lights, etc. during the high cost periods.

The scope of the project included:

- Selection of information treatments designed to provide a concept test of the ability of enhanced information to amplify price response
- Presentation of prototype treatments to focus groups and phone survey participants
- Live application of prototype treatments to a subset of critical peak pricing participants
- Market survey and load data analysis to determine if the concept warrants further consideration

Two forms of information treatment were chosen for examination:

1. Enhanced energy bill analysis, provided monthly, which used bill determinants and customer survey information to compute and present benchmarks of the prior months use, and recommendations for energy bill savings in the coming month. This information was provided, at the customer's choice, by mail or by email.

2. Local display technology, provided throughout the period, which gave customers visual signals of impending, and current, high energy price periods

This research specifically investigated whether providing local display and enhanced information treatments to SCE and SDG&E customers[1] participating in the critical peak pricing (CPP-V) rate pilot would likely create incremental energy-saving benefits over and above the load savings from the standard CPP rate treatments.

In more detail, the research addressed the following:

1. What types of feedback information technologies are currently available for dynamic pricing? What types of information feedback tools are available to customers and what are their costs?

[1] PG&E did not participate due to the lack of the CPP-V tariff in their service territory

2. What is the potential for real-time feedback and/or detailed consumption analysis beyond what the Joint Utilities are offering in the SPP and within the schedule for significant analysis?
3. What are customers' preferences for information technologies currently not available from utilities that customers would find useful to pay directly for, and what mechanisms would they use to purchase? Are these technologies useful and cost effective on their own merits?
4. What kinds of information do IDP participants need/want to respond more easily and effectively, within the context of the SPP?
5. What were the incremental load impact differences of IDP customers compared to the control group or customers with standard information and/or technology treatments?

Our research approach included:

- A survey of available information display to determine effective and useful display treatments for deployment in the IDP
- Development of a sampling plan for information display (based on a preliminary technology assessment)
- Development of enhanced information treatments for customer communication via email and regular mail
- Deployment of the information and display treatments to participant homes/meters (portion of SPP participants)
- Pre- and post- treatment discussions with customers that received treatments
- A review of load data collected from IDP participants to estimate load impact changes
- Focus groups with non-treatment customers to better understand limitations of the treatments and research
- A general population survey of non-treatment customers to determine, generally, what types of information customers want, will use, and are willing to pay for

Key Findings

Question 1: What types of information feedback tools are available to customers and what are their costs? What types of feedback information technologies are currently available for dynamic pricing?

Information feedback tools providing specific, quantified benchmarks and bill analysis for critical peak rates were not currently available. The team prepared a prototype for use in this pilot test, based on energy models and tools used elsewhere to provide bill analysis for residential and small business customers for non-critical peak rates. The information provided to customers in mail and email formats was selected to be scalable at a very low per-customer cost if applied broadly.

Prototypes of enhanced information treatments were prepared for delivery in three forms: mail, e-mail, and Web. The treatments were designed to inform customers about ways to reduce their usage during critical peak periods. All three forms were presented to focus group and survey

participants. Each contained similar information to simplify consolidation of results: the e-mail was designed to be a relatively freestanding treatment consistent with the other forms.

The question regarding feedback technologies is answered in a separate report. This question was researched through a technology assessment, and for the most part, that study found price and notification display technologies were somewhat limited. Most devices or systems were neither readily available, nor able to be deployed in time for the pilot study.

The one exception was an off-the-shelf technology called an "Energy Orb" that was reprogrammed through this effort to be a price notification device for pilot customers.[2] The Energy Orb, located in each participant's home or business, is a small glass globe that changed color to indicate the price the customer was paying for electricity. Controlled by a paging signal, it also flashed as a warning for four hours before each critical peak price period. The findings with regard to this question are found in a separate report prepared by Primen, entitled "California Information Display Pilot: Background, Research, and Results".[3]

Question 2: What is the potential for real-time feedback and/or detailed consumption analysis beyond what the Joint Utilities are offering in the SPP and within the schedule for significant analysis?

To assess the potential for real-time feedback and/or detailed consumption analysis, we conducted a general survey of residential and commercial customers through out California. Almost all (94 percent) residential customers and 82 percent of all commercial customers who responded to the general population telephone survey felt that they could do something to reduce their electricity usage.[4] Specifically, they stated that they would be able to take actions to reduce consumption a few days a year when the electric system is stressed in order to avoid an energy crisis.[5]

While only 29 percent of all residential customers and 47 percent of commercial customers stated that the lack of information was a barrier to reducing consumption, even more customers appear to need information due to a general lack of knowledge.

When customers were asked about their familiarity with the top three energy users in their home or business, many were unsure. Moreover, when these same customers were asked if they needed more information regarding their electricity consumption to accurately answer the question about their top energy users, many of the customers that *were* able to state three answers indicated that they were not confident in their responses and could use additional information.

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[2] We selected the Energy Orb technology for deployment and decided that the small sample size of precluded us from deploying more price display technologies.

[3] "California Information Display Pilot: Background, Research, and Results" is available through Primen, 1750 14th Street, Suite 200, Boulder, Colorado 80302 (303) 545-0100

[4] Note that 25 residential customers and 44 commercial customers were asked questions about their ability to adjust usage, and then were not asked the remainder of the survey because they did not feel that they could adjust their electricity consumption.

[5] Note that their comments were not in response to an established rate.

In at least one point in our survey, therefore, more than one half of all customers *directly* stated that they need more information regarding their energy usage to adjust usage.[6] In addition, several other customers were unable to list their top three electricity users, indicating that additional information would probably be useful for these customers as well.

Notably, residential customers were significantly more likely than commercial customers to use current information, find energy use reports useful, and take actions as a result of information. Moreover, the barriers for commercial customers appear to be much greater than for residential customers. The largest barrier for commercial customers is that they would be unable to shift usage because all usage is critical during these peak hours: more than two-thirds of commercial customers considered this a barrier. The largest barrier for residential customers is that they have not had the opportunity to assess savings opportunities (43 percent)—a barrier which could be overcome through informational materials. The potential for load shifting among residential customers, therefore, appears to be greater than among small commercial customers.

Overall, therefore, we estimate that at least 70 percent of residential customers and 81 percent of commercial customers would benefit from additional information. And even more expressed interest in additional information once presented with the options even if they didn't directly indicate that they needed information.

Question 3: What are customers' preferences for information technologies currently not available from utilities that customers would find useful to pay directly for, and what mechanisms would they use to purchase? Are these technologies useful and cost effective on their own merits?

To be useful, information should be customized and very specific to individual rooms, appliances or equipment that the customer has. Furthermore, the messaging is also important and should be kept simple with an overall tone of empowering the customer to save energy and money.

When we were able to show customers the newsletter, customers generally had favorable opinions of the newsletter and the types of information in the newsletter, although some feel that this alone might not change their behavior. Of the various types of information presented in the newsletter, the customized tips appear to be the most useful in helping customers to shift or reduce their electricity usage because they provide actionable suggestions about what customers can do. Through telephone surveys, this was also the most favored by both the residential and commercial customers with over half (56 percent) of the residential customers and 44 percent of commercial customers indicating that this would be very useful. A pie chart showing the breakdown of electricity use in the customer's home or business is also reported by the survey respondents to be very valuable to customers.

[6] These customers either indicated that they needed more information regarding their usage to be able to shift or reduce electricity usage and/or they mentioned that they needed more information regarding their electricity usage to accurately gauge what the three biggest electricity users in the home or business are.

For most applications, getting these types of messages in front of customers (both residential and small commercial) still means presenting the information through mail, even though it is easier to provide a large quantity of information on the Internet. Two-thirds of both residential and commercial customers indicated that hard copy was their preferred form of communication. While approximately 15 percent of residential and 20 percent of commercial customers would like to receive email, this does not appear to be the best method for reaching most customers effectively, at least not initially. Furthermore, through our quantitative surveys, it appears that information should be provided to customers about once every three months (with the option of them logging on to the web site for more frequent updates).

We also explored customers' opinions regarding a couple of other tools such as interactive online tools (e.g., load calculator), and energy display devices. Customers generally felt that the online concepts were good, however, some felt that they were too complex and too time-consuming for the average customer. Most customers, however, felt that real time information through an in-home or business energy display would be useful both in general (59 percent residential and 50 percent commercial) and for reducing electricity consumption (63 percent residential and 52 percent commercial). In general, customers felt empowered by the concept.

Customers are generally willing to pay a little more for an energy display device than for general information. Most residential customers are willing to pay very minimal charges for a display device in their home: 17 percent are not willing to pay anything, but 69 percent of residential customers are willing to pay between one and 49 dollars. Commercial customers were more willing to pay more for this sort of device with 45 percent of commercial customers willing to pay 50 dollars or more.

In our quantitative surveys, *slightly* more than half of both residential and commercial customers indicated a preference to purchase this sort of device from a retail store, rather than through a small monthly charge on their bill. The utilities may want to consider both of these options since an *overwhelming* majority did not prefer the retail store option.

These findings clearly show that customers are interested in more information than they currently have. However, while customers generally want and like information, many are accustomed to having these types of services provided for free from their utility. Despite the fact that many are likely to use, and see value, in customized information such as that provided in a newsletter, far fewer customers are willing to pay for online or mailed customized information.

Question 4: What kinds of information do IDP participants need/want to respond more easily and effectively, within the context of the SPP?

There were several customers in the pilot (particularly commercial customers) that do not feel that they are capable of adjusting electricity usage during peak times. It is difficult to assess the most valuable information for these customers since it is unlikely that they would change their behaviors no matter what information was provided. The majority of pilot customers that are willing to take actions, however, appear to like the Energy Orb. We asked respondents how effective the notification process was in giving advance notice of a super peak day, and most respondents reported that they were usually or always aware of the super peak day before it

happened. The orb was also the overwhelming preferred method of notification at the end of the pilot, with some of these respondents also asking for both orb and telephone notification.

Furthermore, while the effects of the newsletter were limited by the fact that not all customers recalled receiving it, customers that could recall receiving it generally felt that it had value. The vast majority of residential respondents (12 of 14) and all small commercial respondents (10 of 10) that could recall the newsletter indicated that they would like to continue to receive the newsletter with the hard copy newsletter, proving to be more useful than the email version.

Although there were some customers that stated that they did not use the orb or newsletter, many customers did take actions to reduce their electrical usage. In total, 19 of 23 residential respondents took actions as a result of the orb or newsletter, with customers indicating that the orb had a bigger effect than the newsletter. Of the residential respondents who stated that they shifted or reduced electricity use as a result of the treatments, seven stated that *both* the orb and newsletter had an effect, 11 respondents said that the orb led them to changes, and one stated that the newsletter was the sole reason for their actions. Residential customers most frequently mentioned that they shifted or reduced washer/dryer use, turned down their air conditioners, and/or turned off some lights. Notably, unlike shifting washer/dryer use, the two other measures that residential customers most frequently took (i.e., turning down air conditioning and turning off lights) were short-term energy conservation measures rather than load shifting measures.

Seventeen small commercial customers (of the 26 that we spoke with) indicated the treatments were useful in helping to shift or reduce electricity usage. Like residential customers, small commercial customers also indicated that the orb had a bigger effect than the newsletter. Of the residential respondents who stated that they shifted or reduced electricity use as a result of the treatments, seven stated that *both* the orb and newsletter had an effect, and 10 respondents said that it was primarily the orb that led them to make changes. By far, turning off some lights and reducing air conditioner usage (short-term energy conservation measures rather than load shifting measures) were the primary ways in which these commercial customers reduced their electricity consumption.

Despite customers' preferences for this method of price notification, willingness to pay for the orb or newsletters is low. We asked customers who were still using the Energy Orb about their willingness to pay for the device. There were only two residential respondents (of 16 total) and three commercial respondents (of 14 total) who said that they would pay more than $25 for the orb. The remaining residential respondents were split between indicating that they would not pay for the orb, and stating that they would pay between $1 and $25 for the orb. On the commercial side, half of all commercial respondents said that they would pay $1-$25, while the remaining four respondents (28 percent) said that they would not pay for this device.

When we inquired about customers' preferences for purchasing the orb at a store versus paying a small monthly charge to the utility, residential respondents were split—indicating a slightly stronger preference for purchasing at a retail store over purchasing the orb from the utility for a monthly fee. Commercial customers, however, were twice as likely to indicate that they would prefer to purchase the orb from a retail store over paying a small monthly fee to the utility.

Question 5: What were the incremental load impact differences of IDP customers compared to the control group or customers with standard information and/or technology treatments?

Results of the analysis indicate that residential customers appear to be responding to the enhanced information treatments, but commercial customers do not appear to be responding. This response is over and above the standard CPP-V treatments provided to all CPP-V customers in the SPP, including dynamic prices and an option for enabling technologies.

The load savings for 2-hour event days and for 5-hour event days show an effect for the residential customers, including apparent savings during the warning period. They show little or no effect for the commercial customers, especially on the two-hour event days.

We did significance tests on these load impact estimates, but found that none of the load savings were statistically significant. This is not surprising, based on the small sample sizes (load impacts are based on only 32 residential customers and 29 commercial customers).

Team Recommendations

The team has presented recommendations in two categories. The first recommendations are based upon lessons learned in this pilot with regard to the effective use of information treatments. The second group of recommendations describes opportunities for future research.

Key Recommendations for any Implementation of Information Treatments

- *Target Information To Customers In Need*: The sponsors should recognize that not all customers on a dynamic CPP rate are able to make adjustments. It may be beneficial to consider targeting enhanced information treatments to those customers who have the willingness but need more information for shifting load during critical peak periods. We recommend further analysis to determine how best to target customers based on predictors (such as billing data, geographic location, etc.) known for all customers before any implementation of information treatments.

- *Provide Information via Mail While Working To Engage Customers Through Other Methods*: Periodic hard copy information (with an email option) may be the best way to provide customers with information about their usage presently. The sponsors should continue to provide information in this manner; however, they may also want to require an email address from customers at the time that they sign up for the rate in order to increase communications with these customers. To be most effective, the utilities will want to allow for various methods of communications, perhaps offering customers a choice for how they would prefer to receive this type of information when the customer signs up. We discuss creative ways to engage customers electronically under our future research recommendations.

- *Refine the Commercial Customers Information and Messaging:* Our research appears to indicate that the rate (with or without information) may be a more difficult concept to

understand for small commercial customers, as opposed to residential. This may be because C/I customers are not as in tune with their daily electricity behavior, or because other business operations take precedence over load shifting. As such, the sponsors may want to tailor their current marketing and information and refine this information for commercial customers

- *Provide Price Notification Displays That Offer The Benefits of the Orb*: Among respondents that feel that they can adjust their usage, the Energy Orb appears to be a valuable tool. The IDP customers that experienced the orb generally liked its features and felt that it was a good price notification option. While the concept of the orb is valuable, we recommend continuing to explore alternatives that offer similar benefits and be on the lookout for new developments in this area.

- *Use Either Two or Five Hour Events As Necessary to Meet Goals*: Our preliminary findings (although based on limited data) found that 2-hour or 5-hour peaks work equally well. For residential customers both two hour and five hours, when used with a prior four hour warning, appear to have the same effect during the event.

Recommendations for Further Research

- *Enlarge Sample Sizes*: The IDP sample sizes of 32 residential and 29 commercial customers are not large enough to detect statistically significant load impacts from the enhanced information and price notification treatments, nor to assess customer responsiveness to the technologies applied. Larger samples are needed to reduce the measurement error and provide meaningful information. In future research for 2005, both the residential and commercial ISP samples should be increased in size to allow enhanced study. The team is assessing the existing post-2004 CPP population for a research design plan that could be used for the 2005 IDP research goals.

- *Apply the Information and Price Notification Treatments Differently, Depending on the Rate:* In 2004, there were not CPP-F participants receiving the IDP treatments, due to the initial design of the IDP. These enhanced usage analysis tools developed for the CPP-V rate customers could be easily applied to the CPP-F customers, since the rates are nearly identical in structure and the traditional information treatments are similar. It would be meaningful to take post-2004 CPP-F participants and give them access to the IDP enhanced information tools. This option is being discussed by the three Utilities.

- *Continue Deploying Real-time Energy Use/Notification Displays:* Through both our general and pilot research, we found that customers would be interested in real-time energy displays, particularly those that display cumulative energy costs over the month. The sponsors should continue to explore current technologies and may want to continue deploying real time energy use display systems as part of the ongoing pilot effort. Deploying more price notification devices (Energy Orbs) would also be helpful to assess impacts for either more residential and commercial customers and improve the analysis of the load data for 2005.

- *Research The Effects of Alternative Warning Approaches:* Based on customer comments, in general, a 4 hour advance warning of a super peak event appears to be enough advance notice for most customers to take action. Impact data, and customer comments, however, suggest that many customers take action *during* the 4-hour warning period rather than just during the event. It may be useful to look into either a different schedule for a warning period, or a different warning strategy.

- *Explore Ways of Communicating More Effectively Via Email and Web Channels:* We recommend that future IDP research encourage more customer Web participation to test the viability of Web/email treatments over mail, which would be more cost-effective in a large-scale rollout. This should be done with a larger IDP sample during recruitment. Although customers have stated their preference for traditional information treatments (direct mail and newsletters), the use of the Internet for communication of the enhanced treatments should be further explored.

Introduction

California's consideration of the deployment of dynamic electricity pricing rates, as well as the installation statewide of an advanced metering infrastructure, represents a substantial investment if undertaken. A key question is, will electric customers understand these rates and manage their use in response to them? Will the metering infrastructure support more than just routine billing – can it provide valuable feedback to customers? If customers are to adequately and routinely respond to the price signals of dynamic tariffs such as time of use and critical peak pricing, they must be able to choose, comprehend, and respond to these rates. They must also receive the education, timely price information, and direct feedback necessary for them to achieve the maximum benefit of cost savings that the tariffs will allow.

The hypothesis of the Information Display Pilot, a study within the overall Statewide Pricing Pilot (SPP), is that the effectiveness of the critical peak price signals, and their acceptance, can be enhanced with supplemental information, delivered in communications via the Web or email, or delivered by display equipment. The SPP is being run by the three major investor-owned utilities[7] in California (Joint Utilities) under the auspices of the California Public Utilities Commission (CPUC).

Although customers already have the information necessary to choose and respond to the rates and price signals, the IDP was designed to develop communication approaches not normally provided by utilities. Nested as a sub-study within the SPP, this project was able to explore and quantify the incremental benefits of the enhanced information treatments.

This research specifically investigated whether providing additional local display and information treatments to SCE and SDG&E customers[8] in the SPP would increase the energy and demand savings from a critical peak pricing (CPP-V) rate. The primary goal was to estimate the incremental energy-saving benefits of information and display treatments over and above the load savings from the standard CPP rate treatments.

In addition, we examined the customer responsiveness to various *types* of information treatments (beyond what is already provided by the utilities) through the pilot study and general population research, both through focus groups and a quantitative non-participant statewide telephone survey.

Our research looked at both residential and small commercial customers and sought to answer five fundamental questions:

1. What is the potential for real-time feedback and/or detailed consumption analysis beyond what the Joint Utilities are offering in the SPP and within the schedule for significant analysis?
2. What types of feedback information technologies are currently available for dynamic pricing? What types of information feedback tools are available to customers and what are their costs?

[7] Southern California Edison (SCE), Pacific Gas and Electric (PG&E), and San Diego Gas and Electric (SDG&E)
[8] PG&E did not participate due to the lack of the CPP-V tariff in their service territory

3. What are customers' preferences for information technologies currently not available from utilities that customers would find useful to pay directly for, and what mechanisms would they use to purchase them? Are these technologies useful and cost effective on their own merits?
4. What kinds of information do IDP participants need/want to respond more easily and effectively, within the context of the SPP?
5. What were the incremental load impact differences of IDP customers compared to the control group or customers with standard information and/or technology treatments?

Education and behavior modification for dynamic pricing generally are based on detailed enrollment materials, monthly bills, and notification of super peak events provided by the utilities. If customers have better information about what energy really costs in their houses and businesses, will they be able to make more informed decisions?

As part of this research, we examined the effects of various educational material, web information and local display and feedback technologies. The informational treatments included customer-specific information based on billing and profile data, and were transmitted by email and regular mail. The emails drove the customer to a specific web site that was pre-loaded with the customer's billing information, allowing for a customized analysis of their usage and possible actions to take under the CPP-V rate.

Price and notification display technologies were somewhat limited. These were researched earlier through a technology assessment, and no readily available device or system was deployed in time for the pilot study, other than an off the shelf technology called an "Energy Orb."[9] The Energy Orb, located in each participant's home or business, is a small glass globe that changed color to indicate the price the customer was paying for electricity. Controlled by a paging signal, it also flashed as a warning for four hours before each critical peak price period.

Our research approach is described in the following section, but included:

- A survey of available information display and determine effective and useful display treatments for deployment in the IDP
- Development of sampling plan for information display (based on a preliminary technology assessment)
- Development of enhanced information treatments for customer communication via web, email, and regular mail
- Deployment of the information and display treatments to participant homes/meters (portion of SPP participants)
- Pre- and post-treatment discussions with customers that received treatments
- Review of load data collected from IDP participants and estimate significant load impact changes
- Focus groups with non-treatment customers

[9] We selected the Energy Orb technology for deployment and decided that the small sample size of precluded us from deploying more price display technologies.

- General population survey of non-treatment customers to determine what types of information customers want, will use, and are willing to pay for

This report finally describes the findings from our pilot effort to determine if California can provide better response (further reductions in electricity use) through enhanced information, such as more timely feedback.

In a parallel effort, Primen prepared a white paper of possible information display technologies that may or may not be tied to advanced metering, and that could have been used in the IDP. This white paper also summarized existing technologies and their possible future applicability to dynamic pricing, and fed into the development of our methodology and survey development. That report is available under a different cover and is a separate deliverable.

Methodology

Our team developed a methodology to address the stated objectives described in the introduction. The research approach included the following components:

General Research Tasks

- Focus groups with existing non-SPP utility time-of-use customers (one residential and one commercial group in each of the three utility territories)
- A quantitative survey of the general population of utility customers, including 400 residential and 204 commercial customers

Pilot Effort

- Install price notification Energy Orbs
- Deliver enhanced information treatments via mail (and email when possible) to all treatment participants
- Conduct a pre- and post-treatment survey of participants
- Perform a load impact analysis of participants versus a control group

This research approach sought to not only determine the effects and load impact changes of the information treatment, but also to gain an understanding of specifically which aspects of the treatments caused these changes, and what can be done to increase the effects when the full program is rolled out.

General Research Tasks

Focus Groups

Opinion Dynamics Corporation completed six focus groups between August 25 and August 30. Two focus groups (one with commercial customers and one with residential customers) were conducted in each utility region (PG&E, SCE, and SDG&E). These focus groups were conducted with existing utility time-of-use (TOU) customers because TOU customers were believed to be more familiar with variable rates than the general population of customers.

Focus group participants were drawn from lists of TOU customers provided by the utilities, and were screened in advance to ensure that they were aware that they were on a TOU rate. The groups typically included eight to 10 customers; however the first commercial group, which was held in PG&E's territory, had only four participants.

It should be noted that although the commercial focus groups were aimed at small commercial customers, several of the commercial participants (particularly in the PG&E and SDG&E territories) were mid- to large-sized customers.

Among residential focus group participants, there were a few customers in the PG&E and SCE groups who generated electricity through solar electric (and in some cases, sold electricity back to the utility). We also found that a large number of residential customers did not have air

conditioning in their homes. SCE confirmed that many of their TOU customers are coastal customers that are not as likely to have air-conditioning.

These focus groups asked customers to assess enhanced information and display treatments and their usefulness. Through the focus groups, we were able to display a variety of information presentations and devices currently available for informing customers about their electricity usage.

Focus group results informed the design of the quantitative non-treatment telephone survey instrument (described below). Note that the focus group guide and handouts are provided as appendices to this report.

General Population (Non-Treatment) Survey

Following the focus groups, Opinion Dynamics Corporate conducted 400 residential surveys and 204 commercial surveys with the general population of utility customers (i.e., customers not on a special dynamic rate). Approximately one-third of these surveys were conducted in each of the three utility territories. The sample was obtained from the utilities and the surveys were conducted in October 2004. Note that respondents were screened to ensure that they were not predisposed to thinking that there was nothing that they could do to shift or reduce their electricity use.[10]

The survey instrument was developed to build on the focus group findings, and determine quantitatively what types of information customers want, will use, and are willing to pay for.

Since the survey was conducted with a general population of respondents, we introduced the concept of on- and off-peak pricing (i.e., time dependent rates) so that we could ask about their preferences for price notification. About three-quarters of all customers stated that they were familiar with the concept of on-peak and off-peak pricing prior to our survey, with 42 percent of customers claiming to be very familiar with this concept. About a quarter of the respondents were not at all familiar with this concept. Note that some customers in the survey could have been on existing IOU time-of-use rates, which make explain some of the variation in level of understanding with this concept. However, the majority of all customers surveyed do have some level of understanding of this concept, which will make the introduction of a variable rate with super peaks much easier.

Table 1: Familiarity With Concept of On-Peak and Off-Peak Pricing

	Residential n=400	**Commercial n=204**
Very Familiar	42%	42%
Somewhat Familiar	30%	34%
Not at All Familiar	26%	23%
Don't Know	2%	1%

The non-treatment survey instrument is included as an appendix to this report.

[10] 25 residential customers and 44 commercial customers were terminated because they stated that they felt there was nothing that they could do to adjust usage.

Pilot Efforts

Treatments for Pilot Effort

Initially, this pilot effort included 65 CPP-V[11] customers (33 residential customers in San Diego Gas & Electric's territory and 32 small commercial customers in Southern California Edison's territory). Due to issues with customer contact, participation in the IDP, customer refusals, or lack of radio coverage, four of these customers were not available for receiving full treatments, leaving a total of 32 residential customers and 29 commercial customers for the pilot effort analysis.

Information treatments were designed and delivered to these customers during August/September 2004 billing cycles. These treatments consisted of the installation of an in-home/business price notification technology (the Energy Orb) as well as a customized newsletter developed by Nexus Energy Software.

Energy Orbs were programmed by Primen to show pricing periods as shown:

- Off-peak: Blue
- On-peak: Green
- Critical peak: Red
- 4 hours before critical peak: begin flashing red

We did not use the intuitive green/yellow/red combination because Orb yellow is pale and difficult to distinguish from green.

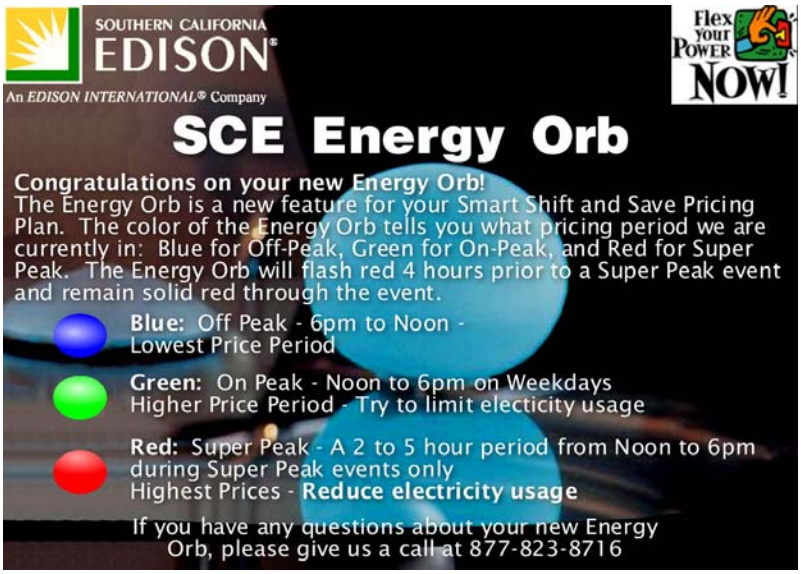
The Energy Orbs were delivered and installed to IDP participants in Southern California by Geltz Communications (Geltz) under a separate contract with the utility. The installations occurred between July 29 and August 26, 2004, and were scheduled to coincide as close as possible with the cycle date for the next billing period, so that a full billing period of treatment would occur. In all, Geltz's records show that 28 residential and 31 commercial customers received orbs.[12]

Geltz personnel contacted each of the IDP customers and scheduled appointments to deliver the Energy Orb. They visited each home and/or business and instructed customers to plug in the device and wait for it to cycle and stabilize. Occasionally this installation process took several attempts due to radio coverage problems. The customers signed an "orb acceptance" form indicating their receipt of the orb. The Geltz installer alerted customers to the orb color scheme, reminded them about the CPP rate, provided feedback to the utilities for any customer issue, offered suggestions for ways to reduce electricity usage, and provided a leave-behind "orb information card" (See Figure 1 below.)

[11] These customers were selected from the original CPP-V "Track A" group in the SPP that was placed on hold after recruitment efforts in 2003 failed to meet the sample cell requirements

[12] There is a difference between the ODC and Geltz records for IDP participants. A few customers were not available to receive orbs during the treatment period, and a couple received orbs but did not participate in the IDP.

Figure 1: SCE Energy Orb



Following the installation of the orb, customers receive two customized energy reports, or newsletters, based on their energy usage on the CPP-V rate. The customized newsletter highlighted efficiency measures that are relevant to critical peak, including reducing air conditioner usage and shifting appliance usage in homes occupied through the day. (A sample treatment for Residential and Small Business customers is included as Figure 8.)

The newsletter presentation was based on IOU energy use billing data and customer provided profile information along with additional data points designed to gauge the potential for customers to respond to critical peak pricing events. Nexus then ran the energy model and performed specific calculations using the data noted above to create specific energy savings measures for each customer based upon their facility profile, bill information and critical peak usage.

Specifically, the following elements were captured from each customers August and September bill.

Name	Description
Client ID	Nexus will provide code for each client – SCE and SDG&E.
Account number	
Account type	Business or Residential
Bill Date	Date of bill containing the data that follows. There can be many bill dates under an account.
Bill Days	Number of days billed. Can be used to validate that sufficient readings exist.

Meter Number	Meter ID pertaining to following set of readings. There may be many meters under a bill.
Meter Interval	Frequency of readings – hourly, 15 minute, etc.
Meter Multiplier	Converts pulse readings to energy units – typically Watts or kWh
Units	Units obtained when meter multiplier is applied to reading – watts or kWh for electricity
Fuel	Fuel being metered
Read Date	There may be many read dates for a given bill. There should be records for each day from the start date to the end date of the bill.
Total Cumulative Reading	Total reading for read date. This reading is used to validate interval readings.
Interval Readings	Reading value. A sequence number must identify each reading. For hourly interval, there will be 24 readings. For 15-minute interval, there will be 96 readings.

In addition, the following elements were captured from each customer's bill for critical peak usage.

- Start date
- End date
- Total peak use
- Total peak cost
- Total super peak use
- Total super peak cost
- Total off-peak use
- Total off-peak cost
- Total use (should be sum of above)

For each Critical Peak Event, the following data were used in the Nexus Energy Model:

- Date
- Client (SDGE or SCE)
- Customer Type (Residential or Commercial)
- Start Time
- End Time

Using the Nexus ENERGYprism methodology and the consumption information for each participant, Nexus delivered two analysis reports to each customer. The original plan was to deliver one in early August and the second in early to September. The actual newsletter deliveries were delayed until late August/early September and later September/early October respectively, due to delays in acquiring customers' bill information from SCE and SDG&E. The

details of the actual delivery schedule are included in the attachment, Information Treatment Schedule.

To create critical peak guidance communications that would benefit the customer the most, we extended the ENERGYprism model to specify hourly factors for non-AC appliance loads, as a percentage of monthly or annual appliance use, with *dependencies* on supplemental customer inputs related to their critical peak use characteristics, such as whether the home is occupied on weekday afternoons. The newsletter identified primary measures that customers can take to respond to critical peaks (such as thermostat control).

All customers received their customized reports (i.e., newsletters) by regular mail. These were also sent out by email if a customer provided an email address. In addition, customers could access the IDP website and the online tools to help them further understand their usage.

Nexus prepared prototypes of enhanced information treatments for delivery in three forms: mail, email, and Web. The treatments were designed to inform customers about ways to reduce their usage during critical peak periods. All three forms were presented to focus group and survey participants. Each contained similar information to simplify consolidation of results: the e-mail was designed to be a relatively freestanding treatment consistent with the other forms.

Recruitment efforts on the IDP sample did not to encourage email over mail: 20 of the 60 participants chose email, the remainder chose mail. Direct use of the Web was not offered to the sample as an option.

The email form included a hotlink to a website which had similar information as well as a load shift calculator and a supplementary efficiency content. These specific benefits were not highlighted on the two initial email issues, but will be promoted on later issues. However three of the 20 email recipients followed the link from email to website in the first two months of treatment.

In the IDP continuation, the research agenda will shift towards testing the viability of Web-email treatments, which are less expensive than mail treatments. Also, email recipients will be encouraged to visit the Web by content promoting use of links on the email, rather than repeating the customer scorecard on the email itself. This will support an evaluation of Web content by live users, which has not yet occurred.

In the proposed IDP expansion to CPP-F, it has been suggested that the focus move to Web/email by primarily recruiting (by phone) email and Web participation, with mail offered only on refusal.

Target results:

Response rates for well designed, targeted and personalized campaigns to subscribe customers to receive periodic emails of this type for energy utilities have achieved in the past results as follows:

- Offers to sign up for subscription emails – 30% to 45% via email; higher by phone solicitation; lower by mail.
- Open rates for subscription emails – 50% to 75%.
- Click-though rates from subscription emails to a related Website – 35% to 55%.

With the focus on email participation, and with greater time and scale as proposed in the IDP continuation, we would expect results in this range.

For the first two months of the CPP-V sample, the following was observed:

	Residential	**Business**
Total Participants	33	32
Participants that received Direct Mail Only	24	15
Email/DM	8 Note: 1 email was undeliverable	15 Note: 3 emails were undeliverable
Comments	Revised total was 32	Revised total was 29

Web visits from email recipients were not directly encouraged with specific benefits in the first two months, but three business users (no residential users) accessed the web site. The following accounts accessed the pilot web site.

Account Number	Name	Treatment Type
15389720	WJ BYRNES & CO OF LOS ANGELES	E-mail/DM
21306365	SERFAS	DM only
21672474	SCOTT LARSON	E-mail/DM

The participants were encouraged to go the IDP web site for more information regarding ways to save energy and shift they usages during critical peak periods. The overall flow of the web site is shown below in Figure 2: Web Flow. For samples of actual web pages, please see Figures 3 - 7 below.

Figure 2: Web Page Flow

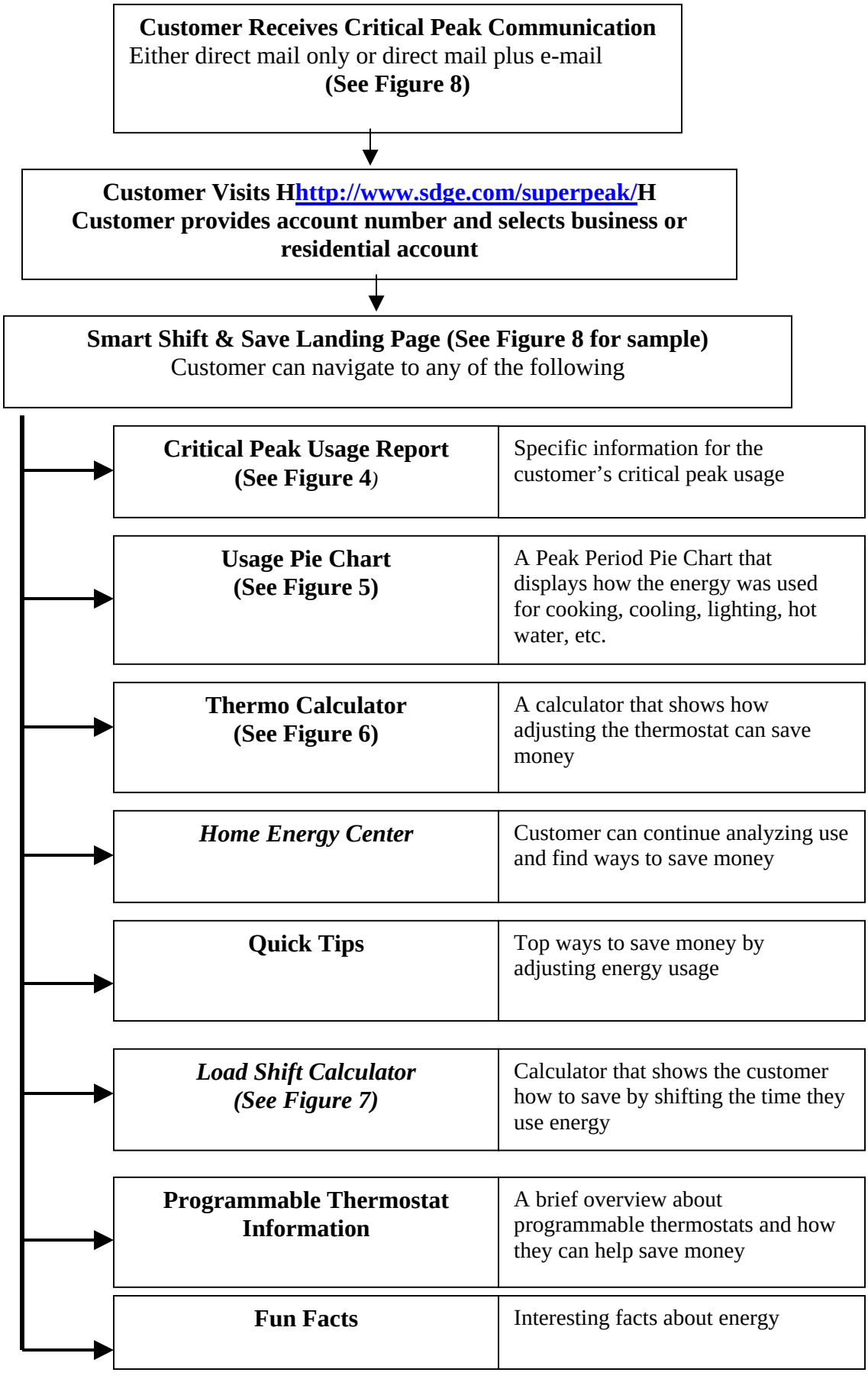


Figure 3: Smart Shift & Save Landing Page

Figure 4: Home Energy Center

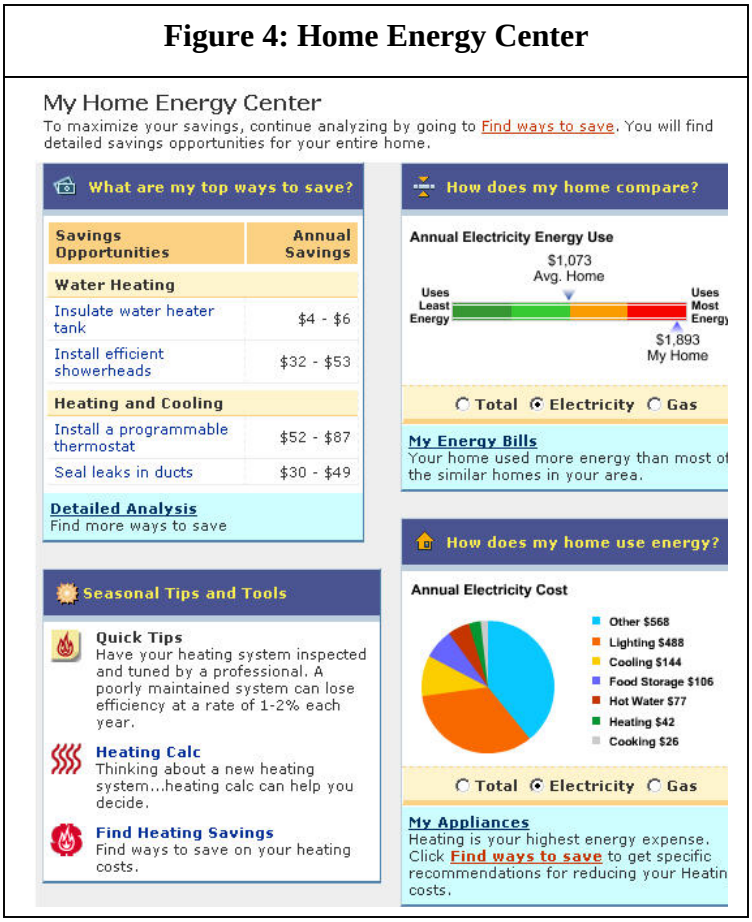


Figure 5: Usage Pie Chart

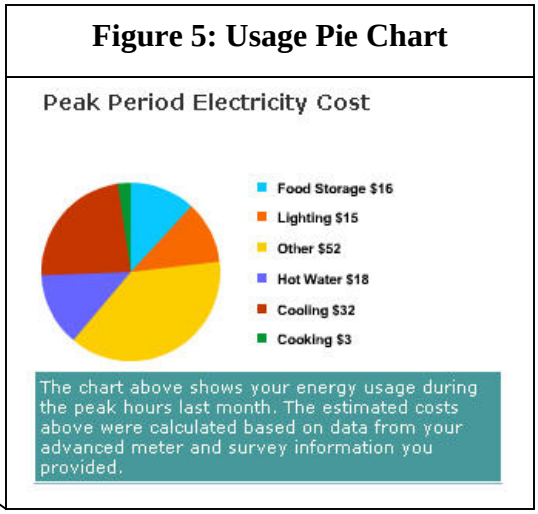


Figure 6: Thermo Calculator

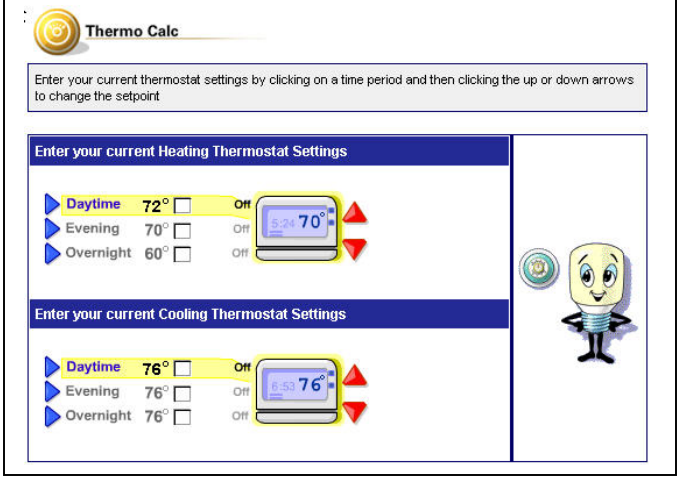
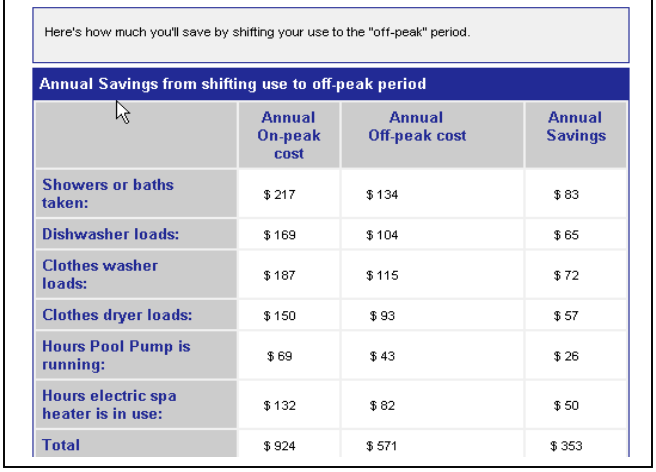


Figure 7: Load Shift Calculator



	Annual On-peak cost	Annual Off-peak cost	Annual Savings
Showers or baths taken:	$ 217	$ 134	$ 83
Dishwasher loads:	$ 169	$ 104	$ 65
Clothes washer loads:	$ 187	$ 115	$ 72
Clothes dryer loads:	$ 150	$ 93	$ 57
Hours Pool Pump is running:	$ 69	$ 43	$ 26
Hours electric spa heater is in use:	$ 132	$ 82	$ 50
Total	$ 924	$ 571	$ 353

Figure 8: Sample Newsletter

Smart Shift & Save Plan — Southern California Edison

Your Account Number: 5722274

Dear Jim,

The ***Smart Shift and Save Plan*** allows electricity prices to adjust based on demand shifts. Here is some important information about your usage and how you can make a difference.

Your Report Card

This month you used **21% of your energy On-peak**. That's **5% less** than the average customer.

- Nice work, you're saving money every time you shift usage off-peak.

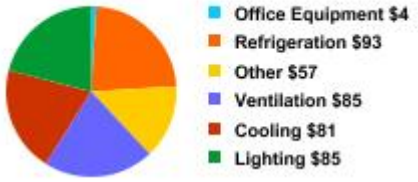
On the **Critical Peak days**, your peak energy use increased from an average of **87 kWh per day to 106 kWh**. This brought you an excess charge of $13!

- Focus on the Super Peak days to maximize your savings on the Smart Shift & Save Plan.

We can create a more secure energy future for California if customers like you reduce energy use by **20% on Critical Peak days**. Last month your energy use **increased by 22%**.

- Using the tips and energy savings tools can help you reach your goals

Peak Period Electricity Cost



The chart above shows your energy usage during the peak hours last month. The estimated costs above were calculated based on data from your advanced meter and survey information you provided.

Visit our Super Peak homepage to maximize your savings and learn more.

Quick Tips

Replace Old A/C Equipment...Save $29
High efficiency air conditioners are 50-80% more efficient than units that were available 10 years ago. Replacing low efficiency (EER<9) units with higher efficiency (EER=12) could result in the monthly savings above.

Install Efficient Fluorescent Lighting...Save $23
T-8 fluorescent fixtures use 30-40% less electricity compared to "regular" (T-12) fluorescents and generate significantly less heat. The savings estimate shown above is for monthly on-peak energy.

Use Compact Fluorescent Bulbs...Save $13
Replace incandescent bulbs with compact fluorescents. They consume 60%-75% less electricity and create a lot less heat. This monthly on-peak savings estimate shown above assumes 20% of floor space currently is lit incandescently.

Pre- and Post- Treatment Surveys

Opinion Dynamics also conducted quasi-depth (i.e., in-depth, with some quantitative questions) interviews with treatment respondents both before and after they received the information and orbs. To cost effectively conduct this research within the tight timeframe given, we conducted the pre-treatment participant survey while collecting the customer profile data needed for Nexus's reporting software and/or while installing orbs at the customer's home or business. This minimized the burden on participants.

Of the 32 commercial customers in our pilot, we completed 22 pre-treatment surveys and 26 post-treatment surveys. Note that when we were unable to reach the business by phone, fax, or email, we attempted to visit the business (with the exception of one Palm Springs business). There were several surveys where we were unable to ask all of the questions due to time constraints or inapplicability. A survey was deemed complete, however, if we were able to determine the current status of the orb.

Of the 33 residential customers in the pilot effort, we completed 24 pre-treatment surveys and 23 post-treatment surveys. The remaining customers could not be reached by phone, fax, or email.

In all, we completed 46 pre-treatment surveys (24 with residential customers and 22 with commercial customers) and 49 post-treatment surveys (23 with residential customers and 26 with commercial customers).

The pre-treatment surveys allowed us to gauge customers' initial actions and baseline knowledge prior to receiving the information treatment, while the post-treatments were used to better understand which aspects of the treatments lead to behavior changes, and what improvements could be made to the treatments.

Pre- and post-treatment surveys are included as an appendix to this report.

Impact Analysis

In order to assess the incremental load impact of the enhanced treatments of the IDP, we used a comparison method sometimes referred to as the "difference of differences" method. The IDP customers were the "treatment group." For these customers, we collected metered interval data both before and after the start of treatment. The treatment included both the Energy Orbs and the energy information. The installation date of the orb was considered the start of the treatment.

We also used other CPP-V customers in the SPP that did not receive any enhanced treatments as the "control group." These customers were similar to the IDP customers in that they were both recruited into the SPP and shared the same sample characteristics and locations, and also shared the CPP-V rate and Super Peak days. We monitored the control group customers by collecting interval load data both before and after the treatment installation in the same manner as the treatment group.

Both treatment and control customers were all given the option of the smart thermostat enabling technology. Because of this, the approach we used provides the incremental load impact of the information treatment above and beyond the enabling technologies.

In order to estimate the savings impact of the information treatment, we first calculated the difference between the treatment group and the control group during the post-treatment period. This unadjusted savings impact would be valid if the control group was identical to the treatment group. However, to adjust for the differences between the two groups, we calculated the difference between the control group and the treatment group during the pre-treatment period, and then used this difference to adjust the savings estimate, taking the "difference of the two differences." This can be thought of as a correction to the savings estimate based on the systematic differences between the treatment and control groups.

Because the sample customers for the SPP were stratified based on climate zone, usage level, and price ratio, we kept this stratification, and calculated the differences of differences for all the cells containing treatment customers. This grouped similar customers together, thereby reducing variance and making it easier to detect a difference. Once we had the adjusted savings estimate for all cells, we calculated a weighted average adjusted savings, using weights based on the number of sample customers in each cell.

The load impact calculations were as follows:

First, for each customer, either treatment or control, we calculated the pre- and post-treatment averages.

$$Tpreload_{i,*,k,h} = \left[\sum_{j=1}^{npredays_i} preload_{i,j,k,h} \right] \Big/ npredays_i$$

$$Tpostload_{i,*,k,h} = \left[\sum_{j=1}^{npostdays_i} postload_{i,j,k,h} \right] \Big/ npostdays_i$$

$$Cpreload_{i,*,k,h} = \left[\sum_{j=1}^{npredays_i} preload_{i,j,k,h} \right] \Big/ npredays_i$$

$$Cpostload_{i,*,k,h} = \left[\sum_{j=1}^{npostdays_i} postload_{i,j,k,h} \right] \Big/ npostdays_i$$

Where

$preload_{i,j,k,h}$ is the load for customer i, on day j, for hour k, in cell h.

$Tpreload_{i,*,k,h}$ is the load for customer i, for hour k, in cell h, averaged across days, for a treatment customer, during the " pre" period.

$Cpreload_{i,*,k,h}$ is the load for customer i, for hour k, in cell h, averaged across days, for a control customer, during the " pre" period.

$Tpostload_{i,*,k,h}$ is the load for customer i, for hour k, in cell h, averaged across days, for a treatment customer, during the " post" period.

$Cpostload_{i,*,k,h}$ is the load for customer i, for hour k, in cell h, averaged across days, for a control customer, during the " post" period.

$npredays_i$ is the number of pre - treatment CPP days for customer i.

$npostdays_i$ is the number of post - treatment CPP days for customer i.

Then, for each cell, we averaged the customers, keeping treatment and control separate.

$$Tpreload_{*,*,k,h} = \left[\sum_{i=1}^{nTcust_h} Tpreload_{i,*,k,h} \right] \Big/ nTcust_h$$

$$Tpostload_{*,*,k,h} = \left[\sum_{i=1}^{nTcust_h} Tpostload_{i,*,k,h} \right] \Big/ nTcust_h$$

$$Cpreload_{*,*,k,h} = \left[\sum_{j=1}^{nCcust_h} Cpreload_{i,*,k,h} \right] \Big/ nCcust_h$$

$$Cpostload_{*,*,k,h} = \left[\sum_{j=1}^{nCcust_h} Cpostload_{i,*,k,h} \right] \Big/ nCcust_h$$

Where

$Tpreload_{*,*,k,h}$ is the load for hour k, in cell h, averaged across treatment customers, during the " pre" period.

$Cpreload_{*,*,k,h}$ is the load for hour k, in cell h, averaged across control customers, during the " pre" period.

$Tpostload_{*,*,k,h}$ is the load for hour k, in cell h, averaged across treatment customers, during the " post" period.

$Cpostload_{*,*,k,h}$ is the load for hour k, in cell h, averaged across control customers, during the " post" period.

$nTcust_h$ is the number of treatment customers in cell h.

$nCcust_h$ is the number of control customers in cell h.

We then calculated the first difference, the treatment load minus the control load, for both the pre- and post-periods, for each cell.

$$prediff_{k,h} = Tpreload_{*,*,k,h} - Cpreload_{*,*,k,h}$$
$$postdiff_{k,h} = Tpostload_{*,*,k,h} - Cpostload_{*,*,k,h}$$

Where

$prediff_{k,h}$ is the difference between the treatment average and the control average during the pre - treatment period, for hour k, in cell h.

$postdiff_{k,h}$ is the difference between the treatment average and the control average during the post - treatment period, for hour k, in cell h.

Then we calculated the second difference for each cell, which removes from the impact any pre-treatment differences between the treatment group and the control group.

$$celleffect_{k,h} = postdiff_{k,h} - prediff_{k,h}$$

Where

$celleffect_{k,h}$ is the estimated load impact for hour k, in cell h.

Lastly, we calculated the weighted average of the cell impacts, using the number of treatment customers in each cell to calculate the weights.

$$impact_k = \sum_{h=1}^{ncells} w_h \cdot celleffect_{k,h}$$

Where

$w_h = \frac{nTcust_h}{\sum_{l=1}^{ncells} nTcust_h}$ is the weight based on the number of treatment customers in cell h.

The fact that the super peak times were not consistent across all CPP days[13] created another level of complexity. We calculated the savings across CPP days in two ways: First, calculating an average load savings across all CPP days by hour, and second, by adjusting the loads to the time relative to the start time of the super peak period. The average load savings across all CPP days by hour include hours that are super peak hours on some CPP days, and not on others, so it is more difficult to see the effect.

[13] The CPP-V Super Peak time was either two or five hours in duration, depending on the SPP dispatch for each of the 12 Super Peak days during the summer, with varying start and end times.

The savings that are relative to the start time of the super peak period give a clearer picture of the effect, since they are averaging like hours together, regardless of when during the day those hours occur. Because the first differences are taken between the treatment and control groups for the same CPP days, the effect of different hours on load is controlled.

Issues Encountered During the Evaluation

As expected, coordinating the installation of the Energy Orbs and the delivery of the treatment reports to coincide with each customer's cycle billing date was a challenge, as some customers received different parts of the treatment starting at different times. This may have mitigated the impact of the treatment somewhat, assuming that both components had an effect. Also, many customers did not want to receive their information treatments via email, which was a major component of the IDP design. Due to the lack of email addresses, we would expect that fewer customers would access to the web for further information. Lastly, we had hoped for an equal distribution of the events in the pre- and post-treatment periods and time for customers to respond to the treatments, but the events were all completed within an 8-week period. As a result, some customers were subjected to relatively few critical peak days after the treatments started.

Table 2 below shows the number of treatment customers that saw different numbers of pre-treatment and post-treatment CPP days. In all cases, there were enough pre-treatment and post-treatment CPP event days for comparison across all CPP days. In some cases, the small number of pre-treatment days may have influenced our ability to determine separate effects for 2 hour and 5-hour event days, since only half of the days fell in each of those categories.

Table 2: CPP Days

	Number of pre-treatment CPP days	Number of post-treatment CPP days
16 customers	4	8
45 customers	7	5
1 customer	9	3

Another problem, discovered late in the analysis process, was with the consistency of the curtailment signals sent to the smart thermostats in the homes in the San Diego area. The signals were not sent at the correct time for some of the curtailment events.

This does not affect our analysis of the IDP customers. The timing of the signals sent to the Energy Orb was correct. The same thermostat control signals were sent to both the IDP treatment customers and the CPP-V control customers. Because of these two facts, the difference of differences method used will accurately reflect the incremental load impact of the information treatments, unaffected by the error in the thermostat signal times.

General Research Findings

Below we present the results of our general research efforts. Specifically, our general research set out to answer the research questions:

> *What is the potential for real-time feedback and/or detailed consumption analysis beyond what the Joint Utilities are offering? and*
>
> *What are customers' preferences for information technologies currently not available from utilities that customers would find useful to pay directly for, and what mechanisms would they use to purchase?*

The information in this section includes the analysis of data collected through a series of focus groups, and a general population survey, as described in the methodology.

This chapter is divided into two parts:

- Part 1: The Need for, and Value of, Information
- Part 2: What Customers Want, Would Use, and Are Willing to Pay For

Part 1 deals primarily with the first research question listed above, while Part 2 discusses findings related to the second research question about customer preferences.

Part 1: The Need For, and Value of, Information

Below we explore the need for, and the value of, information above and beyond what is currently provided on customers' bills and through current utility educational efforts. In general, our findings indicate that many customers express a need for additional information. Furthermore, even customers who do not express that they are in need of information indicate that they *want* additional information and would find it useful in helping reduce electricity consumption.

Perceptions of the Ability To Change Energy Use

Prior to exploring the types of information customers want and would use (described in the second part of this section), we examined customer perceptions of their ability to change electricity use. Specifically, we attempted to determine a rough estimate of the percentage of customers that have a preconceived notion that there is nothing that they can do to reduce electricity use.

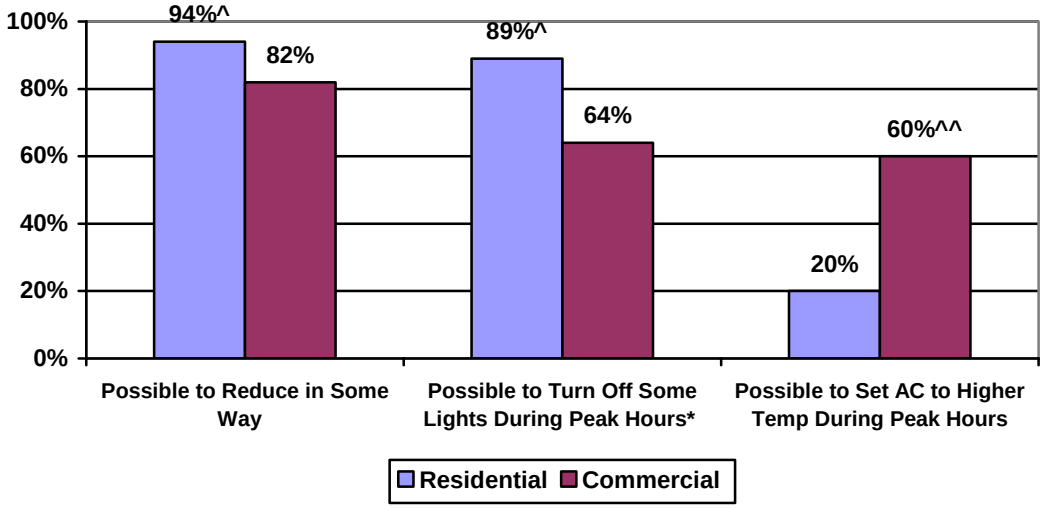
In our focus groups, many of the time-of-use customers that we spoke with felt that they are doing as much as they can to save energy. Many had been on the TOU rate for over five years and took actions initially when getting on this rate. In general, they felt that California customers are more energy conscious nowadays, following the Energy Crisis, and there is a preconceived notion that people are implementing energy saving measures already. However, while many TOU customers entered the focus group with this perception, one commercial focus group participant acknowledged that the information, "…would be a gentle nudge to let you know that you can do more than you are doing. I feel that I am doing everything I possible can, but just

sitting here today [in the focus group], I found a couple of areas where I can save some energy pure and simple."

Although many of the TOU customers in our focus group seemed to feel that they were already taking measures to reduce consumption, when we asked the general population of customers about their ability to reduce electricity consumption, a large majority indicated an ability to reduce electricity use in some way. Almost all (94 percent) residential customers and 82 percent of all commercial customers who responded to the general population telephone survey felt that they could do something to reduce their electricity usage.[14] (See Figure 9.) Specifically, they stated that they would be able to take actions to reduce consumption a few days a year when the electric system is stressed in order to avoid an energy crisis.[15]

As shown in Figure 9, 89 percent of residential customers state that a few days a year when the electric system is stressed, it would be possible for them to turn off some lights. This was significantly higher than the percentage of commercial respondents that indicated they would be able to turn off some lighting during these times. However, a large percentage of commercial customers (64 percent) thought that they would be able to shut off some lights when the system is stressed.

Figure 9: Percentage of Customers That Are Able to reduce Electricity Usage
(residential n=425, commercial n=248)



^A significantly higher percentage of residential customers than commercial customers.
^^A significantly higher percentage of commercial customers than residential customers, as only 50% of the residential customers interviewed had air conditioning.
**Peak hours in the residential survey were 2-7pm and in the commercial survey were 12-6pm.*

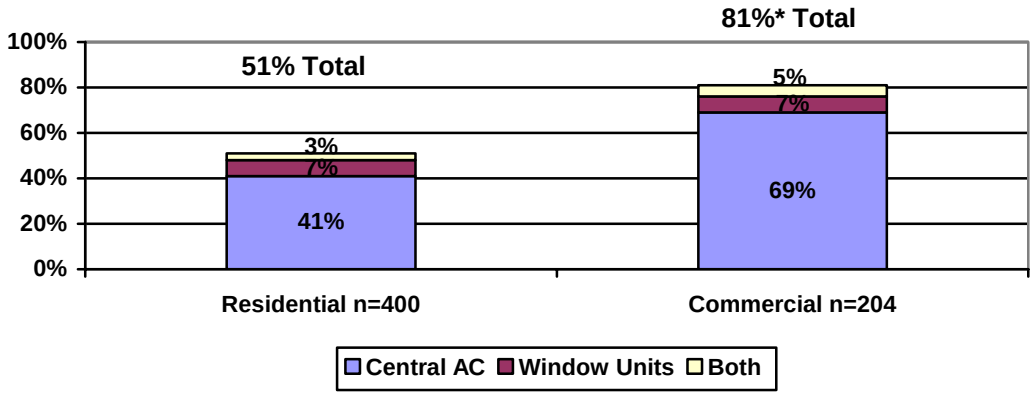
[14] Note that 25 residential customers and 44 commercial customers were asked questions about their ability to adjust usage, and then were not asked the remainder of the survey because they did not feel that they could adjust their electricity consumption.
[15] Note that their comments were not in response to an established rate.

Almost all customers (both residential and commercial) that have air conditioning indicated that they would be able to set their air conditioners to a higher temperature during these times; however, not all customers have air conditioning (or have their air conditioning on during the times that we were talking about). Although 9 out of 10 customers that have air conditioning felt that they could reduce usage, since not all respondents have air conditioning, this represents only 20 percent of all residential customers and 60 percent of all commercial customers that we spoke with.

The percentage of commercial customers that are able to make some air conditioning related reduction is much larger than the percentage of commercial customers because only half of all residential customers have air conditioning, compared to 81 percent of commercial customers. (See Figure 10.) *Moreover, nearly half (45 percent) of the residential customers with air conditioning stated that it is never on between 2 pm and 7 pm on weekdays.*

Of those with some form of air conditioning, central air conditioning is the most common type of air conditioner with 44 percent of all residential customers having central air (central air only or both central air and window unit) while 67 percent of all commercial customers have central air (central air only or both central air and window unit). (See Figure 10 below for a breakdown of types of air conditioners.) Again, almost half (45 percent) of the residential customers with air conditioning indicated that their air conditioning is on during peak times (between 2 pm and 7 pm) on weekdays. Note that we assumed that commercial customers would have their air conditioning on during peak times (12 pm to 6 pm for commercial customers) since they were open for business during these times. We did not ask commercial customers about usage during specific times of day.

Figure 10: Types of Air Conditioners Customers Have



**A significantly higher percentage of commercial customers have air conditioning (81 percent) than residential customers (51 percent).*

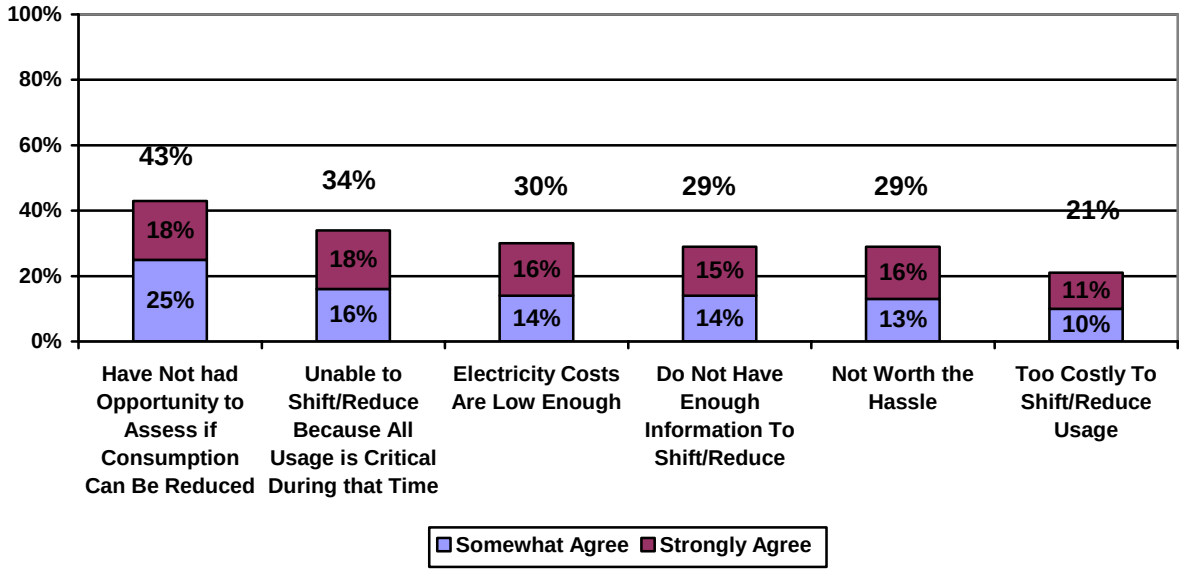
Barriers To Changing Energy Use

We also explored potential barriers to changing energy use, and while the need for additional information was not the largest barrier, 29 percent of residential customers and nearly half (47

percent) of all commercial customers felt that they did not have enough information to shift or reduce their electricity use. Information can also help to overcome some of the other barriers that respondents mentioned.

The largest barrier for residential customers is that they have not had the opportunity to assess savings opportunities (43 percent). This barrier can be largely overcome by getting this issue in front of customers through better communications. This speaks to the fact that any information treatment approach should provide specific recommendations and dollar figures associated with altering consumption during peak periods. Other residential barriers are shown in Figure11a below.[16]

Figure 11a: Residential Barriers n=400

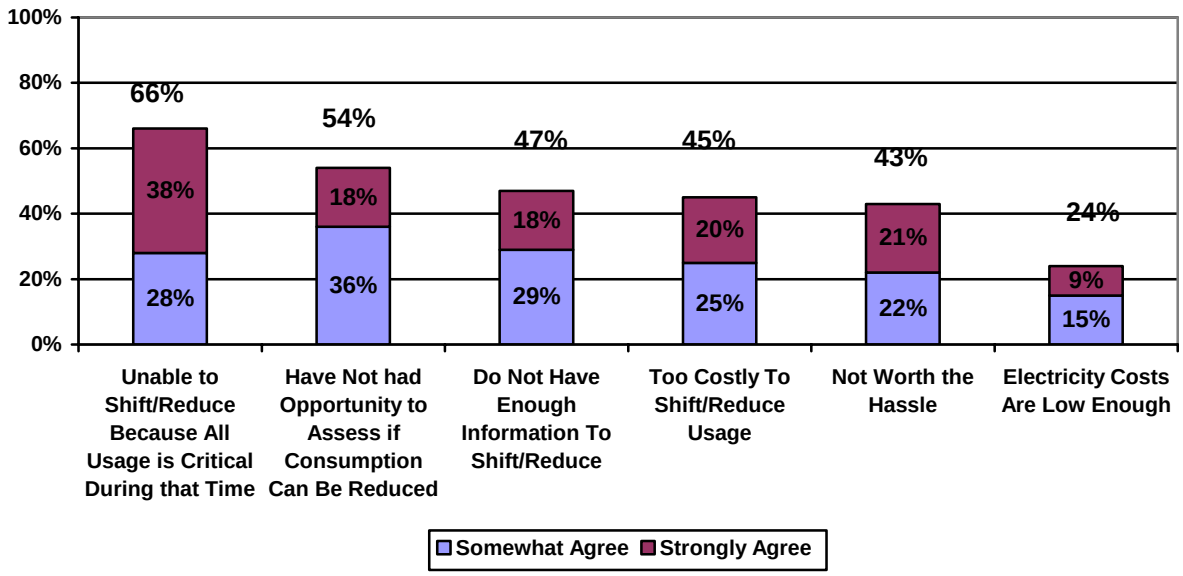


Overall, the barriers for commercial customers appear to be much greater than for residential customers. (See Figure 11b.) The largest barrier for commercial customers is that they would be unable to shift usage because all usage is critical during these peak hours. More than two-thirds of commercial customers considered this a barrier.

Note that the "unable to shift usage because all usage is critical during that time" is underrepresented by our 204 respondents since an additional 44 commercial respondents felt that they could not reduce usage, but were not interviewed since we were attempting to get feedback on various types of information from respondents who did not have a preconceived notion that information would not be of any use. Thus, when these 44 respondents are added in, over 70 percent of commercial customers seem to feel that this is a barrier.

[16] Respondents were asked whether they agree with the following statements. This was not an open-ended question. Note that the "unable to shift times because all usage is critical during that time" is slightly underrepresented since 25 respondents that felt that they could not reduce usage were not interviewed. This would, however, still remain the second largest barrier for residential customers.

Figure 11b: Commercial Barriers n=204



Interestingly, the fact that sixty-six of commercial customers agreed with the statement that they would be "unable to shift or reduce usage because all usage is critical" is somewhat at odds with customers' initial responses that they can take some action. (Refer to Figure 9, showing that 82 percent of commercial customers indicated that they would be able to take some action to reduce consumption when the system is stressed.) One difference, however, is how the question was asked. The original question was asked in the context of reducing electricity usage to prevent the next energy crisis. *Customers were willing to help during the last energy crisis and seem to respond to the crisis or emergency messaging, but are less willing to change usage on a more regular basis.*

Clearly, therefore, messaging is very important to getting customers to reduce usage. Additional information about ways of adjusting electricity consumption, such as turning out *some* lights, or dimming light fixtures, rather than *all* of the lights, may also help commercial customers make these adjustments. Communications with these customers should focus on addressing these barriers.

In addition to the barriers mentioned above, focus group participants mentioned several other barriers to implementing a rate that would encourage reductions during peak times. One of these barriers was skepticism of the utilities motivations. This, however, could be overcome with education, and has been done with the utilities' other programs.

Additional education will also be needed because customers tend to associate any widespread request for a reduction with their experience with block-by-block shutdowns. Moreover, announcements about a limited number of days where customers would need to reduce electricity use would be competing with other requests to reduce usage, such as "Flex Your Power" Days. When educating customers, therefore, the utilities need to have clear messages to distinguish their requests and needs, or need to work to coordinate these efforts.

Finally, several focus group participants also commented on the "use-less, pay-more barrier." Many focus group participants seemed somewhat exasperated by the fact that it is a constant battle of reducing electricity with increasing rates. It seemed difficult for them to accept that their bills would be even higher if they had not reduced consumption.

The Need For Information

While only 29 percent of all residential customers and 47 percent of commercial customers stated that the lack of information was a barrier to reducing consumption, even more customers appear to need information due to a general lack of knowledge.

Eighty-two percent of residential customers and 86 percent of commercial customers were able to tell us the amount of their last monthly bill,[17] indicating that they have some general knowledge about energy costs and usage. However, when asked a more specific question about their familiarity with the top three energy users in their home or business, many were unsure.

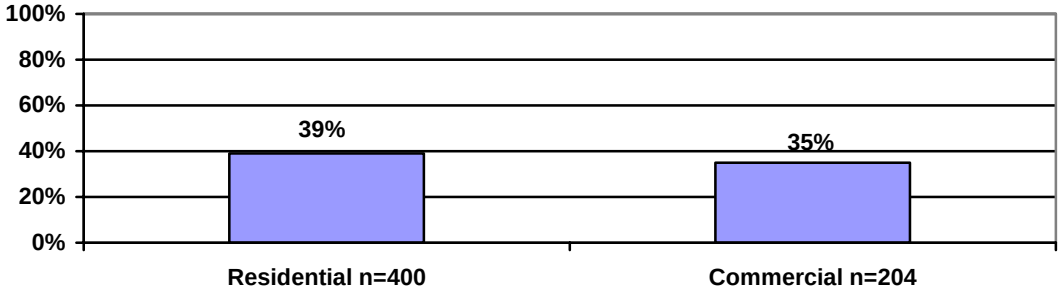
In all, 98 percent were able to name *at least one* of their top energy users but were not sure about all three. Only 60 percent of residential customers and 50 percent of commercial customers were able to come up with what they believed to be their top three energy users. Interestingly, 61 percent of commercial customers and only 31 percent of residential customers mentioned lighting.

When these same customers were asked if they needed more information regarding their electricity consumption to accurately answer the question about their top energy users, many of the customers that were able to state three answers indicated that they were not confident in their responses and could use additional information.

In all, therefore, only 39 percent of residential customers and 35 percent of commercial customers felt confident in their knowledge about the top three energy users in their home or business. (See Figure 12 below) Nearly two-thirds of these populations, therefore, would likely benefit from customized information about their electricity usage and how they can save money in the future.

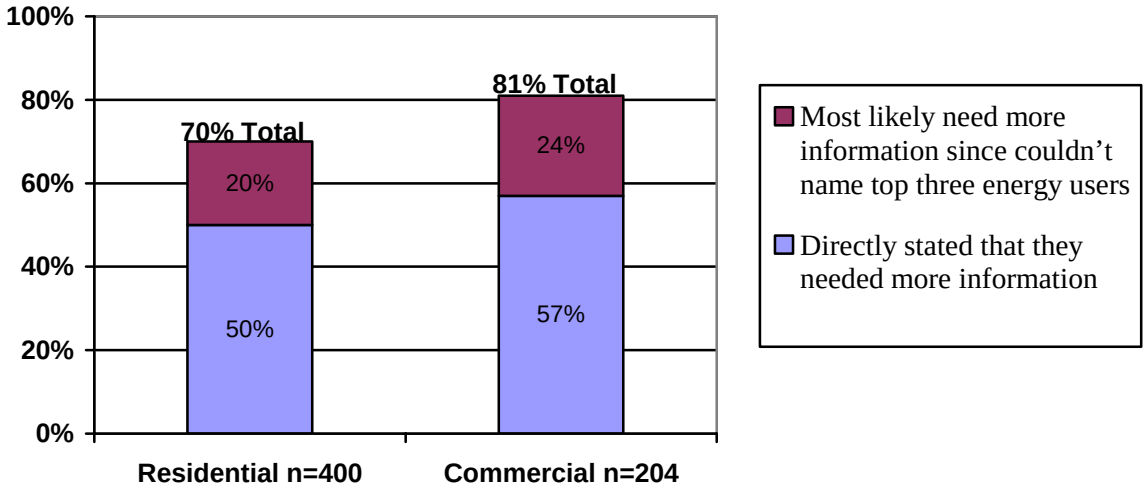
[17] Note that we did not verify these amounts. By giving a dollar amount, however, they indicated that they have some sense of the magnitude of their electricity bill.

Figure 12: Percentage of Customers That Were Confident in Their Knowledge About the Top Three Energy Users In Their Home or Business



In at least one point in our survey, therefore, more than one half of all customers directly stated that they need more information regarding their energy usage to adjust usage.[18] (See Figure 13.) In addition, several other customers (shown below in a separate color) were unable to list their top three electricity users, indicating that additional information would probably be useful for these customers as well. Overall, therefore, we estimate that at least 70 percent of residential customers and 81 percent of commercial customers would benefit from additional information. And even more expressed interest in additional information once presented with the options even if they didn't directly indicate that they needed information.

Figure 13: Percentage of Customers That Need More Information
(need information about electricity usage to determine top three electricity users and or claimed they needed more information to be able to shift or reduce electricity usage)



[18] These customers either indicated that they needed more information regarding their usage to be able to shift or reduce electricity usage and/or they mentioned that they needed more information regarding their electricity usage to accurately gauge what the three biggest electricity users in the home or business are.

The types of information that customers want, and the best methods for presenting this information, are discussed below.

Part 2. What Customers Want, Would Use, and Are Willing to Pay For

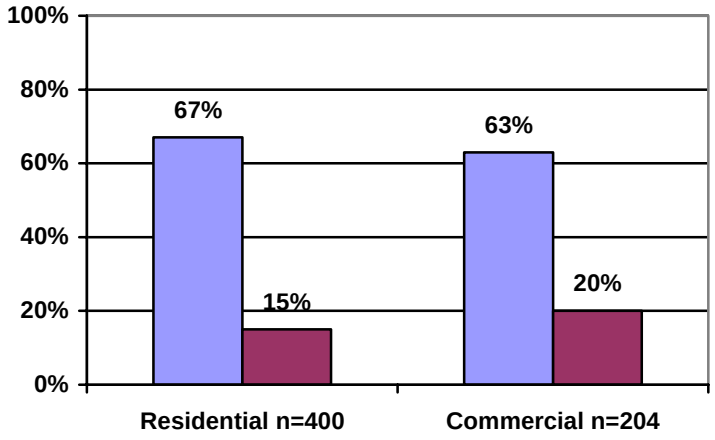
Through our focus groups, we began to explore customer preferences for information and the types of information customers want and would use. We then followed these focus group discussions with quantitative research to test some of the options among the general population.

In general, we found that customers are interested in obtaining additional information on how to reduce electricity costs, such as information on usage and energy saving actions. To be useful, however, this information should be customized and very specific to individual rooms, appliances or equipment that the customer has. Furthermore, the messaging is also important and should be kept simple with an overall tone of empowering the customer to save energy and money. Finally, while customers generally want and like information, many are accustomed to having these types of services provided for free from their utility. These findings are discussed in more detail below.

Value of Current Information

Currently, customers receive some historical usage data on their bill, or can look for information on the utility web site. When customers were asked about their familiarity with the historical information on their bill and their usage of the website, the majority of residential and commercial customers indicated that they are familiar with the year-old history that is available on their bills. (See Figure 14.) They are much less likely to be familiar with the local utility website, with only 15 percent of residential and 20 percent of commercial customers indicating that they had used the website. One important difference, however, is that customers must review their bills each month so the information is presented to them directly, whereas they would have to be proactive to visit the web site.

Figure 14: Familiarity with History on Bill and Web Site*



**Considered familiar with website if customer has ever visited it in the past.*

The percentage of customers that are familiar with their bill history is slightly higher than expected based on comments in focus groups. Based on focus group comments, it seemed as though customers were not very familiar with the current information on their bills. While some were clearly familiar with historical usage, other focus group participants seemed to have only realized this upon examining their bill in preparation for the focus group.[19]

Of those that are familiar with the current resources, customers seem to find the historical information on the bill to be more useful than the website. (See Table 3.)

Table 3: Usefulness of Information on Web Site and Bill History

	Residential n=268		**Commercial n=128**	
	Top 3	**Mean**	**Top 3**	**Mean**
Historical Information On Bill	55%	7.0	48%	6.5
	Residential n=58		**Commercial n=42**	
Information on Web Site	29%	5.8	38%	6.1

Based on focus group findings, both residential and commercial customers generally like being able to compare their current usage to their historical usage. As one focus group participant commented, "I think they should put all this information where you could click it to see your own history back a year or two, and then you could look at your January consumption versus your previous January and see seasonally how you are doing." Another respondent commented that "a snapshot [such as is currently on the bill] is one thing but I want to see the whole picture."

These findings seem to indicate that there is a need to enhance the information that is currently available to customers. We explore some of the enhancement options below.

Customized Customer Analysis

Through focus groups and the quantitative survey, we explored opinions of a customized newsletter (and the various parts of that newsletter) developed specifically for this research by Nexus Energy Software.

When we were able to show customers the newsletter, they generally had favorable opinions of the newsletter and the types of information in the newsletter, although some feel that this alone might not change their behavior. The only comments on the overall presentation of the newsletter from focus group participants were that it has too much text, and should focus on presenting the fact rather than on encouraging customers through phrases such as "Way to go!" Please see Figure 8: Sample Newsletter above.

[19] Several focus group participants actually brought their bills with them to the focus groups.

It was clear from customer comments that the value of the information is in the fact that it is *customized* for the specific home or business. To really make it valuable in the mind of the customer, the customer needs to understand that it is based on their specific usage profile, and the information provided should clearly state this to help the customer see the value.

Of the various types of information presented in the newsletter, the quick tips, or customized tips, appear to be the most useful in helping customers to shift or reduce their electricity usage. Focus group participants and telephone respondents both found this to be the most useful information. As one commercial focus group participant stated, "I like the way the quick tips are done…to just have a quick thing 'Install fluorescent lights and save $240.' If I'm interested, I read on."

According to focus group participants, the quick tips provide actionable suggestions about what customers can do. Through telephone surveys, this was also the most favored by both the residential and commercial customers with over half (56 percent) of the residential customers and 44 percent of commercial customers indicating that this would be very useful. (See Table 4.) Residential customers were significantly more likely than commercial customers to find energy use reports useful.

Table 4: Usefulness of Various Reports and Information on Energy Consumption
(Top 3 - Percent that gave a rating of 8,9, or 10 on a scale of 1-10
where 1 is "not at all useful" and 10 is "very useful")

	Residential n=400		**Commercial** n=204	
	Top 3	**Mean**	**Top 3**	**Mean**
Energy Saving Ideas				
Customized Energy Savings Tips	56%*	7.2*	44%	6.4
Analysis of Biggest Electricity Consumers	51%	6.8*	43%	6.2
Analysis of Hours Using the Most Electricity	44%*	6.6*	34%	5.6
Newsletter Tailored To Customer	44%*	6.3	30%	5.3
Report Card Comparing to Other Customers	36%	6.0*	30%	5.4

**A significantly higher percentage of residential customers indicated that the energy savings idea would be useful than commercial customers.*

When shown the information in a focus group setting, both residential and commercial participants in the groups also felt that a pie chart showing the breakdown of electricity use in the customer's home or business is very valuable. Nearly all participants in the focus groups stated that they found the pie chart to be useful, although a couple of participants expressed skepticism that the information would be correct. While nearly all participants in the focus groups (both residential and commercial) expressed an interest in receiving the information conveyed in a pie chart of their electricity users, some were unsure how it would translate into energy savings because they would not know what actions to take. However, within one of the residential focus group, seven of 10 participants thought that it would help them to reduce their electricity consumption.

The value of "the analysis of the biggest electricity users" appears to be supported by the quantitative surveys, in which we asked respondents how useful a breakdown of their energy use would be in helping to shift or reduce their electricity usage. This analysis was rated as one of the most useful pieces of information; however, only 51 percent of residential customers and 43 percent of commercial customers thought that this would be very useful in helping them to shift or reduce their electricity usage. (See Table 4 above.)

Most focus group participants were less interested in receiving a benchmark (or report card) of their usage against other similar customers. They were generally unable to accept that the comparisons would really be similar given the multitude of factors involved (e.g., square footage, equipment, number of people, hours of operation). For this reason, benchmarking should not be one of the most prominent pieces of information presented to customers. This is generally supported by our quantitative data: the report card comparing to other customers received the lowest ratings from both residential and commercial customers. In general, *customers preferred comparison to their own historical usage data, as described above.*

We also explored customers' opinions regarding a couple of interactive online tools such as a load calculator that would help customers determine energy savings based on actions that they could take. While the concept was good in principle, many focus group participants felt that it was too complex and too time consuming for the average customer. However, this resource appeared to be valuable for some customers who were a little more energy savvy.

As one commercial customer stated, "Just sitting here and looking at this and listening to you people, I've just found two areas where I can save electricity. I noticed we were running our roller this afternoon, which is a peak hour. Haven't given much thought before. And also running our spray…during peak hours, where we should be running it in the morning."

One residential focus participant in the Long Beach discussion had used a similar on-line analysis tool on a local utility's website, but stated that above a certain point (20 light bulbs) the tool was not precise enough. "It did not distinguish between 20 or 100 light bulbs." These comments reiterate the need for simple and specific tools. However, in general, the load calculator is a good tool to have on the web, and to promote through basic communications.

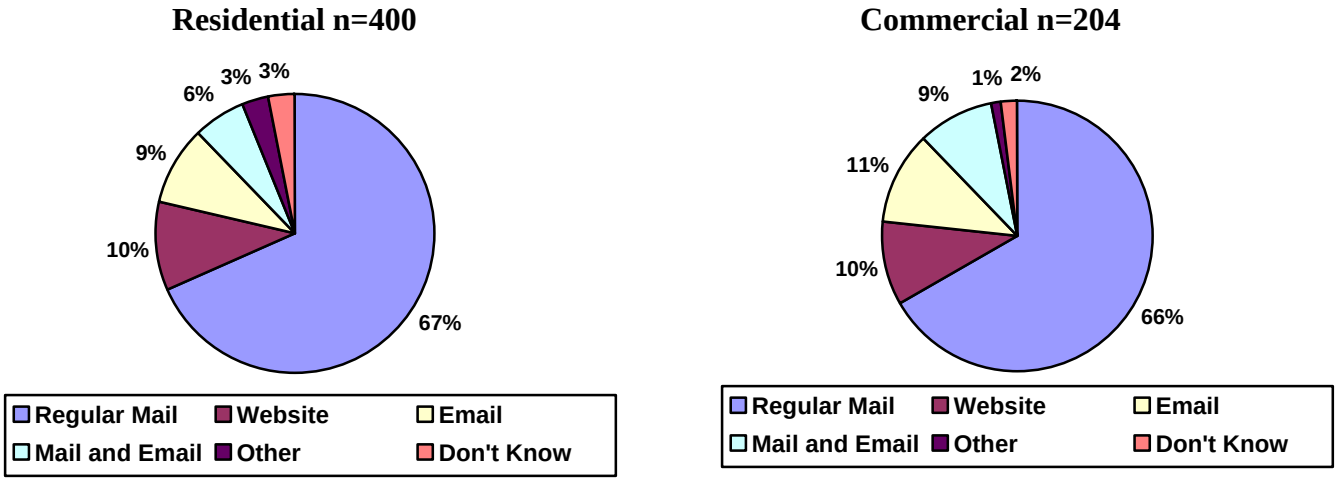
How Customers Want to Receive Information

Basic messages and information needs to be put in front of customers. For most, this still means presenting the information through mail, even though it is easier to provide a large quantity of information on the Internet. The on-line approach also allows for interactivity and more detail than is possible on hard copy. Perhaps it is the simplicity of the paper media that is appealing.

Both residential and commercial customers have a very large preference for communications to come to them in the form of regular mail. (See Figure 15.) Two-thirds of both residential and commercial customers indicated that this was their preferred form of communication. While approximately 15 percent of residential and 20 percent of commercial customers would like to receive email, this does not appear to be the best method for reaching most customers, at least not initially.

The figure below also shows that approximately one in 10 customers would like the information on the Web. Again, however, while this is a good way to present a variety of information (depth) the utilities should not rely exclusively on the Web at this stage because it requires the customer to be proactive.

Figure 15: Preferred Form of Communication from Utility



When customers were asked what they see as the most important information in order to reduce electricity usage during peak times, 25 percent of residential customers and 20 percent of commercial customers stated that it is information on the bill. Focus group participants had mixed responses about whether they want information on/with their bill with some customers saying that they would be more likely to look at information if it is with their bill, while many others state that they throw away all of the inserts with their bill.

One residential focus group participant mentioned integrating the information (or a URL) into the bill "If it was just an insert in the mail, it's probably going to get thrown away…but if it's integrated with the bill… like whenever we get a phone bill, I probably do scan the pages of the phone bill, even though the only one that I need to look at is the last page with the bill on it." Alternatively, the utility could place a URL on the envelope, or a sticker on the bill. Whatever the format, the information on the bill needs to be clear and recognizable so that customers are aware it is there, compelled to read it, and understand it enough to take action.

Additional suggestions include placing a handout in commercial bills that the bill payer could share with the owner, or an email that they could forward to others in the building to educate them about energy use.

To be most effective, the utilities will want to allow for various methods of communications, perhaps offering customers a choice for how they would prefer to receive this type of information when the customer signs up for the program.

Frequency of Information

When presenting customers with information, the utility may want to consider providing this information more frequently at first and then as a reminder. The utility could also alter shorter messaging on the bill via a magnet or sticker on bill, with the newsletter coming out every six months.

Through our quantitative surveys, about once every three months seemed to be the appropriate amount of contact: 48 percent of residential and 54 percent of commercial customers stated that quarterly was their preferred frequency of communication. (See Table 5a) About a quarter of the respondents indicated that they wish to be contacted monthly. Very few customers felt that they needed frequent communications such as once a week or continuously through a Web site.

Table 5a: Preferred Frequency of Communications

	Residential n=400	Commercial n=204
Preferred Frequency of Communications		
Quarterly	48%	54%
Monthly	23%	28%
Once Per Year	18%	16%
Continuously Through a Web Site	4%	6%
Once Per Week	1%	1%
Other	1%	0%
Never	4%	5%

When we explored the timing of providing information with focus group participants, most saw value in providing the information consistently (although not continuously) since they felt that it might not catch their attention the first or second time that they see it.

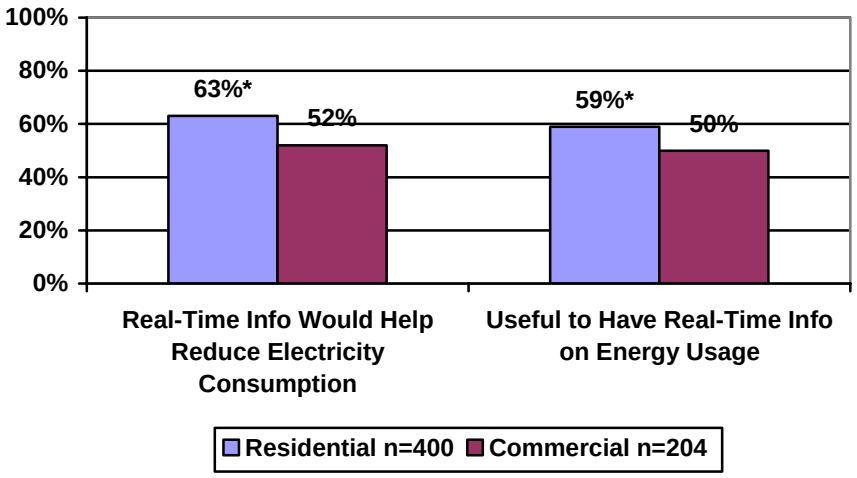
Electricity Information Displays

While the findings above seem to suggest that customers prefer information approximately four times a year, we also presented the concept of real-time electricity information displays and explored the value of more timely feed back and whether this is perceived to increase savings. When we presented the concept of real-time feedback in a telephone survey, many customers indicated that it would be useful to have real-time information to help reduce electricity consumption.

A significantly higher percentage of residential customers than commercial customers thought that real-time information would be useful both in general (59 percent versus 50 percent) and for reducing electricity consumption (63 percent versus 52 percent). (See Figure 16.) This is a surprisingly large percentage given that we were unable to demonstrate the concept over the telephone so the concept was somewhat abstract. The findings, however, clearly showed that customers are interested in more information than they currently have.

As one residential focus group participant stated, "Well, if I see the dollars and things adding up, I would go through the house and start shutting stuff down." Another stated that he likes the idea, "If you look at it and you see that you're clicking up pretty fast and you know 'Oh my God, I paid $120 last month in electricity, and it's only three fourths of a month and I'm already at 120, I've got to be really careful.'"

Figure 16: Percentage of Customers that Believe Real-Time Electricity Information Displays Would Be Useful



**Significantly higher percentage of residential customers than commercial customers thought that it would be useful to have real-time information and that it would help reduce electricity consumption.*

When we asked customers about the features of a real-time display, customers indicated that the display should be a wall-mounted device that displays electricity costs in dollars. As one residential focus group participant stated, "Dollars hit you in the pocketbook. Kilowatt hours is some fictitious thing out there." Only more sophisticated energy managers for commercial businesses preferred both dollars and kilowatt-hours.

Comparable to current billing, about half of the customers indicated that they would want to see the amount of electricity being used so far in a current month. There was also some interest in entering a pre-set limit or budget into the device: 55 percent of residential customers and 48 percent of commercial customers are interested in this feature.

Table 5b: Percentage of Respondents Interested in Features for Cost Savings Device

	Residential Customers That Believe Real-Time Information Would be Useful n=220	Commercial Customers That Believe Real-Time Information Would be Useful n=93
What the Device Should Display (multiple response)		
What the Electricity is Costing In Dollars	63%	60%
The Energy Savings from Changes in Use –in Dollars Saved	31%	37%
The Amount of Electricity being used in kW Hours	27%	38%^
Amount of Electricity Shown on Display (multiple response)		
The Amount of Electricity/Cost So Far in Current Month	51%	53%
The Amount of Electricity/Cost Projected for Entire Current Month	29%	32%
The Amount of Electricity/Cost At Current Moment	27%	26%
The Amount of Electricity/Cost So Far Today	25%	24%
Pre-set Budget / Alert		
Ability to Input Pre-Set Limit or Budget	55%	48%
Design of the Display		
Wall-mounted Device	43%	37%
Technology to Plug into Outlet	18%	25%
Display on Computer Screen	16%	26%^
Device for Table or Desk	14%*	3%
Device to be Portable	8%	6%

^A significantly higher percentage of commercial customers were interested compared to residential customers.
** A significantly higher percentage of residential customers were interested compared to commercial customers.*

Note that commercial customers are significantly more likely to indicate that they would want the display on their computer screen, while residential preferred a table or desk.

In the focus group setting, we were able to both discuss these concepts, and to present current options for real-time energy displays. Specifically, we showed focus group participants the EMS2020 and CENT-A-METER (See Figures 17a and 17 b)

Figure 17a: EMS 2020

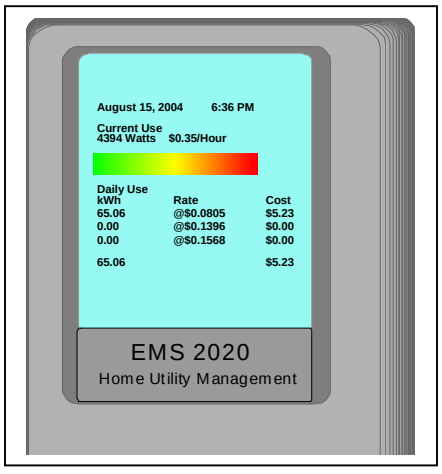


Figure 17b: Cent-A-Meter

In general, focus group participants liked the idea of a device that displays energy use, especially one with a monthly read that can be used to compare utility bill. They felt that this concept was similar to "bringing your meter inside." Once focus group participants understood that you could turn particular appliances or equipment on or off to see changes in that appliance's energy use, many also mentioned that they liked that these tools allowed you to "be your own consultant." In general, customers felt empowered by the concept.

Note that since most in-home displays won't match actual bills for a variety of reasons—the measurements are less accurate, all the various charges aren't included, and the device wouldn't be reset at the precise same time as the monthly read—the month-to-date dollar figure shown in the display won't match the utility bill. For that reason, utilities would need to make clear to customers that in-home displays are a tool for managing energy use and cost, but are not intended to verify, replicate, or replace utility billing meters.

As far as the actual display, almost all focus group participants preferred the simpler larger display of the Cent-a-meter. Focus group participants generally like the idea of a device that can display energy usage *and* costs. They also preferred a wall-mounted device at eye-level (but separate from a thermostat since many homes and businesses have more than one thermostat) to the hand-held device which most people equated to a toy that could be broken or a remote that would either get lost or purposely tucked into a drawer after the initial interest wore off.

When focus group participants were asked about a more complicated hand-held device, a few stated that they would not use this type of device all the time, but that they might use it once. Some suggested that they would rent the device from the utility for short period but that it would end up in drawer if they had for a long time.

Price Notification

In addition to information about energy usage, we also explored through the surveys the various ways of alerting customers to peak periods under a dynamic pricing scheme. Exploring the most effective ways to alert customers to changes in electricity prices during both the focus groups and telephone surveys was difficult because it required an explanation of some form of the dynamic pricing.[20]

When the concept of conveying prices through a technology in your home was presented as an abstract concept, it was seen as "somewhat big brotherish." Focus group participants, however, were then shown two possible methods of conveying pricing: through an Energy Orb, and a Customer Alert Device (CAD). (See Figures18a and 18b below)

[20] The super peak concept was difficult for most participants to grasp without considerable explanation.

Figure 18a: Energy Orb

Figure 18b: Customer Alert Device

Given a scenario of being placed in (or choosing) a variable rate with high peaks 12 times a year, participants want to be informed of the current prices through a technology like the Orb or CAD, along with telephone or email notification.

Participants have mixed feelings about both the orb and CAD (and inquired about the electricity usage of both). Many though the orb would be a nice conversation piece and describe the Orb as a "mood light". However, while some think it would be fun, others feel that it is intrusive and impractical. Many customers were also concerned that they would forget what the various colors meant (and thus preferred something intuitive like green, yellow, red). (As noted previously, the orb yellow and orb green are very similar because combining red and green light generates yellow). In actuality, the IDP team reluctantly decided to replace the intuitively understood green/yellow/red scheme with the more easily seen blue/green/red scheme).

In general, however, participants like the feature of having a large light inform them of price changes (such as the screen of the Cent-A-Meter, or larger lights on the CAD). While some found the orb to be too trendy, others felt that the lights on the CAD are currently too small to notice/monitor effectively. In addition, the CAD is placed in a socket or outlet, so some participants were concerned that they would not see the color changes since it would not be at eye level, if plugged into a low wall outlet.

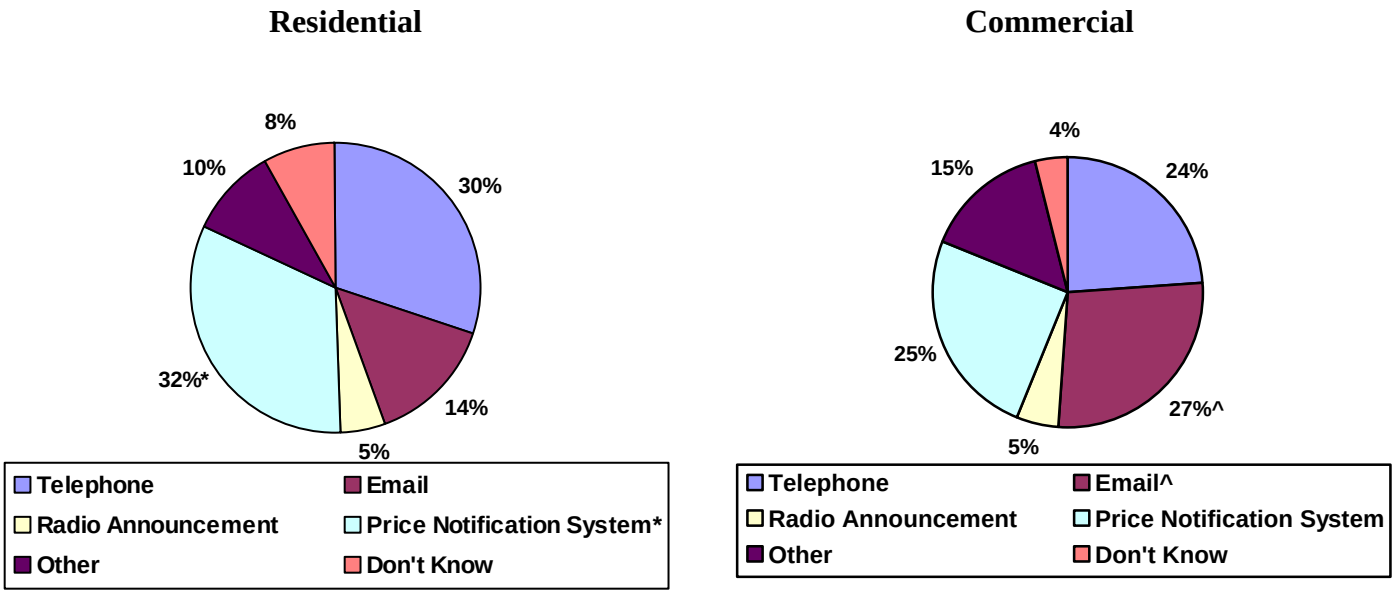
Focus group participants generally like the idea of an audible price notification (such as a beep) *if* they can disable the beeping option. There is some concern about when the device would beep and for how long. Participants also feel that it should not sound like a low battery on a smoke detector; or in the case of commercial customers, it should not sound like a siren that would indicate that customers should leave the facility.

When we explored related concepts in the telephone survey with the general population, the preferred method of peak price notification varied between the residential and commercial groups. (See Figure 19.) A price notification system and telephone were the most preferred forms of notification (32 percent and 30 percent, respectively) among residential customers

while email, a price notification system, and telephone were the most preferred methods (27 percent, 25 percent and 24 percent, respectively) among commercial customers.

These data suggest that there is no one perfect method to notify these customers regarding peak pricing but rather a few different methods should be utilized to reach the largest number of customers. Note that since this was a telephone survey, we were unable to display the actual devices.

Figure 19: Preferred Method of Notification



**Significantly higher percentage of residential customers than commercial customers thought that a price notification system would be a good form of notification.*
^Significantly higher percentage of commercial customers than residential customers thought that email would be a good form of notification.

Similar to responses about a real-time display, a large percentage of residential respondents prefer any form of price notification device to be wall-mounted. Commercial customers, however, are again more likely to prefer the information be displayed on their computer screen.

When we asked respondents whether the notification should be in the form of a visual or audible signal, almost all wanted a visual signal, with many of these wanting both a visual and audible signal. Very few respondents indicated that they would want just a beep or audible alert. As mentioned before, almost all focus group participants also prefer both visual and audible if they can shut off beeping when they chose to with a reset or mute button or on/off switch.

Table 6: Characteristics of Desired Notification Device

	Residential n=400	**Commercial** n=204
Wall-Mounted Technology	37%*	24%
Technology to Plug into Electric Outlet	15%	21%
Display on Computer Screen	13%	21%^
A Portable Technology	10%	8%
A Technology for Desk or Table	8%	8%
Visual	40%*	32%
Audio	8%	10%
Combination of Visual and Audio	31%	34%

**Significantly higher percentage of residential customers than commercial customers thought that a visual device would be a good notification device. Also, a significantly higher percentage of residential customers thought that a wall-mounted technology was the best place for the device.*
^A significantly higher percentage of commercial customers than residential customers thought that a display on a computer screen was the best place to read the device's information.

The majority of customers indicated that four hours is enough time to be told about an impending peak day so that they can shift or reduce electricity usage. (See Table 7.) A significantly higher percentage of residential than commercial customers stated that four hours would be enough time (77 percent compared to 59 percent). The commercial customers generally needed a little more time than the residential customers to shift their electricity usage but 82 percent felt that a day or less was enough time to make any necessary adjustments.

Table 7: Length of Notification Period Needed to Shift or Reduce Electricity Usage
(those who answered "don't know" were removed)

	Residential n=366	**Commercial** n=193
4 hours is enough time	77%*	59%
5-23 Hours	6%	10%
One Day	9%	13%
2-5 Days	3%	9%
One Week	4%	5%
2 Weeks	1%	--
One Month	--	2%
Can't Shift or Reduce	1%	11%^

**A significantly higher percentage of residential than commercial customers stated that 4 hours would be enough time.*

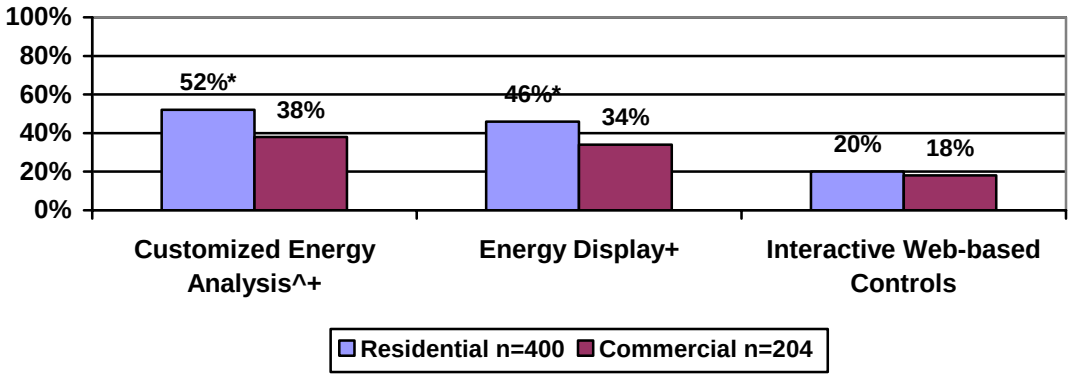
Summary of Preferences and Willingness to Pay

The various types of information that we asked about (i.e., customized energy analyses, energy displays, and interactive Web-based controls) have very different uses. While some customers see value in all three, the customized energy analyses are most likely to be used by customers.[21] (This is also the easiest to implement.) Only one-fifth of customers indicated that they would be likely to use an interactive website.

[21] Note that we added a single question to the survey about interactive Web-based controls for comparative purposes.

In general, residential customers found the different options to be more useful than the commercial customers did. Residential customers have more of an interest, and therefore are more likely to use of the energy savings options that were presented to them.

Figure 20: Likelihood of Using Different Energy Saving Options
(Percent that gave a rating of 8, 9, or 10 on a scale of 1-10 where 1 is "not at all likely" and 10 is "very likely")



**A significantly higher percentage of residential compared to commercial customers rated that they were likely to use this.*
^A significantly higher percentage of residential customers indicated that they were likely to use a customized energy analysis compared to an energy display device or an interactive Web site.
+A significantly higher percentage of commercial customers indicated that they were likely to use a customized energy analysis or an energy display device compared to an interactive Web site.

Despite the fact that many are likely to use, and see value, in the customized energy analysis, far fewer customers were willing to pay for online or mailed customized information. As focus group participants noted, one reason for this is because customers expect this type of information for free, and were already familiar (and/or had taken advantage of) their utilities free auditing services. As such, it was hard for them to accept that information through the mail or email would cost money, when they had an energy professional come to their home for free.

Customers are generally willing to pay a little more for an energy display device. Residential customers are willing to pay very minimal charges for a display device in their home: 17 percent are not willing to pay anything, but an additional 69 percent of residential customers are willing to pay between one and 49 dollars. Commercial customers were more willing to pay for more for this sort of device with 45 percent of commercial customers willing to pay 50 dollars or more.

Table 8: Willingness to Pay for Information and Energy Display Device

	Residential n=280	**Commercial** n=120
Willingness to Pay for Online or Mailed Customized Information		
Nothing	47%*	37%
Less than $25	36%*	37%
$25-$49	6%	10%
$50-$74	2%	4%
$75-$100	1%	2%
Don't Know	8%	11%
Willingness to Pay for Energy Display Device		
	Residential n=258	**Commercial** n=113
Nothing	17%	11%
Less than $25	40%*	21%
$25-$49	29%	23%
$50-$74	10%	27%^
$75-$100	3%	16%^
More than $100	1%	2%

**A significantly higher percentage of residential compared to commercial customers said that they would pay this price.*

^A significantly higher percentage of residential compared to commercial customers said that they would pay this price.

We did not ask telephone respondents about their likelihood to use and willingness to pay for price notification since this was an abstract concept that was explored further in the pilot effort (see next section). When focus group participants were shown the Energy Orb and CAD, however, most think that any notification device should be provided by the utility to encourage switching to the rate, although they would pay $5 or $10 (and some were willing to pay $25 to $50) for a device that notifies them of price and energy usage. As one focus group respondent stated, the might pay $25 for an orb but would opt for the phone call over $100 for the orb.

In general, focus group participants indicated that they do not like the idea of a monthly charge for the device (similar to meter charge) because it is never-ending. The utilities should be aware that some customers who already pay this meter charge felt that they should not be required to pay any additional fees. In our quantitative surveys, *slightly* over half of both residential and commercial customers indicated a preference to purchase this sort of device from a retail store, rather than through a small monthly charge on their bill. The utilities may want to consider alternative options since there was not an *overwhelming* preference for either choice.

Table 9: Preferences Regarding How to Purchase a Device

	Residential n=217	**Commercial** n=102
Preference Regarding How to Purchase Device		
Purchase at a Retail Store	54%	54%
Small Monthly Charge on Electricity Bill	39%	35%

Pilot Effort Findings

Below we present the results of our pilot effort to provide customers on a critical peak pricing (CPP) rate with additional information to enhance their understanding of the both the rate and how to reduce their electricity consumption during peak times. Specifically, our pilot effort set out to answer the research questions:

> *What kinds of information do IDP participants need/want to respond more easily and effectively, within the context of the SPP? and*
>
> *What are the incremental load impact differences of IDP customers compared to the control group of customers with standard information and/or technology treatments?*

As described in the methodology section of this report, this pilot effort included 32 residential customers in SDG&E territory, and 29 small commercial customers in SCE territory.

This section of our pilot effort findings combines the results of a load impact analysis, along with in-depth interviews that were conducted with "treatment customers," (i.e., the 61 customers that received some combination of enhanced information). Treatment customers were interviewed at the beginning of the summer prior to receiving the treatment information (i.e., a pre-treatment survey) and at the end of the summer after receiving information through both the orbs and newsletters (i.e., a post-treatment survey).

This chapter is divided into two parts:

- Part 1: Information Display Treatments and Their Impacts on Electricity Consumption
- Part 2: The Need For, and Value of, Information among Pilot Customers

Part 1: Information Display Treatment and Their Impacts On Electricity Consumption

Part 1 shares some of the background information about our pilot customers, provides an introduction to the information display treatment, and a summary of the actions that customers are taking as a result of the treatments. The impacts on the electricity use of this pilot group (when compared to a control group) are also presented in this section.

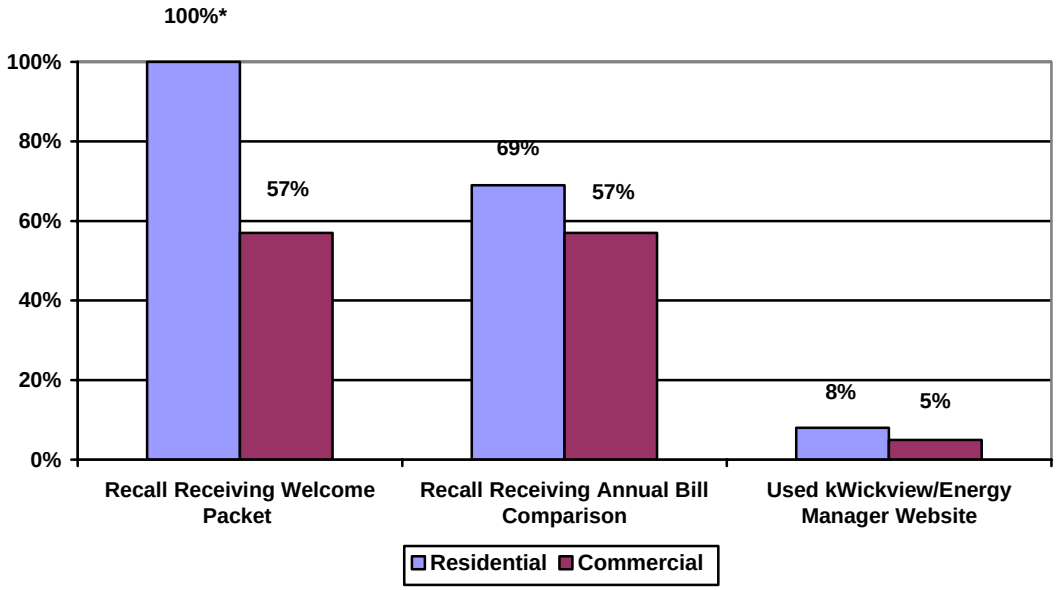
General Knowledge of Energy Bills and Usage Prior to Treatments

Prior to receiving the IDP enhanced information treatments (i.e., the newsletters and the Energy Orb), we explored the pilot customers' general knowledge about their electricity usage to understand the effects of the utilities' prior educational efforts—as well as their perceptions about whether they were in need of additional information. Most pilot customers initially felt that they had enough information about their rate and usage to adjust their electricity consumption; however, as we explored their current understanding of electricity rates and usage and offered them additional information, most customers expressed an interest in receiving some type of enhanced information.

As part of the standard CPP-V rate, customers receive a welcome packet explaining the rate and a telephone call and/or fax or email notifying them of the super peak events the morning of the event day. Annually, they also receive a "bill comparison," which is a statement from the utility that explains their savings (or alternatively, additional expenses) on the CPP-V rate as compared to what they would have spent if they remained on their past rate. Finally, customers also have access to the utility Web site with customer specific information.[22]

When we asked about the information provided by the utility through the standard rate, the welcome packet was most recalled by both residential and small commercial customers. (See Figure 21.) In general, residential customers were much more likely than commercial customers to recall the information provided by the utility, as shown in the figure below.

Figure 21: Recollection of Receiving Welcome Packet and Bill Comparison and Percent That Viewed Web site



**A statistically higher percentage of residential customers than commercial customers recall receiving the welcome packet.*

While customers are more likely to recall the welcome packet than the annual bill comparison, in general they think that the concept of the annual bill comparison is more useful in helping them to adjust their electricity use. (See Table 10 below.) Overall, residential customers found these resources to be more useful than the commercial customers.

[22] Unlike the treatments, this information does not provide customized suggestions on how to reduce electricity use nor the visual price notification offered by the Energy Orb.

Table 10: Value of Welcome Packet and Bill Comparison
(Top 3 - Percent that gave a rating of 8,9, or 10 on a scale of 1-10 where 1 is "not at all useful" and 10 is "very useful")

	Residential		Commercial	
	Top 3	**Mean**	**Top 3**	**Mean**
Usefulness of Information in Annual Bill Comparison	65% (n=20)	8.2	50% (n=16)	7.8
Usefulness of Information in Welcome Package	58% (n=24)	7.6	44% (n=16)	7.1

When we asked customers about the Web site, a very low percentage of customers had ever used the utility Web site for information; eight percent of residential customers (two customers) and five percent of commercial customers (one customer) have ever used this resource. Of the four respondents that had used the Web site, one did not find it useful, one was neutral, one found it useful and one respondent did not know. Although these respondents were split, these data about the value of the website to those who use it is hardly conclusive given the very small number of respondents. The larger issue is the fact that both residential and commercial customers underutilize this resource.[23]

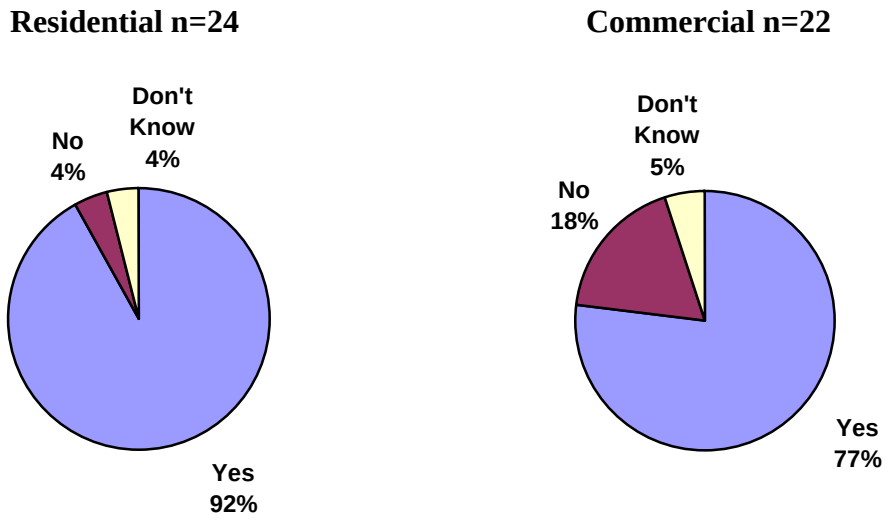
Despite the fact that the information received by customers was limited to those resources mentioned above (and some customers could not recall this information), even prior to receiving the enhanced information treatments, both residential and commercial customers claimed to have enough information about the rate and electricity use to adjust consumption. Ninety two percent of residential customers and 77 percent of commercial customers expressed that they have enough information.[24] (See Figure 22.[25])

[23] Perhaps more marketing of the Web site in the welcome package and other sources will help increase the usage of it.

[24] The difference between the residential and commercial customers is not significant due to the small sample sizes.

[25] Five respondents (four commercial and one residential) indicated that they did not have enough information. Interestingly, these customers expressed an interest in the types of information offered by the treatments such as: 1) more pricing information, 2) information on when peaks occur, and 3) more information on how to monitor electricity usage.

Figure 22: Customers Feel They Have Enough Information About Electricity Use to Adjust Consumption



Despite this claim, before receiving the IDP enhanced information treatments, most customers did not pay close attention to their monthly charges for electricity usage even though they were on a variable demand response rate. When we asked customers what they thought their actual average monthly electric bill was (prior to treatment), only 30 percent of residential customers and 37 percent of commercial customers were within 15 percent of the actual price on the bill. Respondents who guessed at the amount were usually within 25 percent of the true bill amount. Moreover, none of the customers that answered our survey prior to the treatment were able to tell us what their on- or off-peak electricity prices are. These findings indicate that customers on the variable rate are not paying close attention to the details that are provided on their bills.

While most customers were at least somewhat aware of the peaks associated with the variable rates prior to the treatments, many small commercial customers were not all that familiar with the concept of the *super peaks* prior to the treatments, indicating the need for additional information. Residential customers were much more likely to be familiar with this concept.[26]

[26] Note that we spoke with the pilot contact given us by the utility, or the next best contact if the original contact was unavailable or no longer at that place of business

Table 11: Summary Table of Customer Familiarity with Electric Bill and Pricing

	Residential n=24	**Commercial** n=22
How many knew bill amount?		
Within 5%	13%	14%
Within 15%	17%	23%
Within 25%	54%	45%
Beyond 25%	--	--
Don't Know	17%	18%
Familiar with On- /Off- Peak Pricing		
Very	71%*	27%
Somewhat	25%	45%
Not at All	4%	23%^
Don't Know	--	5%
Familiar with Super Peak Pricing		
Very	62%*	14%
Somewhat	29%	32%
Not at All	8%	45%^
Don't Know	--	9%
	Residential n=24	**Commercial** n=20
How many of the treatment groups knew top three electricity users?		
All	0%	15%
Some	63%	70%
None	37%	15%

**A statistically higher percentage of residential customers are familiar with the concept.*
^A statistically higher percentage of commercial customers are not familiar with the concept.

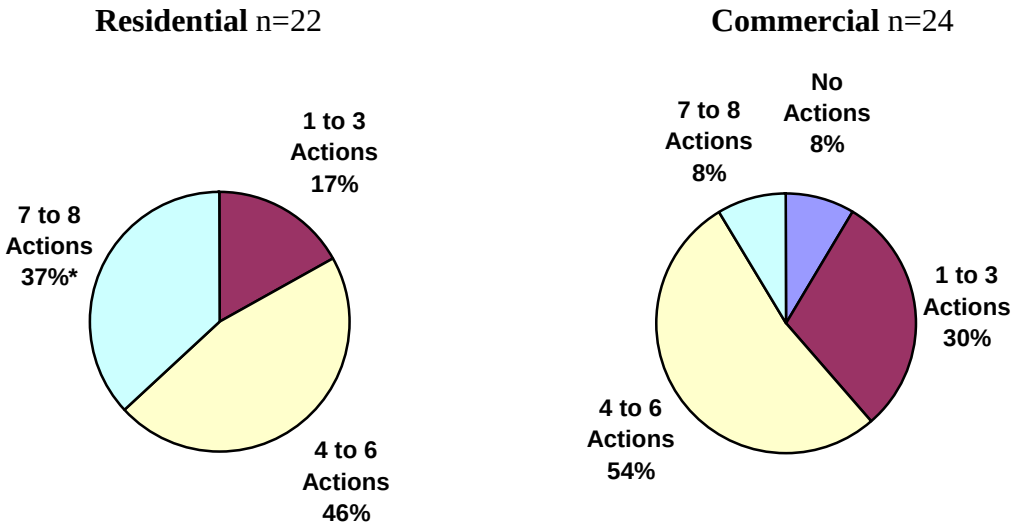
Furthermore, while customers off-handedly state that they have enough information, very few small commercial customers (15 percent) and no residential customers were able to correctly identify their top three electricity users before receiving the newsletter. Most customers knew one or two of the top electricity users (63 percent of residential and 70 percent of commercial customers). Still, over one third of residential customers (37 percent) did not know *any* of the top three electricity users in their homes and 15 percent of commercial customers did not know any of these electricity users in their businesses. These findings indicate that information provided by the newsletter, such as the pie chart that identifies the top energy users in the customers home or business, has value for many customers.

Super Peak Actions Taken By Pilot Customers Prior To Treatment

Prior to the treatments to get a baseline understanding, we asked pilot customers about the number and types of actions that they were taking during the Super Peak Period. Almost all of the customers took some sort of action prior to treatment. Residential customers were significantly more likely than the commercial customers to take as many as seven or eight

actions with 37 percent of residential customers claiming to take this many actions while only eight percent of commercial customers indicated that they took this many actions. Notably, all residential respondents took at least one action prior to treatment.

Figure 23: Number of Actions Taken Prior to Treatment



**A significantly higher percentage of residential customers took 7-8 actions than commercial customers.*

As displayed in Figure 24 below, of the actions we asked about, residential customers were most likely to shift their laundry schedules, turn off lights, and turn off their air conditioners. They were least likely to lower their water heater temperature or laundry temperature. Note, however, that half of the residential customers claim to turn off unnecessary lights all the time as opposed to only during peak hours or not at all. Thus, the CPP-V rate (even before the treatment) appeared to be resulting in both load shifting, and energy conservation measures with the primary actions taken—turning off lights and reducing air conditioning use—energy conservation measures.

Figure 24: Actions Taken Prior to Treatment and When These Actions Occur (Residential)

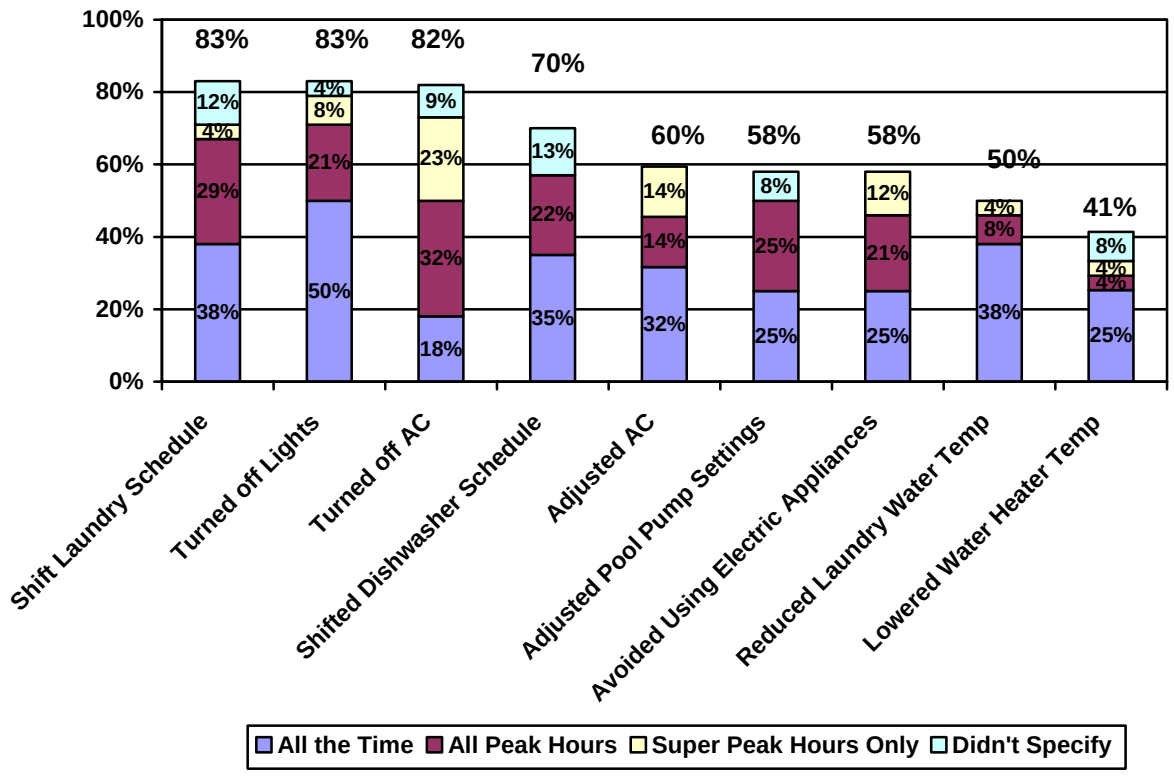
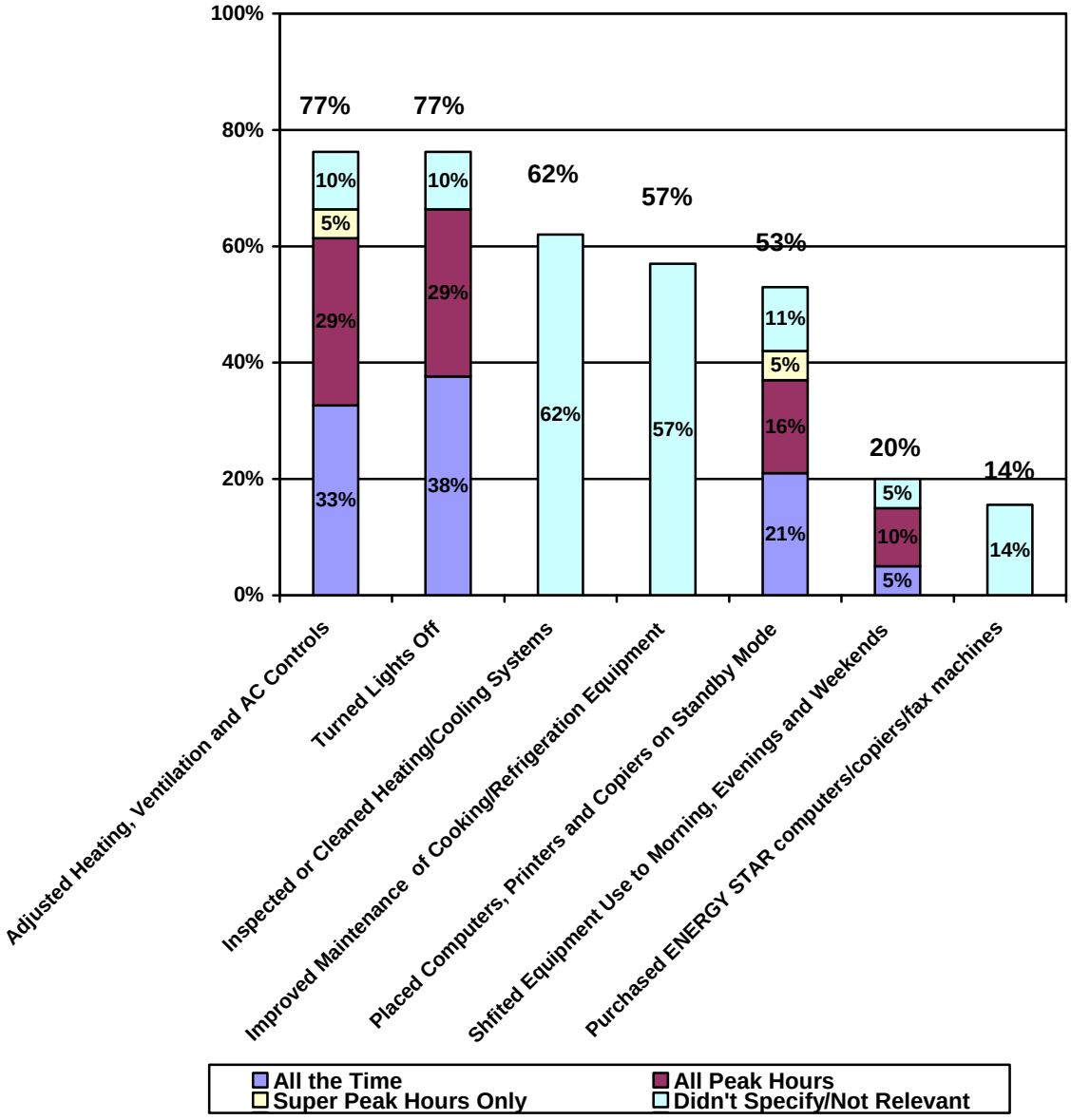


Figure 25 shows that commercial customers were most likely to have adjusted ventilation and air conditioning controls and to have turned off lights prior to treatment. These customers were not likely to purchase ENERGY STAR office equipment or shift equipment usage to morning, evenings and weekends.

Figure 25: Actions Taken Prior to Treatment and When These Actions Occur (Commercial)



Introduction to and Perceptions of the Treatments

Through the IDP enhanced treatments, we provided pilot customers with information that would help increase their responsiveness to the super peak events that they experience on the CPP-V rate (i.e., information treatments). As such, we attempted to provide all pilot customers with an Energy Orb, which displayed the prices as a series of colors: blue for off-peak, green for on-peak, flashing red as a pre-super peak warning four hours in advance of the super peak, and solid red for super peak. The orb was used as a "price notification" device to increase awareness of the super peak events, as well as awareness of daily off- and on-peak times.

In addition to the orb, all customers were sent (either by mail, or both mail and email) a customized newsletter with specific information about what they could do to reduce electricity usage. Pilot customers may also have been made aware of the importance of reducing their electricity use through the in-person installation of the orb. Together, these pieces of information form the information treatments discussed in this section.

Residential Use of the Energy Orb

Of the 32 residential customers in the pilot effort, we completed post-treatment surveys with 23 residential customers. While we were not able to reach all of the treatment customers by phone to discuss their reactions to the information of those that we did reach, nearly 75 percent of residential customers indicated that their orb was still installed and operational, with the majority of these customers indicating that it was leading to energy savings. (Energy Orb usage is summarized in Table 12 below.)

Table 12: Summary of Residential Orb Installation/Use

	Residential Customers (percentage of those we contacted)
Orb leading to changes in behaviors/ energy savings	16* (70%)
Orb installed but not leading to changes in behavior	1 (4%)
Orb no longer installed	6 (26%)
Could not contact	9 (not contacted)

**Note that there was one additional respondent that took action, but no longer had the orb installed at the time of our interview.*

The majority of residential customers stated a strong preference for the Energy Orb. Its presence alone served as a constant reminder to reduce electricity consumption. For example, one residential respondent stated: "I loved it…walked by it and knew to shift my energy use. Didn't have to think".

These residential respondents most frequently mentioned that they kept their orb in the kitchen (47 percent of respondents), with another couple of people indicated that their orb is in a bedroom or the living room.

Of the residential respondents that we spoke with that did not have an orb installed at the time of our interview (five total), three respondents indicated that they never received the orb; and two respondents received the orb but did not use it (one was broken and one customer did not like the orb). The customer that unplugged the orb indicated that: "We are adults and can figure it out when the lights, etc., should be on/off." Note that most of the residential respondents that did not use the orb were not willing to speak about either the orb or the newsletter and the interviews ended when we asked about the orb at the very beginning.

Commercial Use of the Energy Orb

Of the 26 commercial customers with whom we were able to speak, 24 still had their orb installed; with 17 customers actually taking actions because of the orb. (See summary table below.) One commercial customer stated that "It's unique…I'm looking around to see what I can turn off.[27]" Another respondent stated that the orb really made all of the workers more aware of their electricity use. In general, commercial customers tend to place the orb in a prominent location such as on the counter, or on a manager's desk so that energy use is on the mind of all employees as opposed to just keeping the orb in one office.

Table 13: Summary of Commercial Orb Installation/Use

	Commercial Customers* (percentage of those we contacted)
Orb led to changes in behaviors/ energy savings	17 (65%)
Orb installed but not leading to changes in behavior	7 (27%)
Orb no longer installed	2 (8%)
Could not contact	3 (not contacted)

**ODC attempted to interview the utility contact for this pilot program, or the person most knowledgeable about the program. However, some of these respondents that knew about the orb indicated that perhaps someone else would know about the newsletter component.*

Among the commercial customers that still have an orb in their establishment but said it did not change their behavior (7 of 24), a couple indicated that the orbs were blue all of the time, while most said that there is just nothing that they can do to change their electricity usage due to the nature of their business.

Of the two commercial customers where the orb was no longer installed, one customer did not want the orb in his office because he feels that he can not cut down on electricity use (the orb was returned to its box); and the second unplugged it because he did not find it useful and said he needed more warning on super peak days than what was provided by the orb.

For the most part, it appears that most of the small commercial customers in our pilot that are not using the orb to adjust energy usage are not good candidates for the CPP-V rate since they are not able to change their electricity use during peak times regardless of the type of information that is provided.

Interestingly, there were also three respondents that mentioned that the outside of the orb had cracked, although it still changes colors. These respondents still had the orb plugged in.

[27] http://www.ocregister.com/ocr/2004/09/08/sections/business/business/print_231497

Use of the Newsletter

In addition to the orb, customers were also sent a customized newsletter with information on how to reduce usage at their home or establishment. The newsletter seems to have a slightly less awareness at customers' homes and businesses. (See Summary Table 14 below.)

Of our pilot customers, 65 percent of residential customers and 46 percent of small commercial customers interviewed recalled receiving the newsletter. A smaller percentage, however, indicated that the newsletter resulted in changes in their behavior, as shown in Table 14 below.

Table 14: Summary of Newsletter Use

	Residential Customers (percentage of those we contacted)	**Commercial Customers (percentage of those we contacted)**
Newsletter led to changes in behavior	8 (35%)	7 (27%)
Recalled Newsletter but did NOT result in changes in behavior	7 (30%)	5 (19%)
Did NOT Recall Newsletter	8 (35%)	14 (54%)
Did not interview	9 (not contacted)	3 (not contacted)

**ODC attempted to interview the utility contact for this pilot program, or the person most knowledgeable about the program. However, some of these respondents that knew about the orb indicated that perhaps someone else would know about the newsletter component.*

Many of the respondents (both residential and small commercial) who received the newsletter expressed satisfaction with it and found it to be useful. According to one commercial respondent, "I thought I was doing really well and then I got my first report card." There were several others who stated that they did not pay much attention to the newsletter.

One reason why the newsletter may not have been effective in changing behavior is because a large percentage of customers took all of the actions recommended in the newsletter prior to treatment: 42 percent of residential customers took all of the actions while only 11 percent of the commercial customers took all of the actions. (See Table 15 below.)

Table15: Actions Recommended in Newsletter Prior to Treatment

	Residential n=24	**Commercial** n=19
How Many Took Actions Recommended in Newsletter Prior to Treatment?		
All	42%*	11%
Some	50%	42%
None	8%	47%^

**A statistically higher percentage of residential customers than commercial customers took all actions suggested in newsletter prior to treatment.*

^A statistically higher percentage of commercial customers than residential customers took no actions suggested in newsletter prior to treatment.

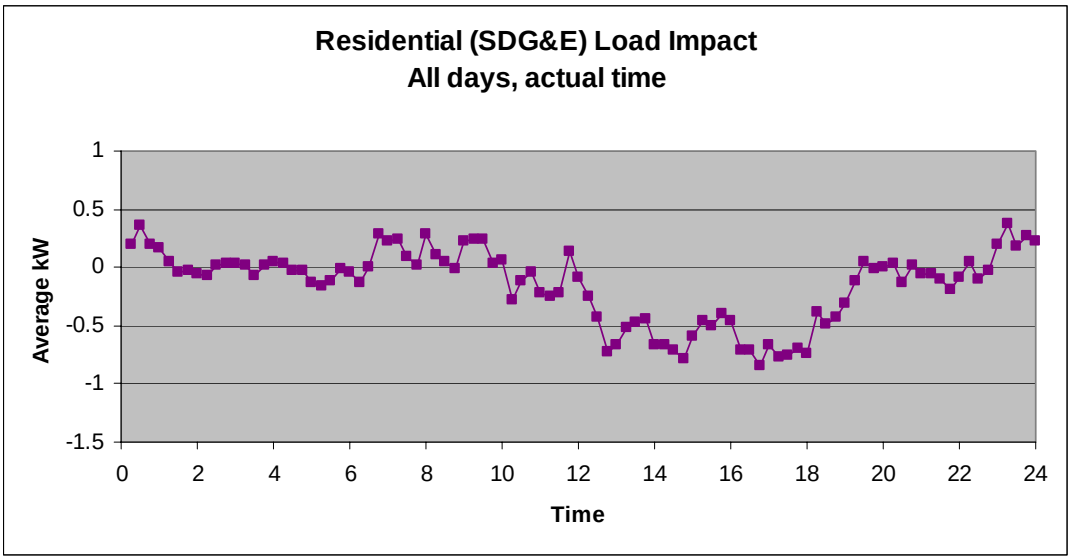
Impacts of Treatment on Residential Customers

Through the load impact analysis approach presented in the methodology section of this report, it appears that the IDP information treatments increases the average level of energy savings among residential customers, over and above the CPP-V rate. While not all customers indicated that they are using the orb and newsletter, in the aggregate, our results show greater reductions among the IDP pilot group than among the control group of other CPP-V customers.

Overall Residential Findings

In the aggregate, the enhanced information and display treatments reduced electricity usage over the standard CPP-V treatments in the SPP. Note that these results include all residential customers (both those that are using the treatments and those that are not). Figure 26 shows the load impact estimate, in kW, for the residential customers in San Diego Gas & Electric's service territory on CPP days.[28] (Note that this figure shows the impact averaged across all CPP days.) Overall, the information treatments appear to be having an effect on these super peak event days, as shown by the dip below the zero point, which corresponds with the usual super peak times.[29]

Figure 26: Treatment Effects for Residential Customers, Averaged Across All CPP Days



The reduction in usage for this group is consistent with findings from interviews with these customers. Although there were some customers that stated that they did not use the orb or

[28] All load data are on a 15-minute interval basis, which picks up more interval-to-interval variation than hourly data. Throughout this section, we use the term "load savings" to mean treatment effect. A negative effect implies the treatment is reducing the load.

[29] There was not a perfect match between the SDG&E CPP-V events and the signal to the thermostats for the residential customers on some of the event days. This does not seriously affect our impact analysis, since the treatment and control customers received the same signals in all cases. The orb event start and end times were all correct, for both treatment and control customers.

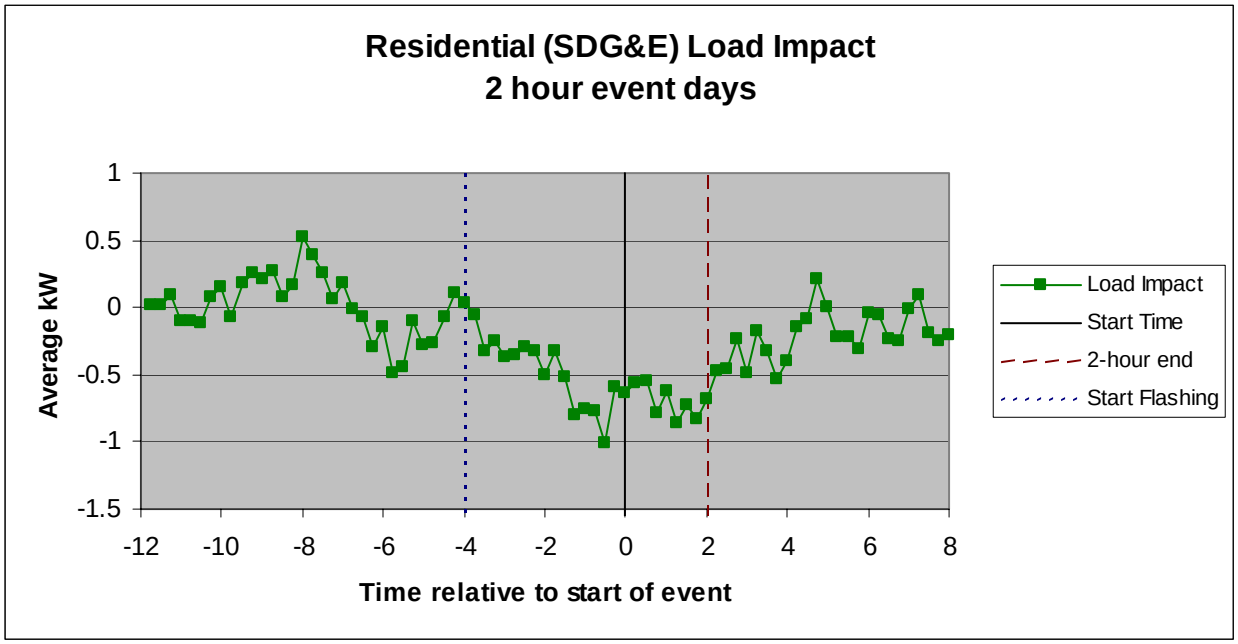
newsletter, many customers did take actions to reduce their electrical usage. In total, 19 of 23 residential respondents took actions as a result of the orb or newsletter, with customers indicating that the orb had a bigger effect than the newsletter.

Of the residential respondents who stated that they shifted or reduced electricity use as a result of the treatments, seven stated that *both* the orb and newsletter had an effect, 11 respondents said that the orb led them to changes, and one stated that the newsletter was the sole reason for their actions. Residential customers most frequently mentioned that they shifted or reduced washer/dryer use, turned down their air conditioners, and/or turned off some lights. Notably, unlike shifting washer/dryer use, the two other measures that residential customers most frequently took (i.e., turning down air conditioning and turning off lights) were short-term energy conservation measures rather than load shifting measures. (Note that a breakdown of actions taken, and when these actions were taken, is shown in Table 16 below.)

Hourly and Daily Insights

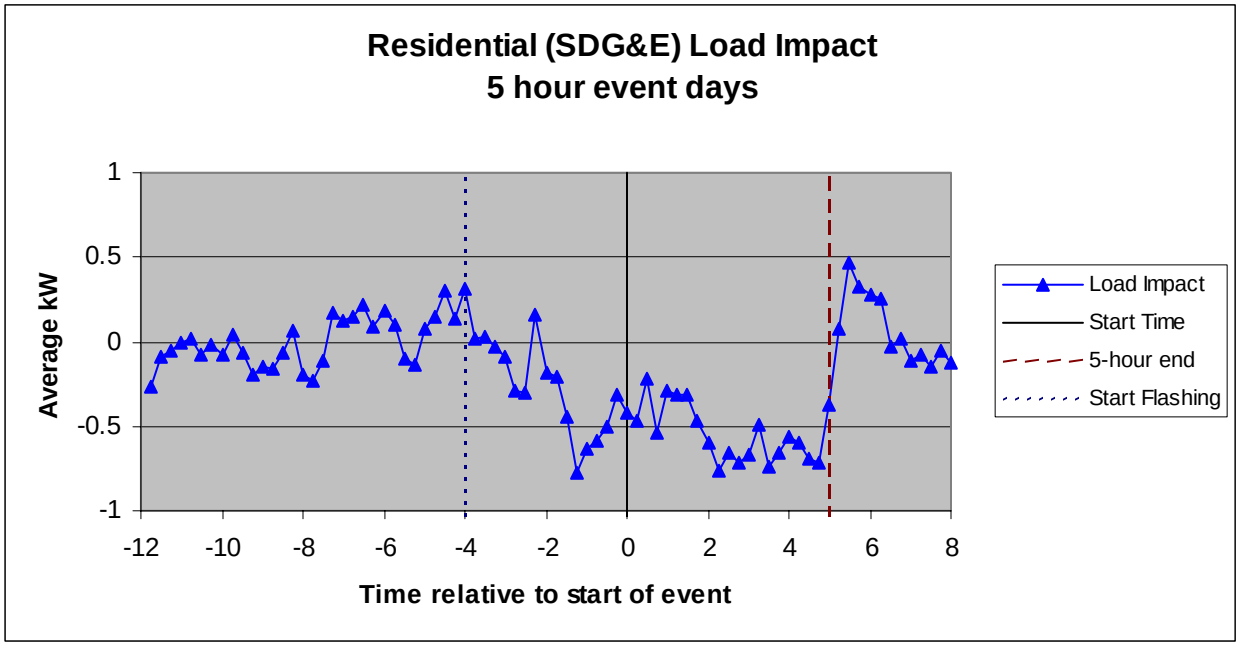
While Figure 26 above shows the aggregate savings over all super peak events, these super peaks were not all identical but rather occurred in periods of either 2 or 5 hours. There were a total of 12 CPP days, with six 5-hour days and six 2-hour days.[30] To further explore the differences in super peak start and stop times, we analyzed the 2-hour CPP event days separately from the 5-hour CPP event days. Figures 27a and 27b show the residential savings on a relative time basis for both 2-hour and 5-hour CPP event days.

Figure 27a: Treatment Effects for Residential Customers, 2-hour CPP Event Days



[30] Because the orbs were installed at different times, some customers experienced only one or two CPP days with a given length in the post-treatment period (with the remaining events occurring prior to the treatment). This makes the resulting load shapes and savings estimate a little more variable across the time periods.

Figure 27b: Treatment Effects for Residential Customers, 5-hour CPP Event Days



As shown in the figures above, the load savings for these residential customers persist throughout the super peak period, both for the 2-hour event days and the 5-hour event days.

Notably, Figures 27a and 27b also clearly show load reductions BEFORE the super peak period, and the minus 4-hour mark. During that time, the flashing red warning on the orb resulted in significant savings during what was intended to be the warning period. There was almost as much load saved per hour during the warning period as there was during the super peak period. This reinforces comments made by participants, such as "I see the orb flashing, and I run around and turn everything off," as discussed below.

When we asked respondents about the timing of their actions and whether it was in response to a particular color change in the orb, we found that residential customers took many of their electricity savings actions on a daily basis (during the daily peak times) rather than just in response to the critical or super peaks. More than half of the actions mentioned by respondents were taken when the orb changed color from blue to green. While these savings are not shown in the figures, it is important to note that the pilot most likely resulted in savings on a daily basis in addition to the savings during super peak events.

Residential customers, however, also took a large number of actions in response to the 4-hour warning in advance of the super peak, which agrees with the findings shown in Figures 27a and 27b. According to the respondents with whom we spoke, one quarter of all actions were taken when the orb was changing from blue/green to pulsing red (i.e., the beginning of the warning period). An additional eight percent of the actions were taken when the orb was changing from pulsing red to solid red. (See Table 16.)

Table 16: Color of Orb When Residential Respondents Action (multiple response)

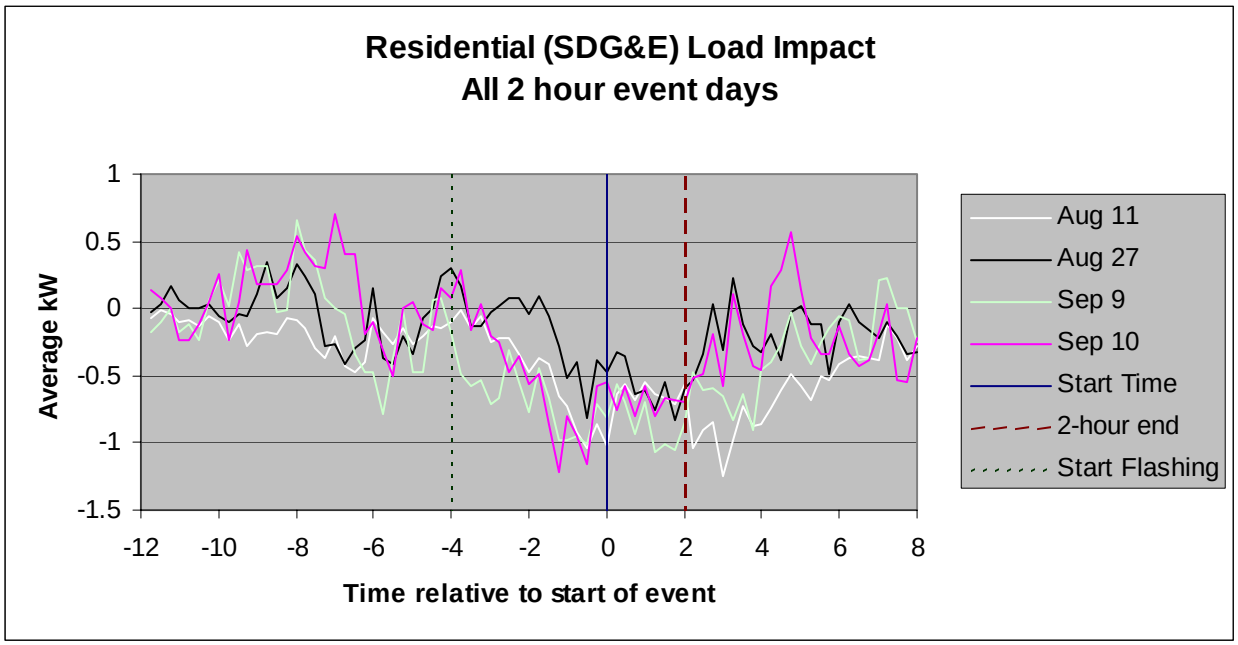
		Color of Orb when Action is Taken			
Actions Taken	Number of **Residential Customers** that took action	Number of Respondents that take action when: **Blue to Green**	Number of Respondents that take action when: **Blue/Green to Pulsing Red**	Number of Respondents that take action when: **Pulsing Red to Solid Red**	Number of Respondents that take action when: **Other/DK**
Shifted washer/dryer machine usage	11	8	1	1	1
Shifted or Reduced AC Use	7	4	2	0	1
Reduced or turned off lights	6	2	3	0	1
Shifted Dishwasher Use	3	2	0	1	0
Shifted Pump Use	3	2	0	0	1
Turned off Appliances	3	0	1	1	1
Shifted Jacuzzi Use	1	0	1	0	0
Shifted Cooking Time	1	1	0	0	0
Shifted TV Use time	1	0	1	0	0
Reduced Fan Usage	1	0	0	0	1
TOTAL	37	19	9	3	6
Total as Percents	**100%**	**52%**	**24%**	**8%**	**16%**

We also looked at the load impact on individual CPP days during the IDP treatment period. Residential customers experienced a maximum of eight super peak events during the IDP treatment period (four 2-hour events and four 5-hour events). The residential treatment effect for each of these days is summarized in Figures 28a and 28b. Individual day graphs are including as an appendix. Note that all customers were in the treatment period for September 8, 9, and 10, and all but one were in the treatment period for August 31. However, only three customers had orbs installed for the August 9, 10, and 11 event days, so these three earlier event days are estimated based on *very* few treatment customers. In fact, the first two days for the residential customers has almost the same load, which is due to the small number of customers for which these days were treatment days (only three customers). For the remainder of the customers, these days are part of the IDP pre-treatment period. As is the case throughout the load impact analysis, the customer-specific treatment period varies based on when the customers had orbs installed in their homes.

For the most part, the shape of the treatment effect across the event days is fairly consistent – there are no obvious anomalies. There is also no evidence of a "day of week" effect, since the shape and magnitude do not seem to depend on the day of the week that the events occur. But with only eight Super Peak event days in the IDP treatment period, there could be a subtle effect that would show up in a larger sample of days.

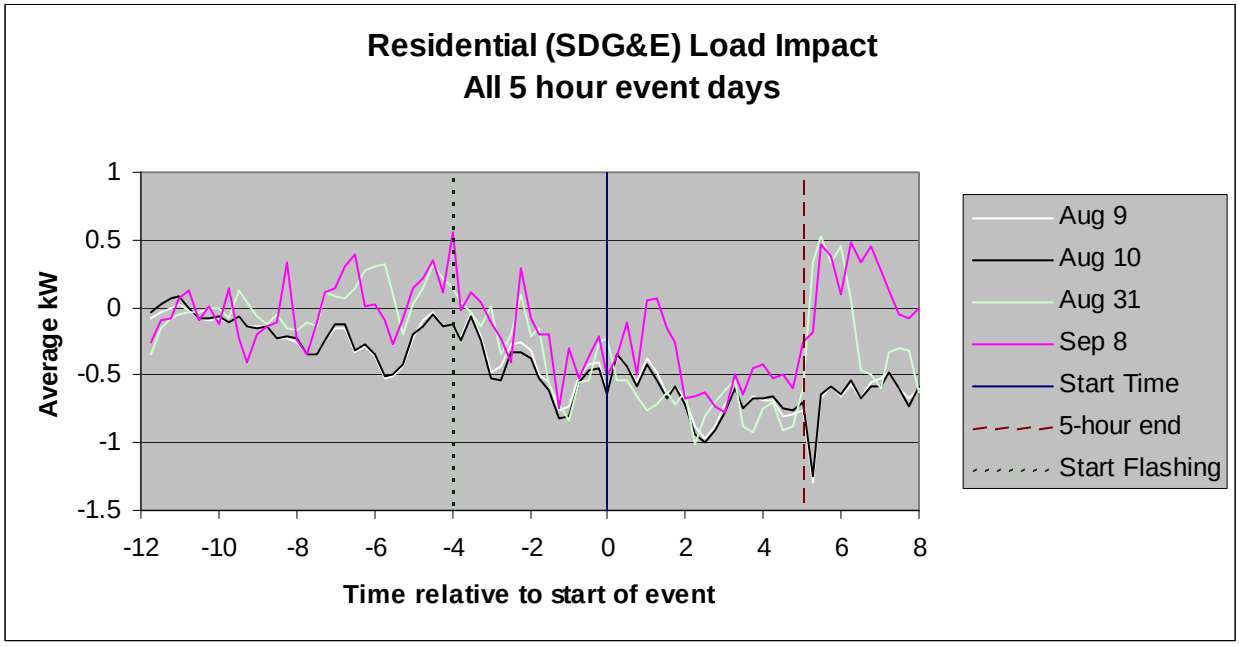
It is evident on a few of the days, particularly Aug 11 and Sep 10, that the savings peak at the end of the "flashing" period – the savings during the actual 2-hour event – is less than the savings just before the event begins. This is further evidence of the level of customer activity in response to the flashing orb. (See the appendices for more details.)

Figure 28a: Individual Day Analysis for Residential Customers, All 2-hour And All 5-hour Event Days



As shown in Figures 27b and 28b, the 5-hour event days also show a "bounceback" effect, particularly on August 31 and September 8, with a load increase for a little over an hour after then end of the event. This seems to indicate some load shifting (as opposed to simple conservation) by residential customers on these days. As shown in Figures 27a and 28a, the 2-hour event days do not show any bounceback effect, just a slow steady rise in load.

Figure 28b: Individual Day Analysis for Residential Customers, All 2-hour And All 5-hour Event Days



Overall, it appears that residential customers are responding to the signal – the only ambiguity appears to be in the meaning of the signal, specifically the warning signal. The average kW reduction per hour during both the warning period and the super peak period are shown in Table 17 below.

Table 17: Average residential kW/hour load savings across time periods

	Warning Period-Avg kW/hr	Super Peak Period-Avg kW/hr
2 hour event days	0.49	0.70
5 hour event days	0.29	0.54

Significance Analysis

With such a small sample of customers, we knew that it would be difficult to find a statistically significant treatment effect. Knowing this, we did calculate standard errors and confidence intervals for the treatment effect on a relative time basis. In order to calculate the variances necessary for this analysis, we had to make some simplifying assumptions. We assumed that within each cell, the load during a given hour was normally distributed across all customers in that cell. This is a common assumption, and is probably reasonable given the large number of factors that drive energy use. Because we had some cells with only one treatment customer in them, we had to make an additional assumption that the variance of the treatment customers in a cell and the variance of the control customers in the same cell, for a given hour, were the same. We estimated this common variance by "pooling" the two estimates, where possible, or by simply using the variance of the control customers' loads, when there was only one treatment customer in a cell. Given these basic assumptions, we could calculate the variance of the

differences, which were also normally distributed, since they were linear combinations of normally distributed estimates.

We made one more simplifying assumption, which was to treat the event days as fixed, and ignore the variation between days, to focus on the variation between customers. Because of the complexity of the variable start dates, the different customers had different days in the pre-treatment and post-treatment periods. By treating these days as fixed, we are making conclusions about the particular event days that happened in 2004. We are not recognizing the variability across days in this interpretation. This choice does not affect the significance result – including this variability would increase the standard errors, so would not change the fact that the load impacts are not statistically significantly different from zero (see below).

Given these basic assumptions, we could calculate the variance of the differences, which were also normally distributed, since they were linear combinations of normally distributed estimates.

As expected, none of the savings were statistically different from zero. We believe that by stratifying the data based on the SPP Cells, we have reduced the variance as much as possible for this sample, but the number of customers is still too small. Using the estimated standard error, we calculated 90 percent confidence intervals for the load impact estimates for both the 2-hour and the 5-hour event days. Figures 29a and 29b show the load impact and the 90 percent confidence intervals for the various event days.

Figure 29a: Treatment Effects with 90% Confidence Intervals.

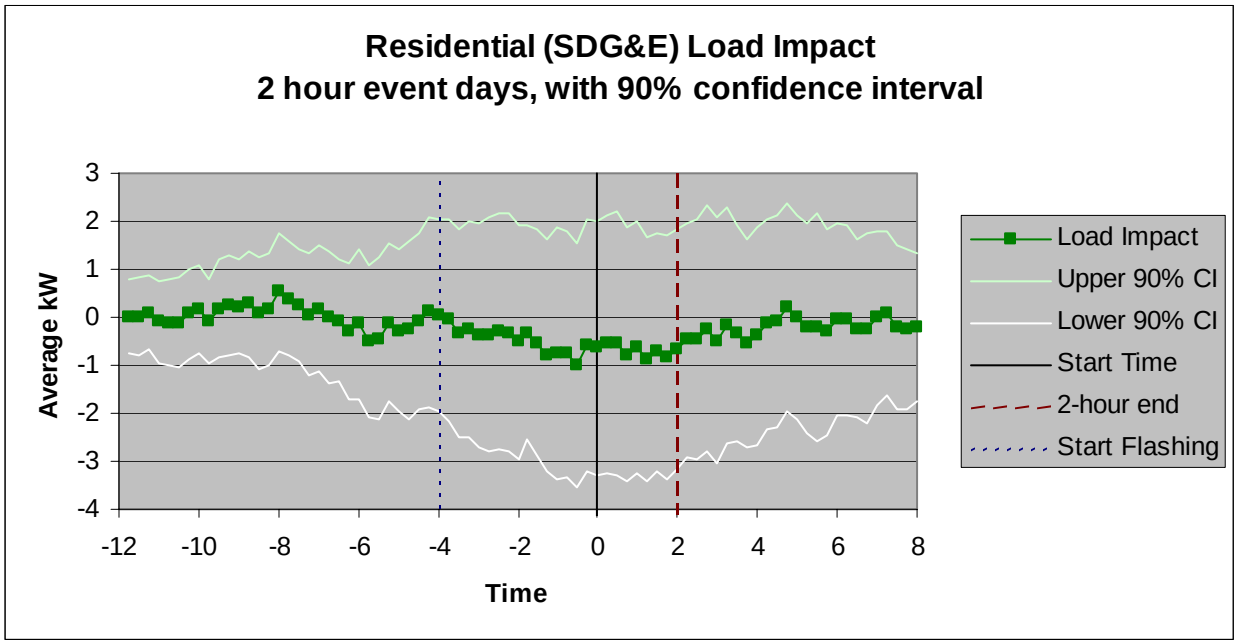
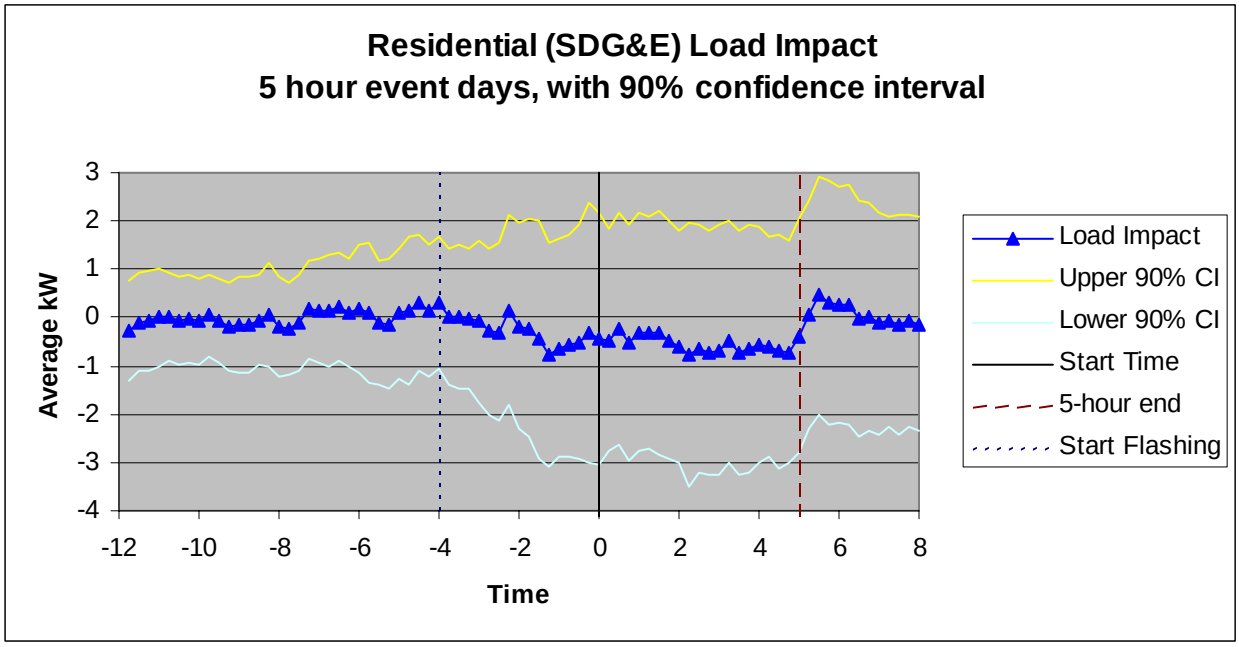


Figure 29b: Treatment Effects with 90% Confidence Intervals.



It is important to note here that this sample includes some customers who are using the orbs and the newsletter information, and some who are not. Customers who are using the information may be responding more consistently, and might even show a significant load savings if the sample excluded those not using the information treatments. Of course, in this study, this would also further reduce the sample, making achieving statistical significance even more difficult.

Impacts of Treatment on Commercial Customers

For commercial customers that used the orb, they report that it was a good way to receive notification of a price change. We asked respondents how effective the notification process was in giving advance notice of a super peak day almost all respondents that answered this question said that they were usually or always aware of the super peak day before it happened. (Thirteen customers said they were always aware of the super peak days and three were usually aware. One customer was only sometimes aware.) Not all commercial customers, however, made changes as a result of the orb.

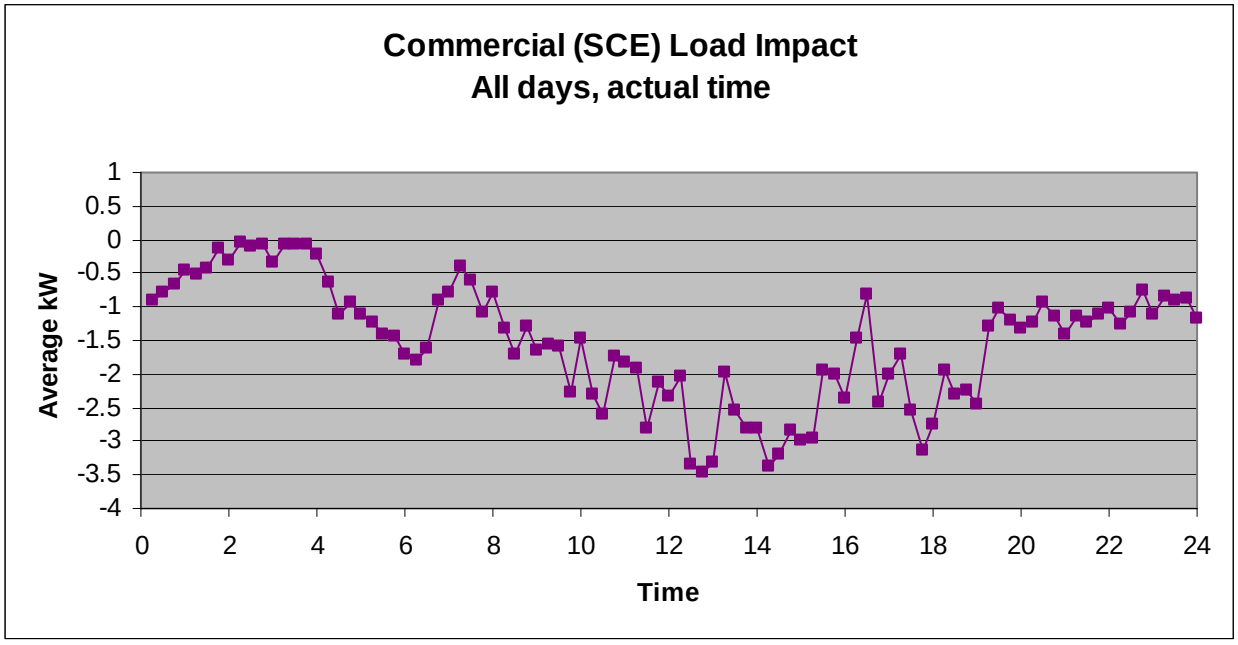
Overall Commercial Findings

Seventeen small commercial customers (of the 26 that we spoke with) indicated the treatments were useful in helping to shift or reduce electricity usage. Like residential customers, small commercial customers also indicated that the orb had a bigger effect than the newsletter. Of the residential respondents who stated that they shifted or reduced electricity use as a result of the treatments, seven stated that *both* the orb and newsletter had an effect, and 10 respondents said that it was primarily the orb that led them to make changes. By far, turning off some lights and reducing air conditioner usage (short-term energy conservation measures rather than load shifting measures) were the primary ways in which these commercial customers reduced their

electricity consumption. (Note that the actions taken be these customers are shown in Table 18 below.)

Figure 30 shows the load impact estimate, in kW, for the commercial customers in Southern California Edison's service territory across all CPP days. Like Figure 26, this figure also represents the average across all CPP days, including days with different start and stop times. While there appears to be some load impact effect in this graph during the Super Peak period, there is also apparently some sort of systematic difference between the CPP-V control group and the IDP treatment group, resulting in a negative difference throughout almost the entire day.

Figure 30: Treatment Effects for Commercial Customers, Averaged Across All CPP Days



Hourly and Daily Insights

When we asked small commercial customers when they took their actions, many could not recall what prompted them to reduce usage. Of those who could recall when they took actions, the responses indicated that an equal number of actions were taken in response to the warning period as in response to the super peak: 27 percent of respondents took an action when the orb was going from blue/green to pulsing red and another 27 percent took an action when the orb was changing from pulsing red to solid red. Note that this does not necessarily correspond to equal energy savings in both periods since some actions save more energy than others.

Table 18: Color of Orb When Commercial Respondents Action (multiple response)

		Color of Orb when Action is Taken			
Actions Taken	Number of **Actions Taken** by **Commercial Customers**	Number of Respondents that take action when: **Blue to Green**	Number of Respondents that take action when: **Blue/Green to Pulsing Red**	Number of Respondents that take action when: **Pulsing Red to Solid Red**	Number of Respondents that take action when: **Other/DK**
Reduced or turned off lights	11	1	3	2	5
Shifted or Reduced AC Use	10	0	4	3	3
Turned off Computers	2	0	0	0	2
Closed Doors	1	0	0	1	0
Turned off Appliances	1	0	0	0	1
Reduced Fan Usage	1	0	0	1	0
TOTAL	26	1	7	7	11
Total as Percents	**100%**	**4%**	**27%**	**27%**	**42%**

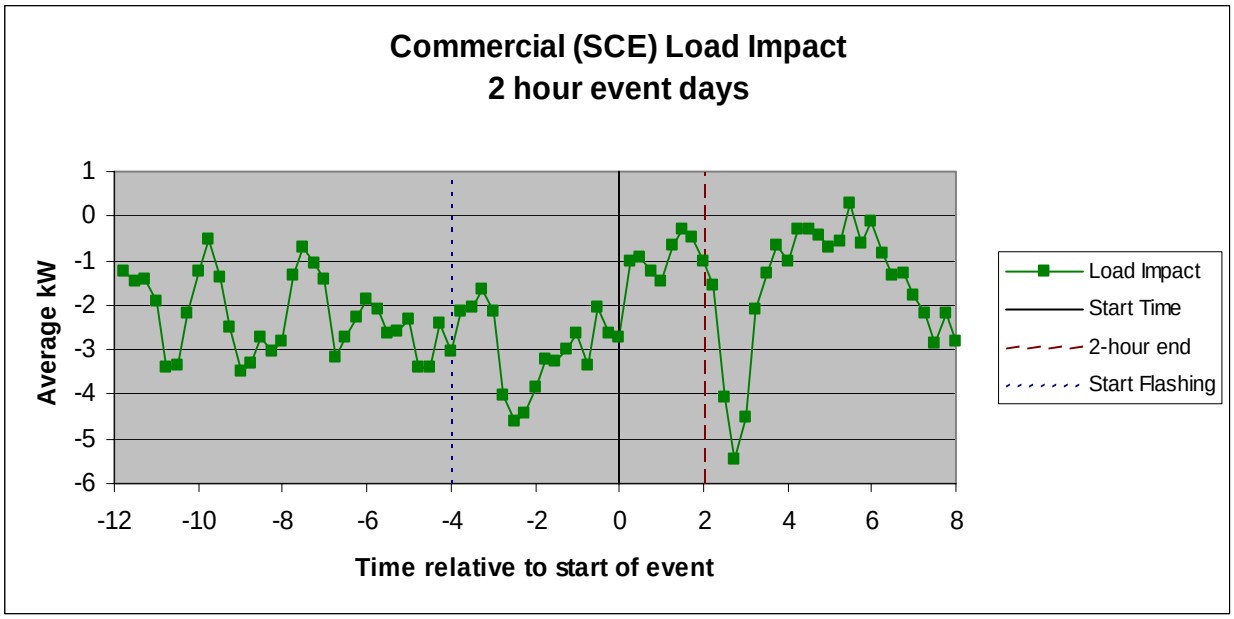
While Figure 30 above shows the aggregate savings over all super peak events, these super peaks were not all identical but rather occurred in periods of either 2 or 5 hours. There were a total of 12 CPP days, with six 5-hour days and six 2-hour days.[31] To further explore the differences in super peak start and stop times, we analyzed the 2-hour CPP event days separately from the 5-hour CPP event days. Figures 31a and 31b show the commercial savings on a relative time basis for both 2-hour and 5-hour CPP event days.

In examining the hourly load savings, the results do not show an obvious effect for commercial customers as we saw for the residential customers during the Super Peak Period. The commercial customers across the SCE territory are by no means as homogeneous as the residential customers at SDG&E, and these differences within the commercial sector (as well as the small sample size) could account for the irregularity of the impacts across the different event types.

The 2-hour graph is somewhat difficult to interpret. It appears that there may be some savings during the warning period, though not a lot when compared with the rest of the day. But those savings disappear during the actual event period. Some of this may be due to the small sample size and the relatively small number of days of each type. Another potential cause is the timing of the 2-hour events and the usual business operating hours.

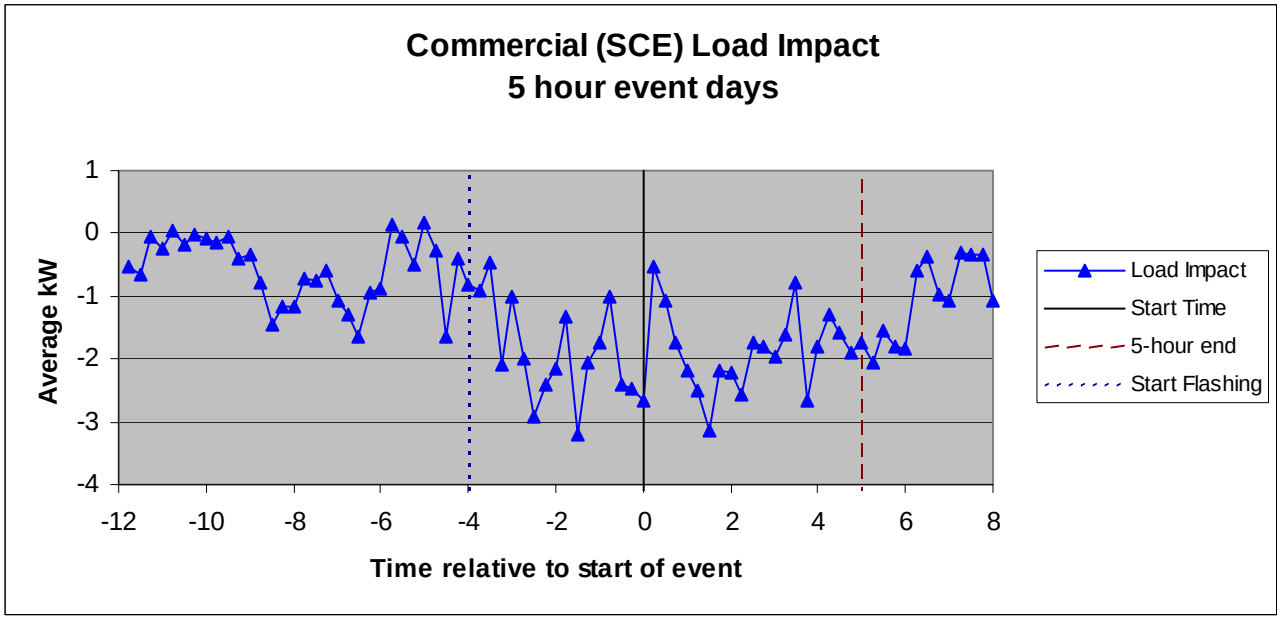
[31] Because the orbs were installed at different times, some customers experienced only one or two CPP days with a given length in the post-treatment period (with the remaining events occurring prior to the treatment). This makes the resulting load shapes and savings estimate a little more variable across the time periods.

Figure 31a: Treatment Effects for Commercial Customers, 2-hour CPP Event Days



The first two 2-hour events started at 3:00 pm for the commercial customers. These two occurred prior to the treatment period. The remaining four 2-hour events started at 4:00 pm. All four, or at least three of these, were in the post-treatment period for all of the customers. Because these time periods cover the end of a "normal business day," the drop off in load normally seen at the end of the day may be convoluting the effect of the event. This difference may also be contributing to the surprising and dramatic savings during the hour following the 2-hour event.

Figure 31b: Treatment Effects for Commercial Customers, 5-hour CPP Event Days



Because the 5-hour events covers much more of the business day, and all start at 1:00 pm, this situation would not effect the 5-hour event days very much at all. Though still highly variable, the 5-hour event days could be interpreted as showing some savings during the warning and event periods relative to the rest of the day.

In addition to our hourly analysis, we also looked at the individual days during the treatment period. There were eight days that were in the treatment period for some or all of the commercial customers in the pilot. The commercial treatment effect for each of these days is summarized in Figures 32a and 32b. Individual day graphs are including as an appendix.

Note that all commercial customers were in the treatment period for August 31 and September 8, 9, and 10. However, only 13 customers had orbs installed for the August 9, 10, and 11 event days. So these three earlier event days are estimated based on fewer treatment customers than the later event days. For the remaining 16 of the commercial customers, these days are part of the pre-treatment period. As is the case throughout the load impact analysis, the treatment period varies based on when the customers had orbs installed in their homes.

Figure 32a: Individual Day Analysis for Commercial Customers
All 2-hour Event Days

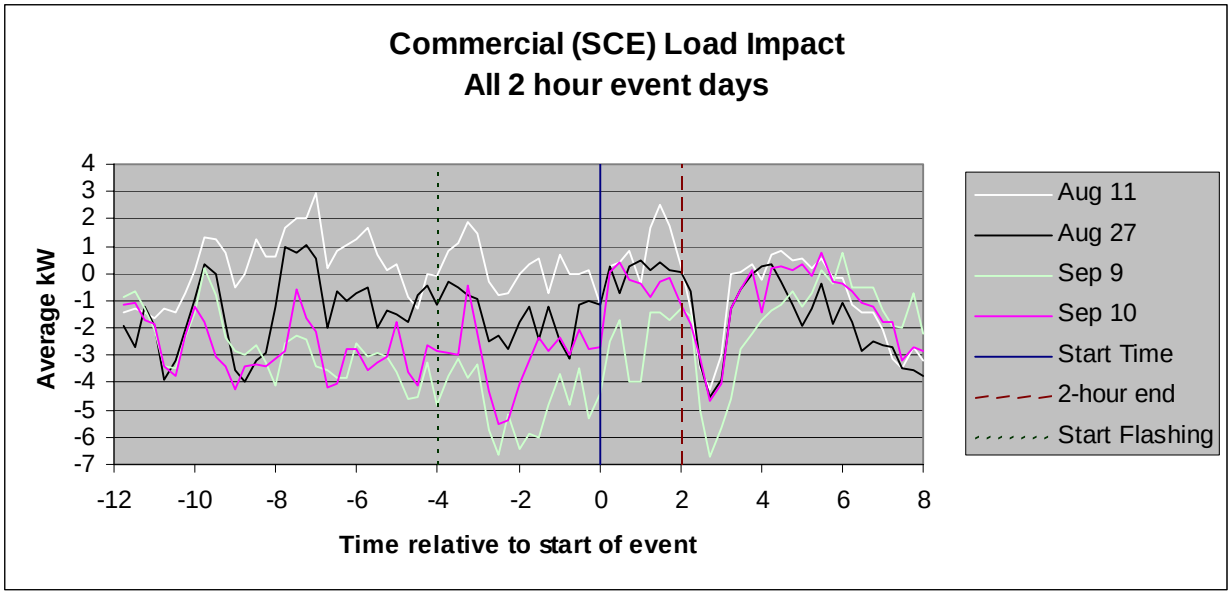
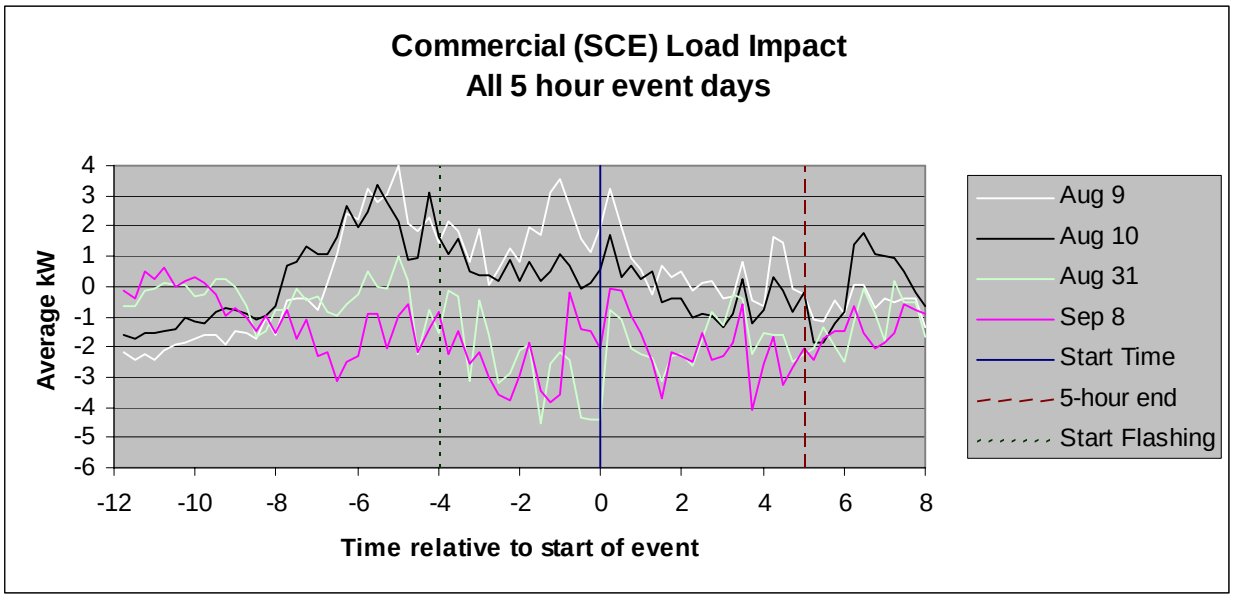


Figure 32b: Individual Day Analysis for Commercial Customers
All 5-hour Event Days



There is more variability in the treatment effect across the days for the commercial customers than for the residential customers. Among the 5-hour event days, August 9 and August 10 appear to show a general downward trend during the time of the event, possibly in reaction to the orb information. The other two 5-hour event days, August 31 and September 8, don't show the same trend. There is some evidence in these two days of a decrease during the flashing period, but that disappears during the actual event period. (See appendices for individual daily graphs.)

As with the residential, the warning periods show a savings comparable to (or in this case, greater than) the savings in the super peak period. Table 19 shows the average kW load savings per hour across the periods for the two different event day durations. Note that while these seem like actual savings, they are comparable to the negative load impact for the remainder of the day. The average load impact during non-event, non-warning hours was –1.98 kW/hr for the two-hour event days, and –0.70 kW/hr for five-hour event days.

Table 19: Average commercial kW/hour load savings across time periods

	Warning Period-Avg kW/hr	Super Peak Period-Avg kW/hr
2 hour event days	2.98	0.89
5 hour event days	1.92	1.85

Caution should be observed in using these results, particularly the results for the two-hour event days given the small sample sizes. Further investigation may identify the reasons for these counterintuitive results, particularly for the 2-hour event days. However, larger sample sizes may be the only way to gain more conclusive results in the future.

Significance Analysis

Similar to our residential findings, none of the commercial savings were statistically different from zero. We believe that by stratifying the data based on the SPP Cells, we have reduced the variance as much as possible for this sample, but the number of customers is still too small, and the variability among customers is too large. Using the estimated standard error, we calculated 90% confidence intervals for the load impact estimates for both the 2-hour and the 5-hour event days.

For the commercial customers, the standard errors (and as a result, the confidence intervals) were orders of magnitude larger than the load impact. For instance, the load impact for the first interval of the actual event was about –1.03 kW for the 2-hour event days and about –0.54 kW for the 5-hour event days. The 90% confidence intervals for these two values were +/- 42.57 kW and +/- 45.45 kW, respectively. Including a graph showing the confidence intervals, as we did for the residential customers, would be meaningless because of the magnitude of the standard errors.

Summary of Actions Taken

In summary, the deployment of the IDP treatments does increase the average level of energy savings. Nineteen residential respondents (83% of those that we spoke to) and 17 commercial customers (65% of those that we spoke to) indicated that they did change behavior as a result of the treatments.

In general, these customers took a number of actions (as shown in Table 20) resulting in significant savings over the IDP control group.

Table 20: Number of Actions Respondents Took in Response to Treatments

	Residential Respondents	Commercial Respondents
Took 1 Action	5 (22%)	4 (15%)
Took 2 Actions	5 (22%)	6 (23%)
Took 3 Actions	6 (26%)	4(15%)
More than 3 Actions	2 (9%)	1 (4%)
Took actions, unspecified	1 (4%)	2 (8%)
No actions taken	4 (17%)	9 (35%)
Total # of Respondents	23 (100%)	26 (100%)

Two thirds of residential respondents that took actions indicated that their homes took “a lot of steps” to better manage electricity use while one third of respondents indicated that their homes did “everything they could do” to manage electricity usage. After receiving the enhanced information treatment, the majority of these residential respondents stated that if the program were to end tomorrow, they would continue to manage their electricity in the same way as they have been.

More than half of the commercial respondents indicated that their business did the most it could possibly do to manage electricity use while the remaining 40 percent indicated that their business

"did a lot" to better manage its usage. Eight out of 11 commercial respondents indicated that if the program were to end, they would continue to manage their electricity use the same way. Two commercial customers indicated that they would stop taking the energy savings measures they have been taking while one respondent said he would stop some measures but continue other measures.

Part 2: The Need For, and Value of, Information among Pilot Customers

Part 2 of the Pilot Effort Findings provides an overview of the need for, and the value of information above and beyond what is currently provided on customers' bills and through current utility educational efforts. This section integrates findings from both a pre-treatment survey and a post-treatment survey of the pilot customers.

In addition to determining the effects of timely feedback on energy savings, we also spoke with our pilot customers about their insights on the orb and newsletter and their perceptions of the types of information they need and want. Again, this information allowed us to answer the research question:

> *What kinds of information do IDP participants need/want to respond more easily and effectively, within the context of the SPP?*

Behavior modification in response to the rate is based on the feedback that these customers receive. As such, we felt that it was important to assess customers' understanding of the rate and their electricity usage prior to receiving the treatment, and then ask them about what types of information they would like to receive in the future.

Note that as described in our methodology, we completed 46 pre-treatment surveys (24 with residential customers and 22 with commercial customers) and 49 post-treatment surveys (23 with residential customers and 26 with commercial customers). Not all pilot customers, therefore, completed the surveys. Furthermore, questions about customer perceptions of the treatments were only asked of customers that were both willing and able to answer our questions (i.e., they had to be familiar enough with the treatment to provide feedback). The general sample sizes for this section, therefore, are shown in Table 21.

In general, we interviewed the customer contact for the program given to us by the utility, or the next best contact that was knowledgeable about the program and the information treatments.

Table 21: Customers that Provided Responses To Most Survey Questions (Including Questions on the Perceptions of the ORB and Newsletter)

	Residential	**Commercial**
	PRE-TREATMENT	
*Answered Most Pre-Treatment Questions**	24	22
	POST-TREATMENT	
Provided perceptions of ORB	19	17
Provided perceptions of Newsletter	14	10

*Note, however, that the methodology and survey instrument were changed mid-course so not all customers received all questions.

Due to the nature of the interviews, these interviews were adapted to the ability of (and time available for) the respondent to answer our questions. As such, sample sizes on the questions in this section vary dramatically and are often much lower than as shown in Table 21. For the most part, this section discusses the perceptions of those that are using the information and generally pleased with both the rate and the program.

Perceptions of the Newsletter

While the effects of the newsletter were limited by the fact that not all customers recalled receiving it, customers that could recall receiving it generally felt that it had value. The vast majority of residential respondents (12 of 14) and all small commercial respondents (10 of 10) that could recall the newsletter indicated that they would like to continue to receive the newsletter.

Residential respondents indicated that the newsletter helped them to better understand their electricity usage and nearly two-thirds of these customers indicated that the newsletter even helped them to shift usage. Interestingly, respondents who shifted or reduced their electricity use were most likely to take actions that would reduce their electricity use all of the time; however there were some residential respondents that mentioned that the actions that they took as a result of the newsletter reduced their electricity consumption during peak times.

On the commercial side, all but one of the respondents who answered our questions indicated that the newsletter had helped them to understand electricity usage and half of the commercial respondents indicated that the newsletter helped them to shift or reduce usage. Most of the respondents indicated that the newsletter helped them adjust their usage all the time while one respondent indicated that the newsletter helped him reduce usage specifically during super peak times.

Generally, both residential and small commercial customers felt that the pie chart was one of the most valuable pieces of information in the newsletter. Most respondents also found the energy saving tips to be useful, followed by the report card.[32]

It is clear that at this point in time, the hard copy newsletter is more useful than the email version. All of the customers that answered our questions about the newsletter looked at the hard copy mailed to them, although one of the residential customers looked at the email version as well. In general, it is very difficult to get customers to share their email addresses. For example, even after repeatedly asking residential customers for an email address, we were only able to get an email address for less than one-third of residential customers and many of these customers indicated that they did not check email regularly.[33] Moreover, even though we provided customers with a web link on the hard copy of the newsletter, only one residential respondent

[32] This is based both on recollection of the information, and the customer's rating of the usefulness of this information. Not all customers were able to recall the information.
[33] We did, however, attempt to send the newsletter to all email addresses that we could get.

and one commercial respondent visited the website—another indication that the internet/email is not the best option to reach this group of customers at this time. This finding reflects comments about price notification by email as well, in which residential customers and commercial customers were both twice as likely to indicate that they would rather receive notification of price changes by telephone as opposed to email.

When we asked customers how they would like to receive this type of customized information in the future, three residential customers and one commercial customer said that they wanted the newsletter by email only with the rest saying either by mail or mail and email.[34] Again, since e-mail addresses are difficult to obtain, hard copy newsletters appear to be the most viable option at this point.

While customers do appreciate the newsletter and find value in it, they only need to see it once a month at the most—and perhaps only quarterly for commercial customers. About half of the residential respondents said that they would like to receive this newsletter monthly while slightly fewer than half of residential customers indicated that they would like to see it quarterly. On the commercial side, most respondents indicated that they would prefer to receive this type of information on a quarterly basis.

Finally, overall, neither residential nor commercial customers expressed a willingness to pay for the newsletter. They provided feedback that paying for this would defeat the purpose of trying to actually save money on the electricity bill.

Perceptions of Price Notification Options and the Energy Orb

In addition to knowing what to do, an extremely important part of this variable time rate is that customers need to be aware of when to take actions. For all CPP-V customers, notification of the super peak times occurs via a telephone call and/or email or a fax the day of the event. As described earlier, however, pilot customers were provided with an Energy Orb that offered a visual signal of the price change in addition to a telephone call. The orb was blue during off peaks, green during daily peaks, and solid red during super peak times (which occur a maximum of 12 times a year and last for either two or five hours). Note that the orb flashed red four hours in advance of a super peak time as a warning to customers.

After using the orb, pilot customers were asked how they would prefer to be informed of changing electricity prices and super peak events in the future. Respondents were allowed to indicate more than one form of notification. The orb was the overwhelming preference of method notification, with some of these respondents also asking for both orb and telephone notification. Only one residential respondent and one commercial respondent mentioned email.[35]

In general, the orb appears to have done a good job of notifying customers of super peak days, although it was not effective for all customers. We asked respondents how effective the

[34] Note that 14 residential customers and 10 commercial customers answered these questions about the newsletter as shown in Table 8.

[35] Note that there were two commercial customers without orbs in their businesses and these customers preferred to be notified by telephone.

notification process was in giving advance notice of a super peak days and approximately two thirds of residential respondents said that they were usually or always aware of the super peak day before it happened. Of the remaining residential respondents, three customers were only sometimes aware and three did not know. These final three customers were most likely not aware of the changing rate otherwise they would have indicated that they were.

The orb was even more effective on the commercial side (among those who still had the orb and answered our questions). All but one commercial customer were always or usually aware of the super peak days, with the final customer stating that he was 'sometimes' aware. (The effectiveness of the orb in helping to *reduce energy use* among commercial customers, however, was much less and is covered in Part 1.)

In terms of effectiveness of the orb as a notification device compared to prior methods of notification (fax, phone, email), the majority of residential respondents (11 out of 18) and commercial respondents (12 out of 16 commercial respondents) found the orb to be more effective than other methods. Of those that did not think that the orb was more effective, many felt that it was on par with other methods. Three residential respondents, however, felt that the orb was less effective for them. Note, however, that these responses are only for those who are still using the orb. Most likely, customers who are not using the orb (see summary tables 12 and 13) would prefer alternative methods as well.

There were several reasons why residential respondents indicated the orb was more effective than other methods of notification. Respondents indicated that the orb was more effective because phone calls could easily be missed as opposed to the orb, which is on the respondent's schedule, the orb served as general awareness for everyone in the household leading to residents being more cautious, and that the orb is a constant reminder of electricity rates.

The main reason that people in offices liked the orb was because it was a visual cue that many people in the office could see and adjust behavior accordingly.

Of the respondents that did not find the orb to be more effective than the prior method, two indicated that the phone would be a better method because they would answer the phone and one indicated that the orb was not always functioning properly (i.e. it was green at midnight once).

When we asked customers about the features and characteristics of the orb, users of the orb appear to prefer the features that the orb offers. After experiencing the orb, customers indicated that they liked having the orb on their table, counter, or desk as opposed to the alternative of a wall-mounted, portable, or computer screen device. Only one residential and two commercial respondents indicated that a portable technology would be preferred, and one residential respondent said that a display on the computer screen would be preferred.

In addition, all of the respondents that used the orb (both residential and commercial) said that they preferred the visual cue offered by the orb to an audible one and all respondents but one residential respondent appeared to understand what the colors symbolized. Note that one respondent that did not ever receive the orb indicated that he would prefer an audible

notification, which is consistent with the phone survey. It seems that although the concept of the orb is a difficult one to grasp, once customers use the orb, they are happy with it.

Furthermore, before and after receiving the enhanced information treatments, the vast majority of customers indicated that four hours was enough notification of a super peak period. Those who did not agree that four hours was enough time were interested mostly in one to three days. There was one commercial respondent, however, who indicated that four hours was too much and he would only need two to three hours. (As shown in Part 1, however, customers often tend to take actions during this warning period rather than at the start of the super peak event.)

Despite customers' preferences for this method of price notification, willingness to pay for this method of notification is low. We asked customers who were still using the Energy Orb about their willingness to pay for the device. There were only two residential respondents (of 16 total) and three commercial respondents (of 14 total) who said that they would pay more than $25 for the orb. The remaining residential respondents were split between indicating that they would not pay for the orb, and stating that they would pay between $1 and $25 for the orb.

On the commercial side, half of all commercial respondents said that they would pay $1-$25, while the remaining 4 respondents (28%) said that they would not pay for this device. Overall, therefore, it may be possible to charge a nominal fee for this device; however, the cost would more than likely have to be subsidized, or the retail price be reduced below $50 per orb.

When we inquired about customers' preferences for purchasing the orb at a store versus paying a small monthly charge to the utility, residential respondents were split—indicating a slightly stronger preference for purchasing at a retail store over purchasing the orb from the utility for a monthly fee. Commercial customers, however, were twice as likely to indicate that they would prefer to purchase the orb from a retail store over paying a small monthly fee to the utility.

We also inquired whether customers would be willing to pay a small monthly operating fee (less than $10) if the orb was given to them for free. Responses to this question mirrored responses to overall willingness to pay. Slightly less than half of both residential and commercial respondents who gave an answer to this question indicated that they would be willing to pay a small monthly operating cost, with the majority of both residential and commercial customers indicating that they would not pay.

Additional Information Options, Such as Energy Displays, And Overall Preferences

Following the treatments, we asked customers whether they felt that they had enough information already about their rate and electricity use, or whether they would want additional information such as a device that displays your electricity consumption or costs AT or UP TO the current moment. Most customers indicated that they would be interested in a real-time energy display device such as the one described. In general, respondents indicated that a display that showed real-time cost and/or kWh would be useful to them.

We also asked respondents about the usefulness of interactive web-based controls. Commercial customers appeared to be more interested in this than residential customers. Nearly two-thirds of

commercial respondents would be interested in controls such as an interactive website to control the thermostat and appliances. The majority of residential customers that answered this question (9 of 13) did not express an interest in having control over their thermostat and appliances through an interactive website. A few residential respondents did express an interest in this though. More commercial customers are interested in this option than residential customers so it may prove to be a better offering for commercial customers.

Summary of Preferences

When residential and commercial customers were asked to comment on what would be the most important information to help them reduce electricity usage during peak times, the answers that residential customers gave were varied. Customers were allowed to give multiple responses to this question.

Commercial customers had one clear choice in terms of what the most important information was. Sixty-nine percent of commercial respondents indicated that an analysis of which hours use the most electricity is the most useful information to helping them shift or reduce consumption. Prior to treatment commercial customers were most interested in a chart of the biggest energy users and now, following treatment, commercial customers are most interested in an analysis of which hours the most electricity are being used.

Overall, residential customers appeared to be more interested in a variety of different options with three quarters being interested, prior to treatment, in an analysis of hours that electricity is consumed and a device showing electricity in real-time. Now, following the treatment, only about half of residential respondents were interested in these forms of information.

Table 22: Most Important Information (multiple response)
(shaded cells represent most frequently mentioned response)

	Residential	Commercial
An Energy Display Device	9 (56%)	5 (38%)
An Analysis of which Hours Customer Uses Most Electricity	8 (50%)	9 (69%)
Information on Bill	8 (50%)	5 (38%)
Customized Energy Savings Tops	8 (50%)	4 (31%)
Analysis of Biggest Electricity Consuming Equipment	8 (50%)	4 (31%)
Report Card	6 (38%)	4 (31%)
A Price Alert	6 (38%)	4 (31%)
Newsletter	6 (38%)	3 (23%)
Website	4 (25%)	3 (23%)
Web-based Controls	3 (19%)	1 (8%)
Don't Know	--	1 (8%)
TOTAL RESPONDENTS	16	13

Satisfaction with the Program

Of respondents that completed the last series of questions in our survey, five out of 12 residential respondents were satisfied with the new pricing program after the enhanced treatments, giving a

rating of 7 or higher because of the savings that they experienced as a result of the rate. Six of the respondents were neutral with one giving a 6 and the other five rating their satisfaction as a five. One residential respondent expressed dissatisfaction with the rate because he made significant reductions in energy use without seeing significant savings. Note, however, that only 12 of the 23 customers that we contacted were willing to complete the survey and answer this series of questions.

Comments that residential customers made regarding satisfaction were varied. One respondent blamed her own actions stating that if one appliance was being used less, she may overcompensate for it by using another appliance more and therefore not see savings. One customer indicated that he uses more energy in the winter and would need to make new judgments at that time. According to another respondent, the last three peak power alerts were three days in a row and that did not work for this family because they needed to use the air conditioning because of a family circumstance.

Prior to the treatment the vast majority of residential respondents (79%) indicated that they would opt for a Smart Shift and Save Plan in the future. This number appears to have gone down for residential customers with more now indicating that they would rather return to their old plan.

For commercial customers, however, prior to treatment half of the commercial customers did not know whether they would opt for the CPP-V rate with about a third saying that they would. The enhanced information treatments appear to have helped convince many of those respondents that were unsure that the program has benefits. Ten out of 13 commercial respondents expressed overall satisfaction (rated 7-10) with the new pricing program while two respondents were slightly higher than neutral and one respondent was not satisfied.

In general, commercial customers would prefer to continue on the new pricing plan with eight out of 13 commercial customers that completed this series of questions stating that they would stay with the current plan. Five respondents still did not know how to answer this question, and two indicated that they would prefer to return to their old plan. Again, it should be noted that many other commercial customers did not answer this question.

The primary reason commercial customers were satisfied was because unnecessary expenses were cut and general awareness regarding energy consumption has gone up**.**

Overall, reasons that customers would not opt for the CPP-V rate for the future are that it is too hard to make adjustments, not enough or no savings was seen, or it would be difficult for the particular facility in question.

Appendices

Individual Day Results

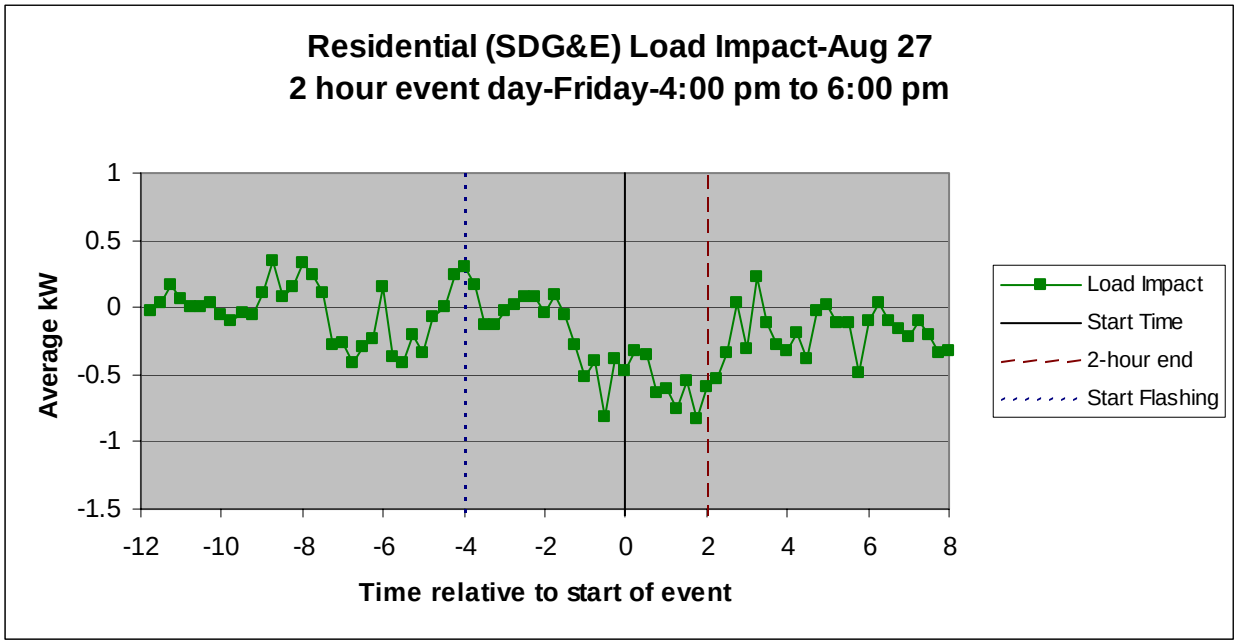
As described in the body of the report, we also looked at the load impact on individual days during the treatment period. There were eight days that were in the treatment period for some or all of the residential customers in the pilot. The residential treatment effect for each of these days is summarized (in the body of the report) in Figures 28a and 28b.

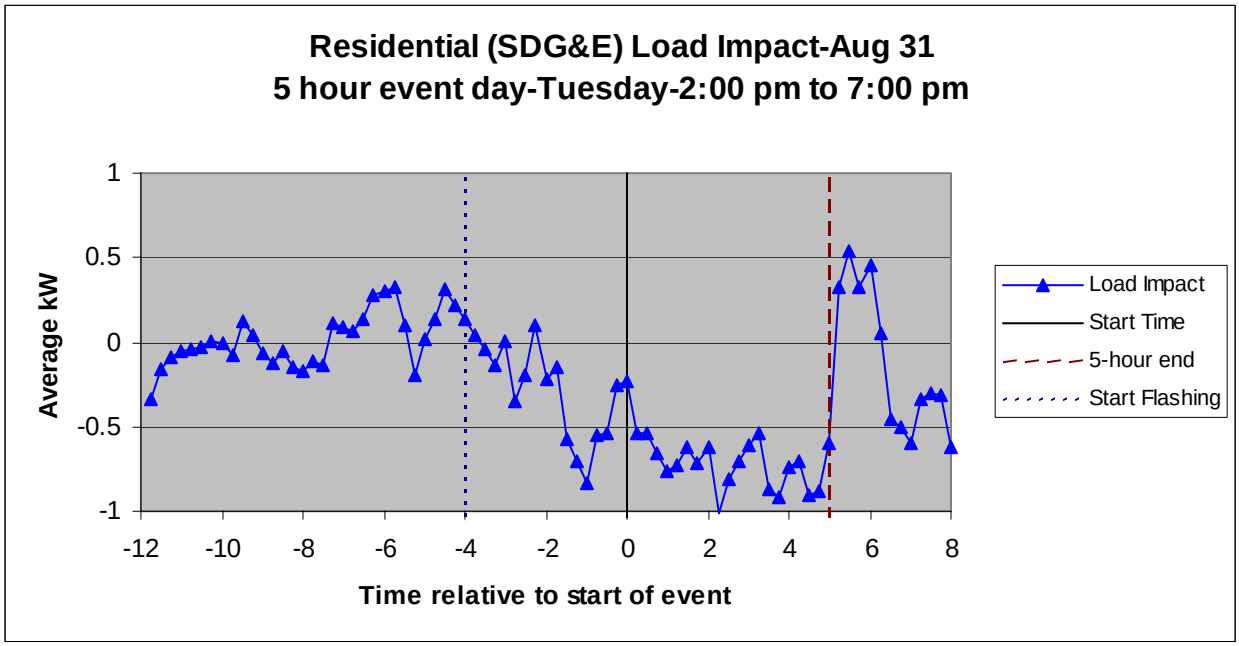
Note that all customers were in the treatment period for September 8, 9, and 10, and all but one were in the treatment period for August 31. However, only three customers had orbs installed for the August 9, 10, and 11 event days, so these three earlier event days are estimated based on *very* few treatment customers, and are not shown. As is the case throughout the load impact analysis, the treatment period varies based on when the customers had orbs installed in their homes.

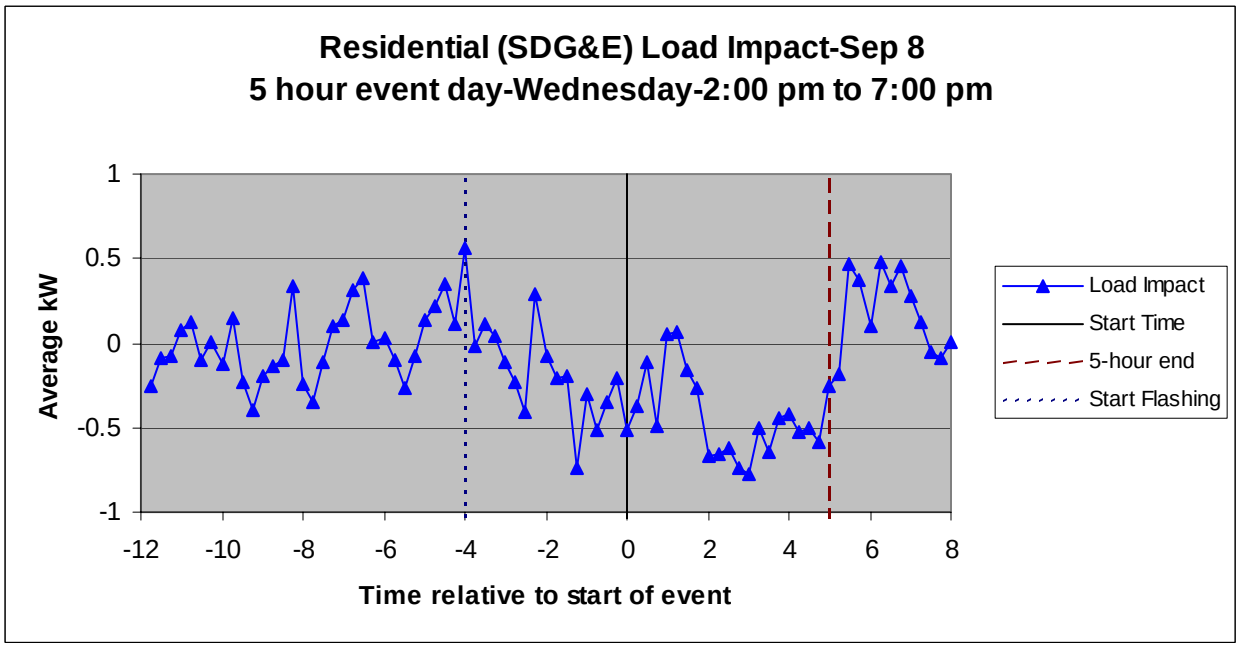
For the most part, the shape of the treatment effect across the event days is fairly consistent – there are no obvious anomalies. There is also no evidence of a "day of week" effect, since the shape and magnitude do not seem to depend on the day of the week that the events occur. But with only eight event days in the treatment period, there could be a subtle effect that would show up in a larger sample of days.

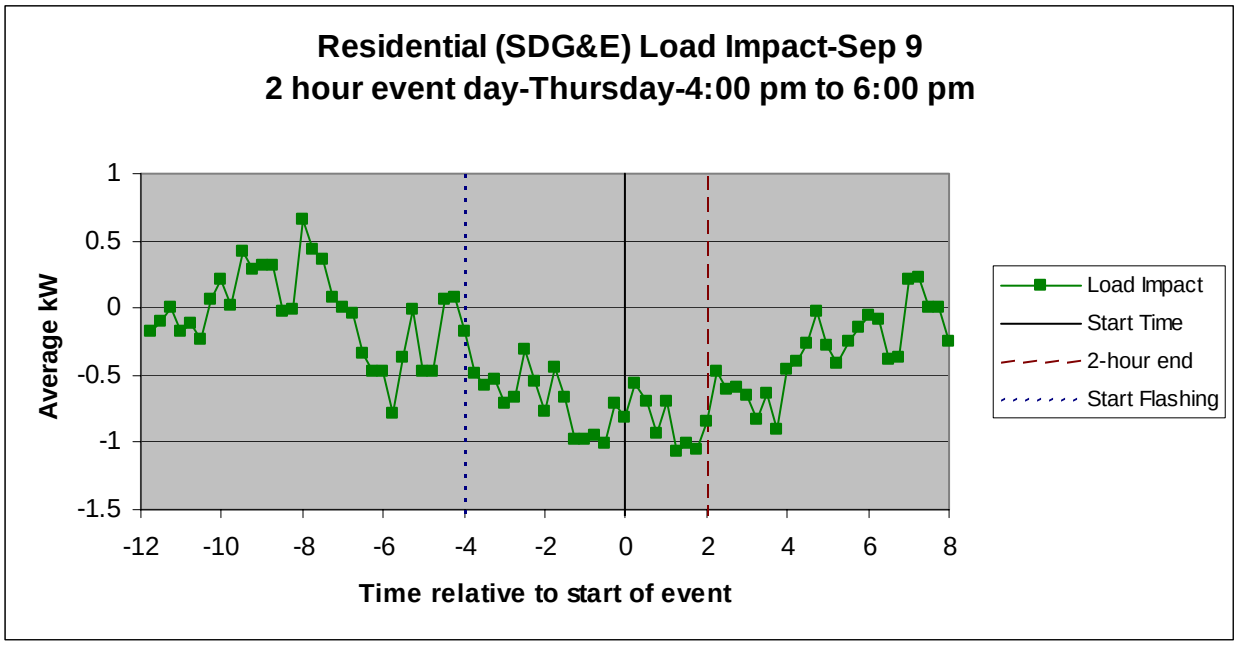
It is evident on a few of the days, particularly August 27 and September 10, that the savings peak at the end of the "flashing" period – the impact during the 2-hour event – is less than the impact just before the event begins. This is further evidence of the level of customer activity in response to the flashing orb.

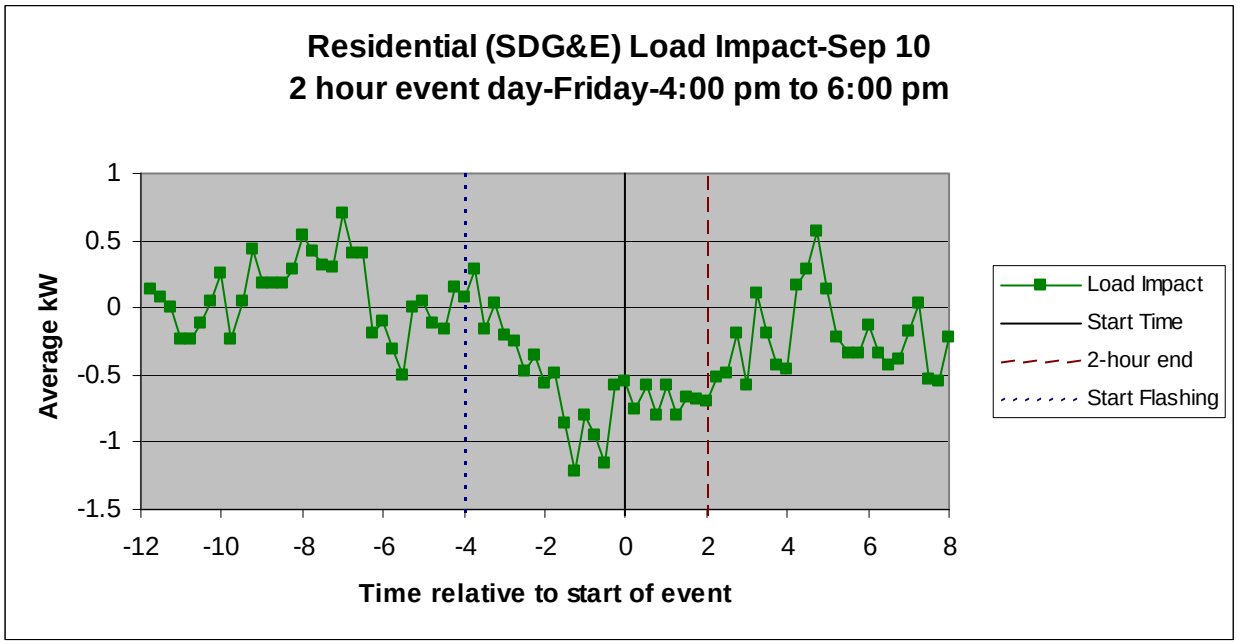
Residential Daily Figures:




Residential (SDG&E) Load Impact-Aug 31
5 hour event day-Tuesday-2:00 pm to 7:00 pm
Average kW
1
0.5
0
-0.5
-1
-12
-10
-8
-6
-4
-2
0
2
4
6
8
Time relative to start of event
Load Impact
Start Time
5-hour end
Start Flashing


Residential (SDG&E) Load Impact-Sep 8
5 hour event day-Wednesday-2:00 pm to 7:00 pm
Average kW
1
0.5
0
-0.5
-1
-12
-10
-8
-6
-4
-2
0
2
4
6
8
Time relative to start of event
Load Impact
Start Time
5-hour end
Start Flashing

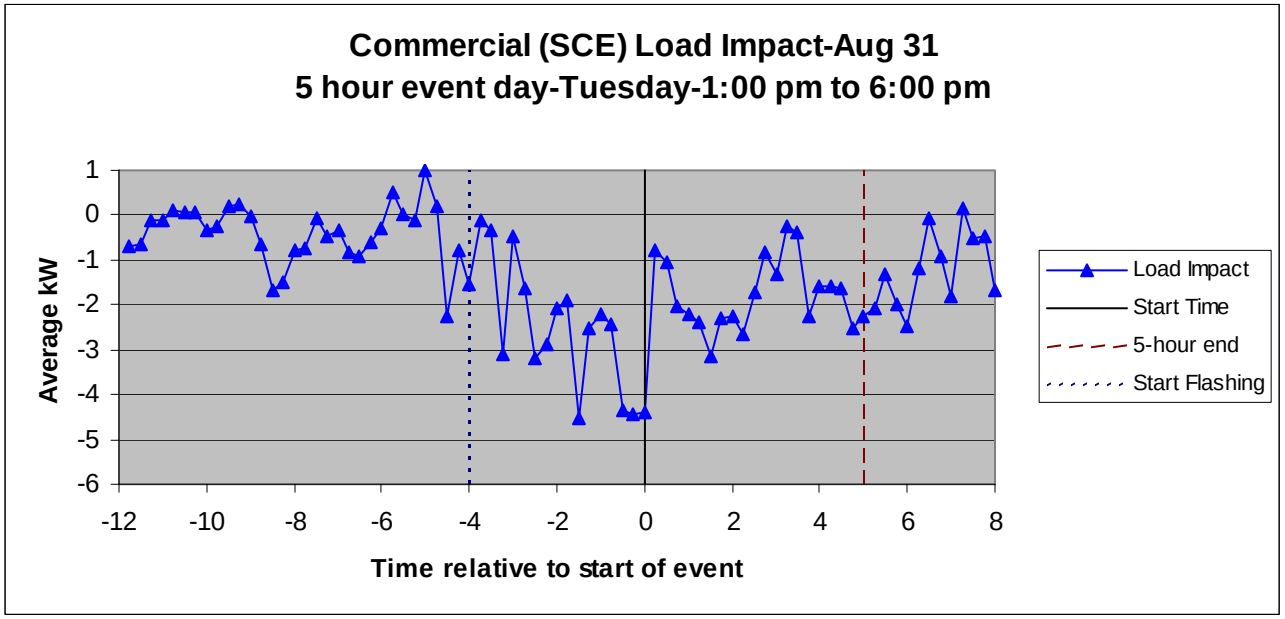

Residential (SDG&E) Load Impact-Sep 9
2 hour event day-Thursday-4:00 pm to 6:00 pm
Average kW
1
0.5
0
-0.5
-1
-1.5
-12
-10
-8
-6
-4
-2
0
2
4
6
8
Time relative to start of event
Load Impact
Start Time
2-hour end
Start Flashing

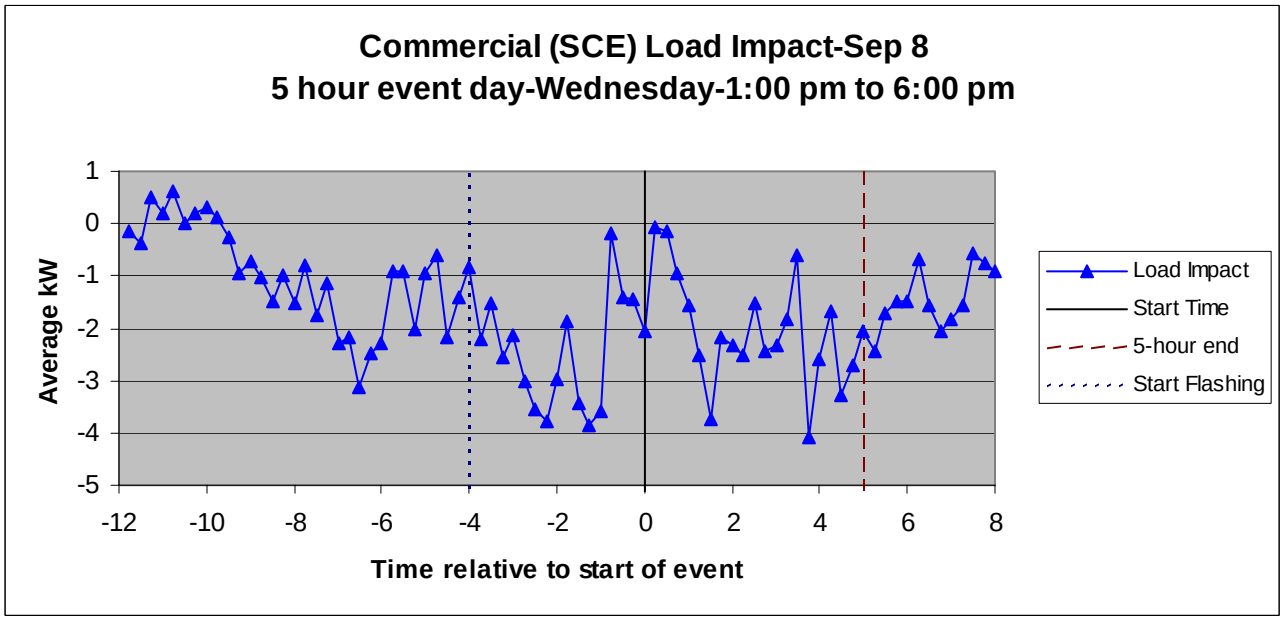

Residential (SDG&E) Load Impact-Sep 10
2 hour event day-Friday-4:00 pm to 6:00 pm
Average kW
1
0.5
0
-0.5
-1
-1.5
-12
-10
-8
-6
-4
-2
0
2
4
6
8
Time relative to start of event
Load Impact
Start Time
2-hour end
Start Flashing

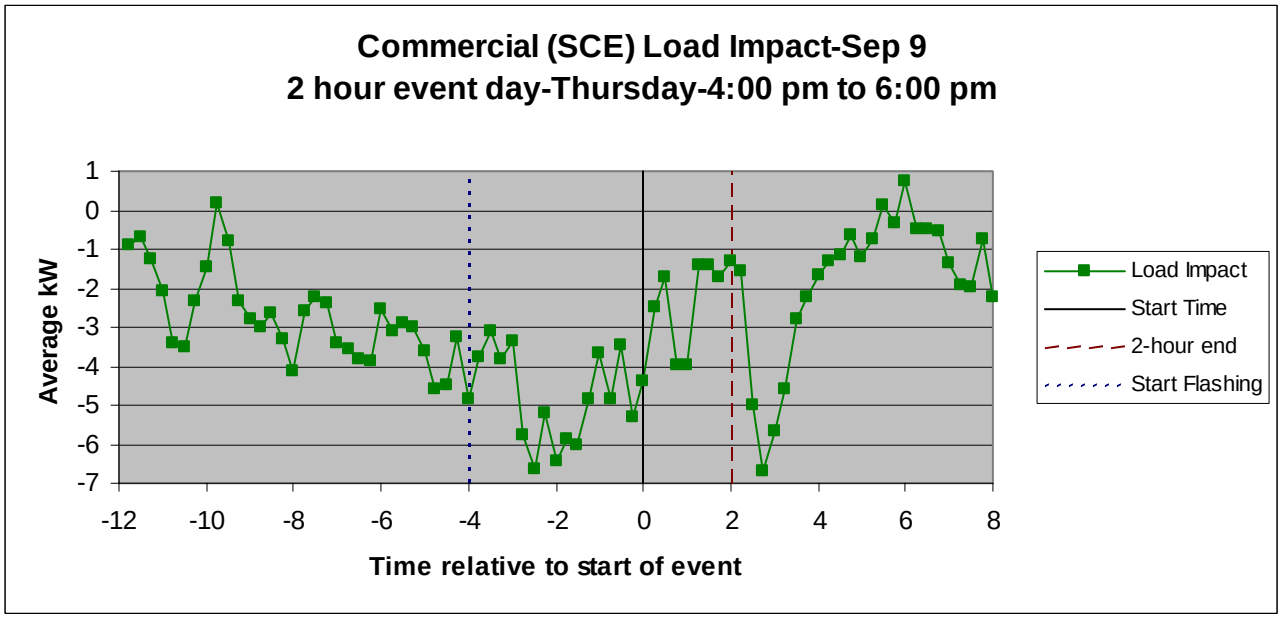
Commercial Individual Day Results

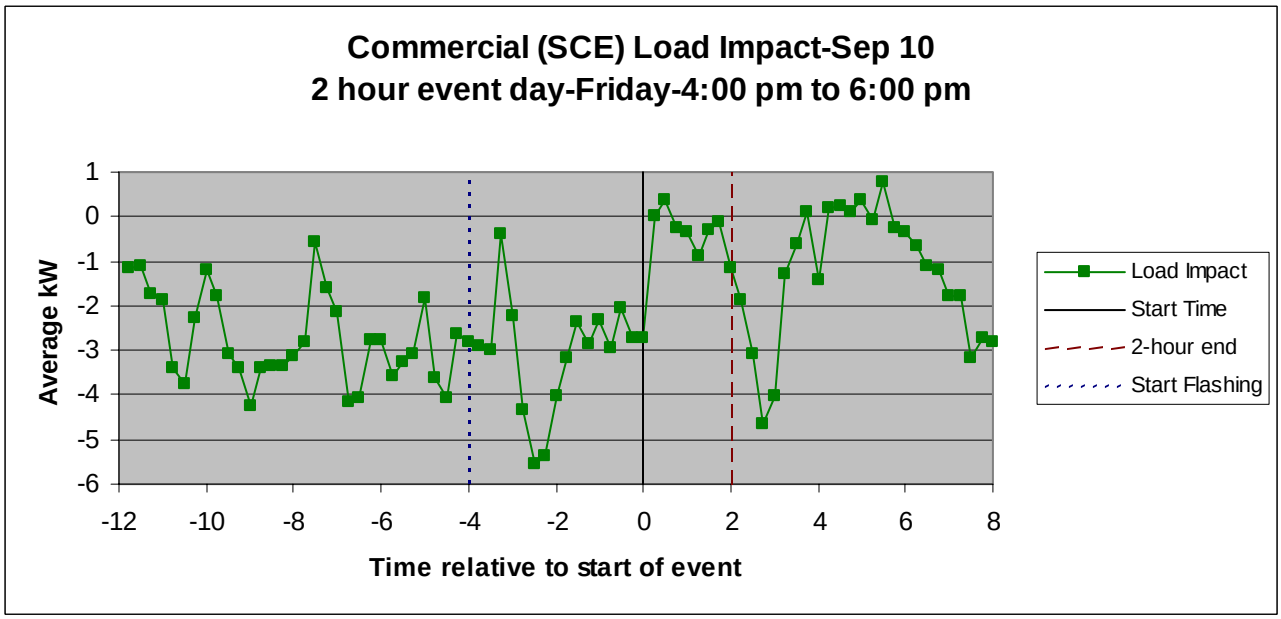
All commercial customers were in the treatment period for August 31 and September 8, 9, and 10. However, only 13 customers had orbs installed for the August 9, 10, and 11 event days. So these three earlier event days are estimated based on fewer treatment customers than the later event days. For the remaining 16 of the commercial customers, these days are part of the pre-treatment period. Only the full treatment days are shown below. As is the case throughout the load impact analysis, the individual treatment period varies based on when the customers had orbs installed in their facility.

Commercial Daily Figures:



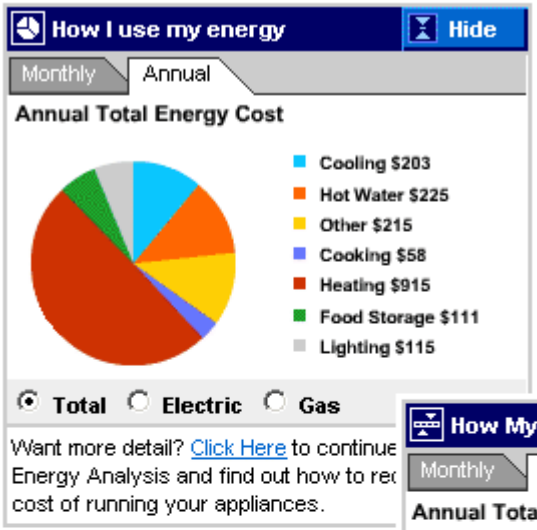



Commercial (SCE) Load Impact-Sep 9
2 hour event day-Thursday-4:00 pm to 6:00 pm
Average kW
1
0
-1
-2
-3
-4
-5
-6
-7
-12
-10
-8
-6
-4
-2
0
2
4
6
8
Time relative to start of event
Load Impact
Start Time
2-hour end
Start Flashing

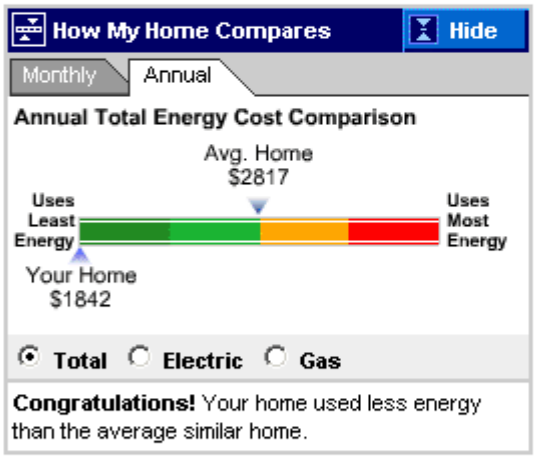

Commercial (SCE) Load Impact-Sep 10
2 hour event day-Friday-4:00 pm to 6:00 pm
Average kW
1
0
-1
-2
-3
-4
-5
-6
-12
-10
-8
-6
-4
-2
0
2
4
6
8
Time relative to start of event
Load Impact
Start Time
2-hour end
Start Flashing

Residential Focus Group Handouts

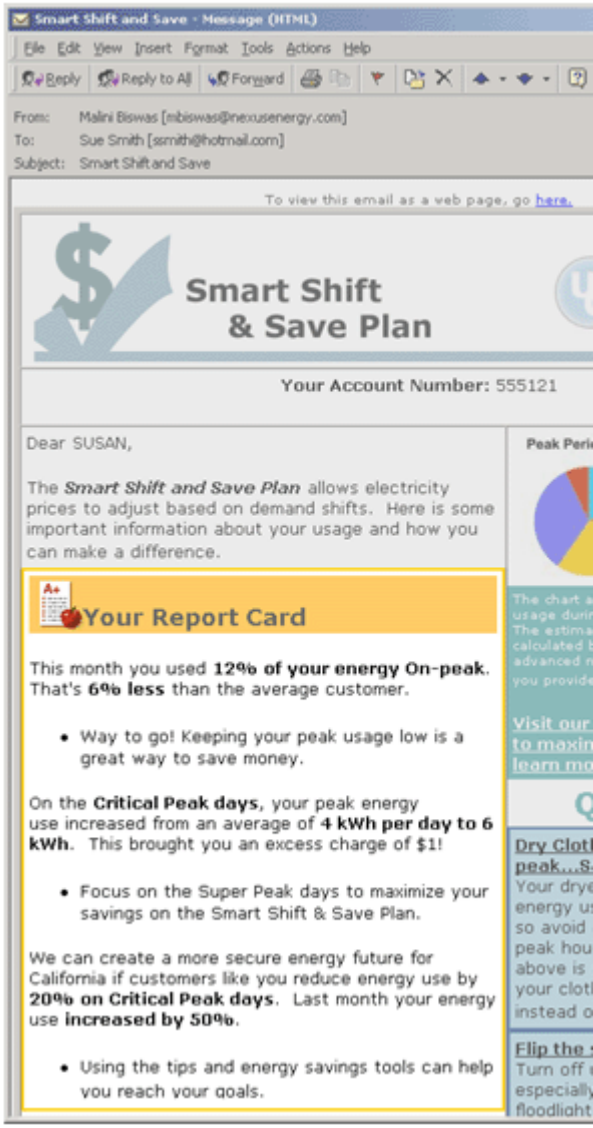
Pie Chart



Benchmarks



Report Card



Quick Tips:

What are my top ways to save?

Savings Opportunities	Annual Savings
Lighting	
Use compact flourescent bulbs	$10 - $20
Replace halogen floor lamps	$8 - $16
Heating	
Install programmable thermostat	$135 - $226
Maintain heating system regularly	$103 - $171

Detailed Analysis
Find more ways to save

Seasonal tips and tools

Quick Tips
Have your heating system inspected and tuned by a professional. A poorly maintained system can lose efficiency at a rate of 1-2% each year. A typical home with gas heat can save $50 per year.

Heating Calculator
Estimate the size and cost of a new heating system.

Heating Ways to Save
Find ways to save on your heating costs.

Lock in your rate
Sign up now to get a fixed gas rate for the entire heating season.

Newsletter:

To view this email as a web page, go here.

Smart Shift & Save Plan

UTILITY COMPANY

Your Account Number: 555121

Dear SUSAN,

The ***Smart Shift & Save Plan*** allows electricity prices to adjust based on demand shifts. Here is some important information about your usage and how you can make a difference.

Your Report Card

This month you used **12% of your energy On-peak**. That's **6% less** than the average customer.

- Way to go! Keeping your peak usage low is a great way to save money.

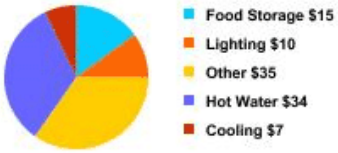
On the **Critical Peak days**, your peak energy use increased from an average of **4 kWh per day to 6 kWh**. This brought you an excess charge of $1!

- Focus on the Super Peak days to maximize your savings on the Smart Shift & Save Plan.

We can create a more secure energy future for California if customers like you reduce energy use by **20% on Critical Peak days**. Last month your energy use **increased by 50%**.

- Using the tips and energy savings tools can help you reach your goals.

Peak Period Electricity Cost



The chart above shows your energy usage during the peak hours last month. The estimated costs above were calculated based on data from your advanced meter and survey information you provided.

Visit our Super Peak homepage to maximize your savings and learn more.

Quick Tips

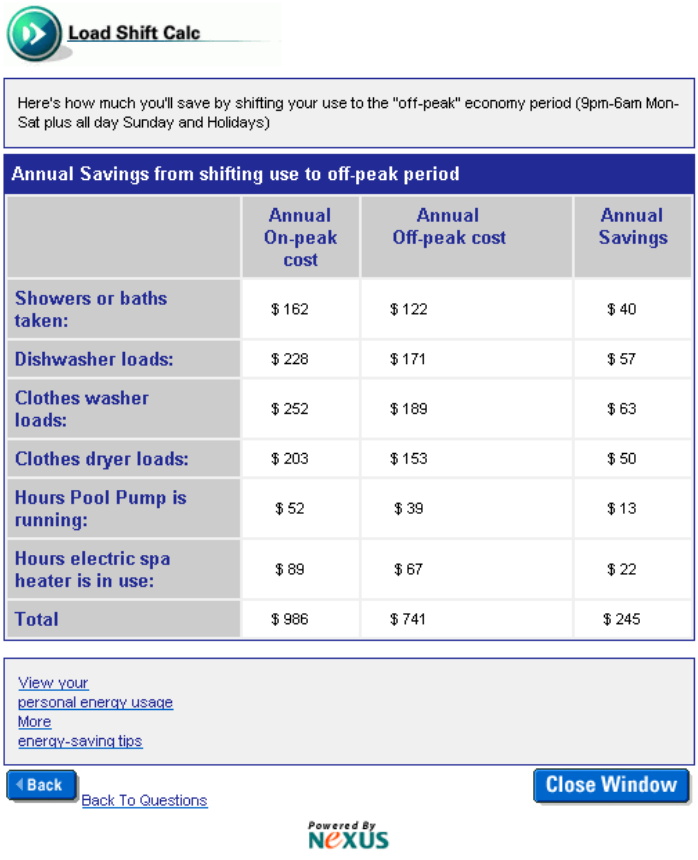
Dry Clothes off-peak...Save $12
Your dryer is one of the biggest energy users of your appliances, so avoid running it entirely during peak hours. The monthly savings above is an estimate for drying your clothes during off peak instead of peak hours.

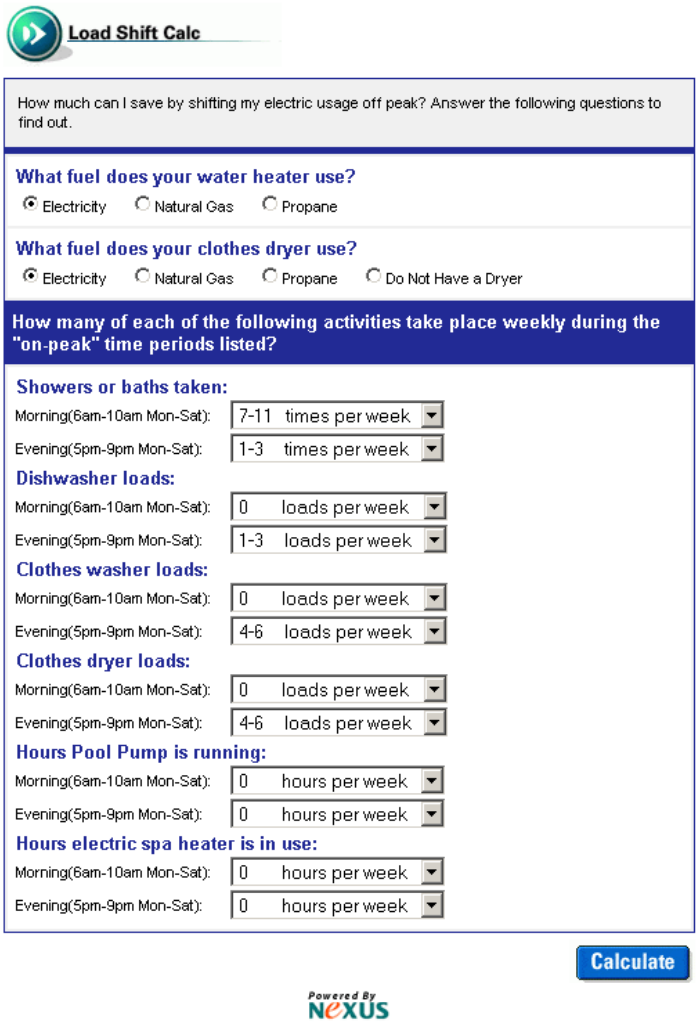
Flip the switch...Save $5
Turn off unnecessary lights - especially the high-wattage floodlights typically recessed in the ceiling. We've estimated the monthly savings for turning off 50% of the lights in an average home during peak hours.

Put off those Dishes...Save $4
Even though your water heater uses gas, your dishwasher still uses energy for its motor and dryer. The savings above is an estimate of how much extra you spend each month if you run your dishwasher during peak hours.

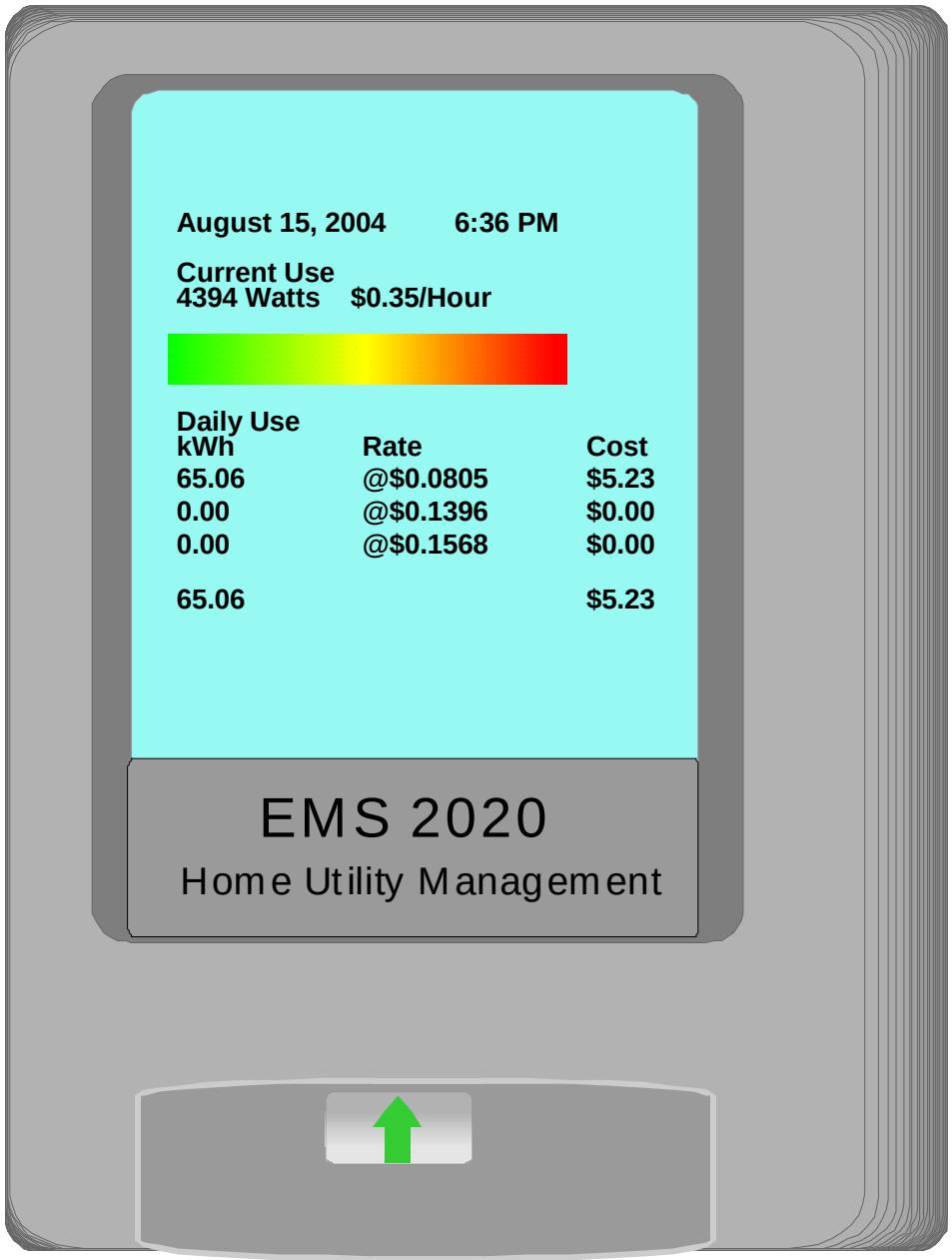
All of these steps can save you energy & money while helping the community and environment on a larger scale. Find even ***more information*** about your usage, how to save, and the Smart Shift & Save program on our super peak homepage at www.energyprism.com.

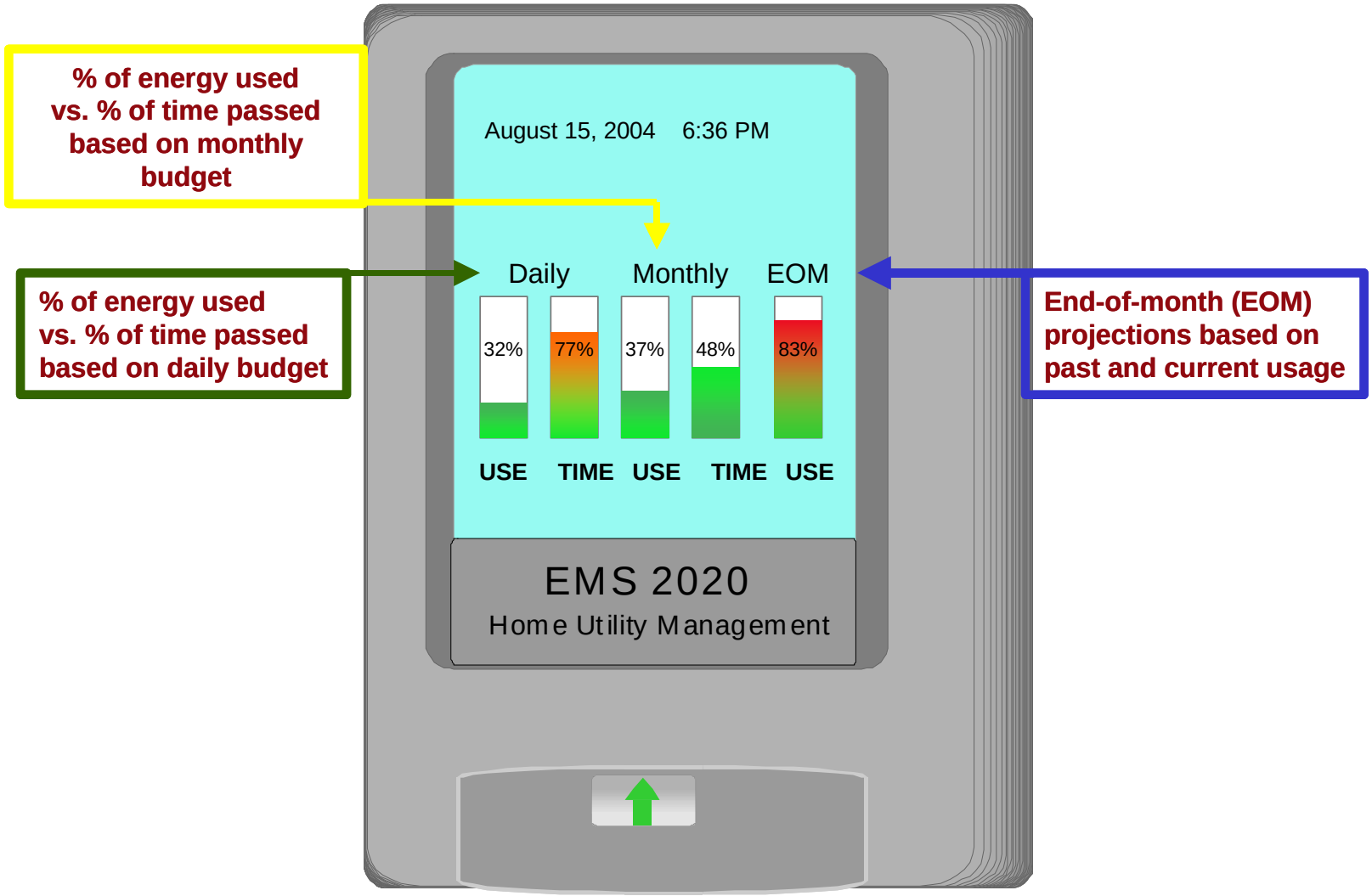
Load Calculator:



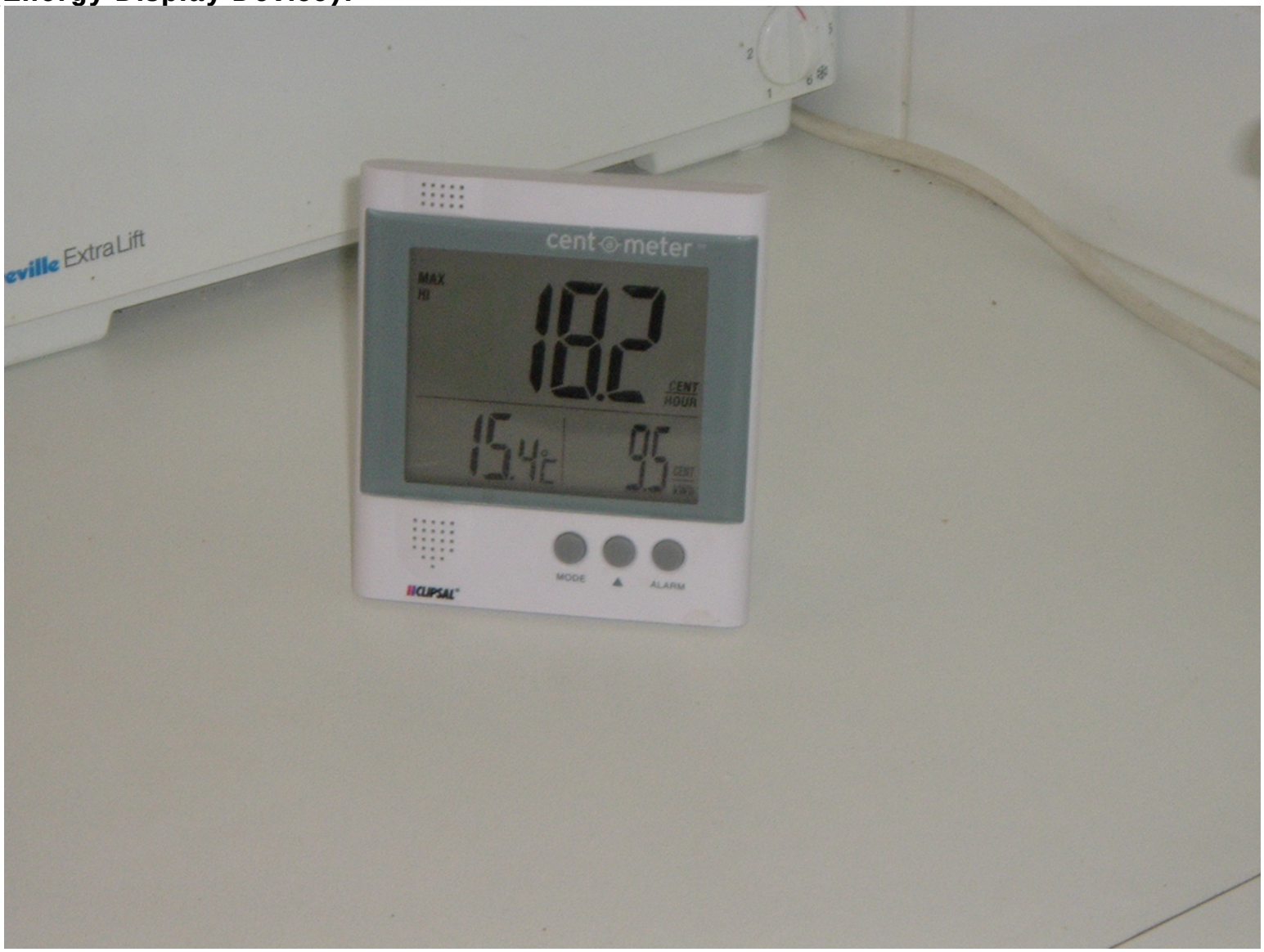


EMS 2020 (Energy Display Device):

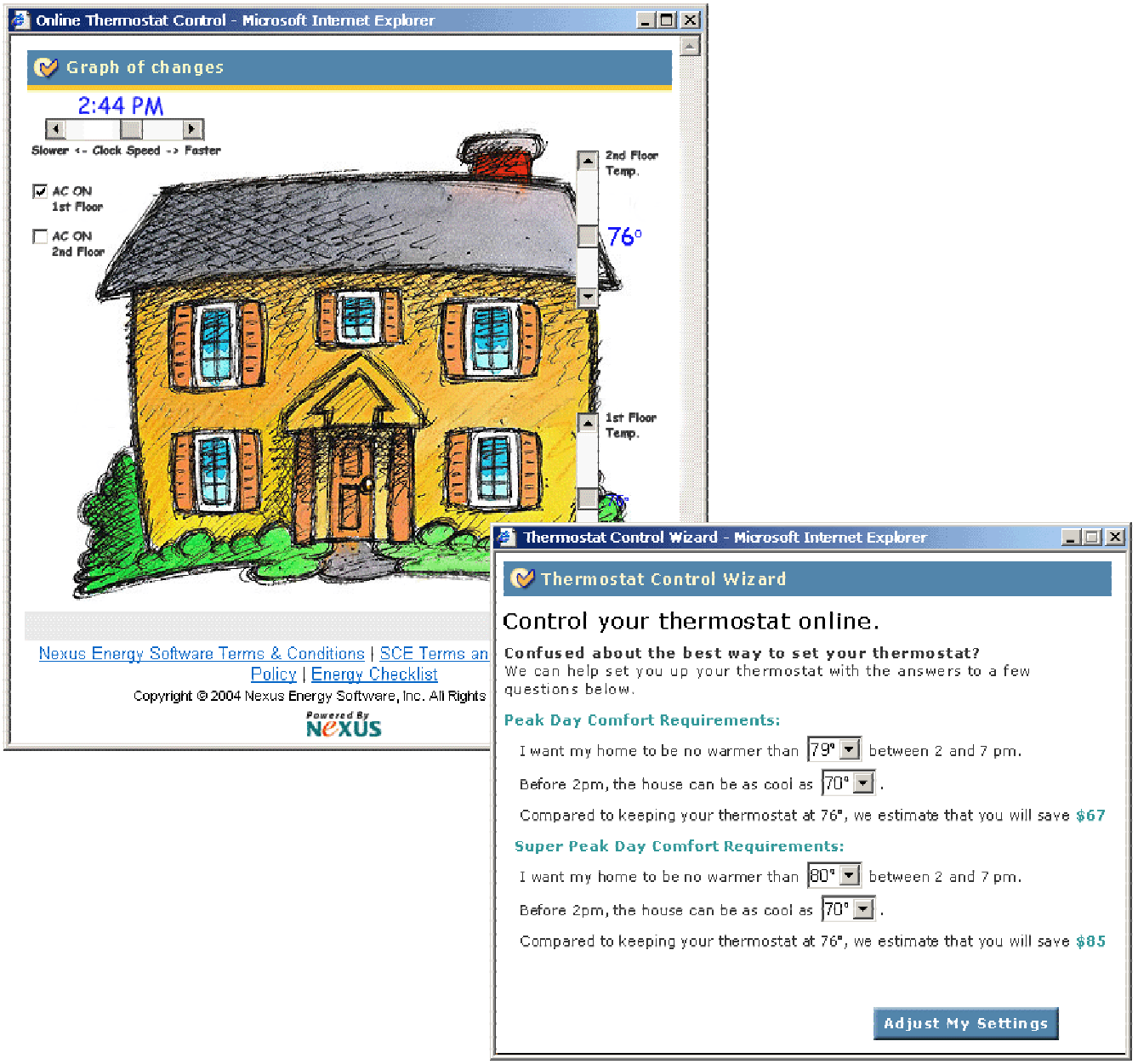

August 15, 2004 6:36 PM
Current Use
4394 Watts $0.35/Hour
Daily Use
kWh Rate Cost
65.06 @$0.0805 $5.23
0.00 @$0.1396 $0.00
0.00 @$0.1568 $0.00
65.06 $5.23
EMS 2020
Home Utility Management

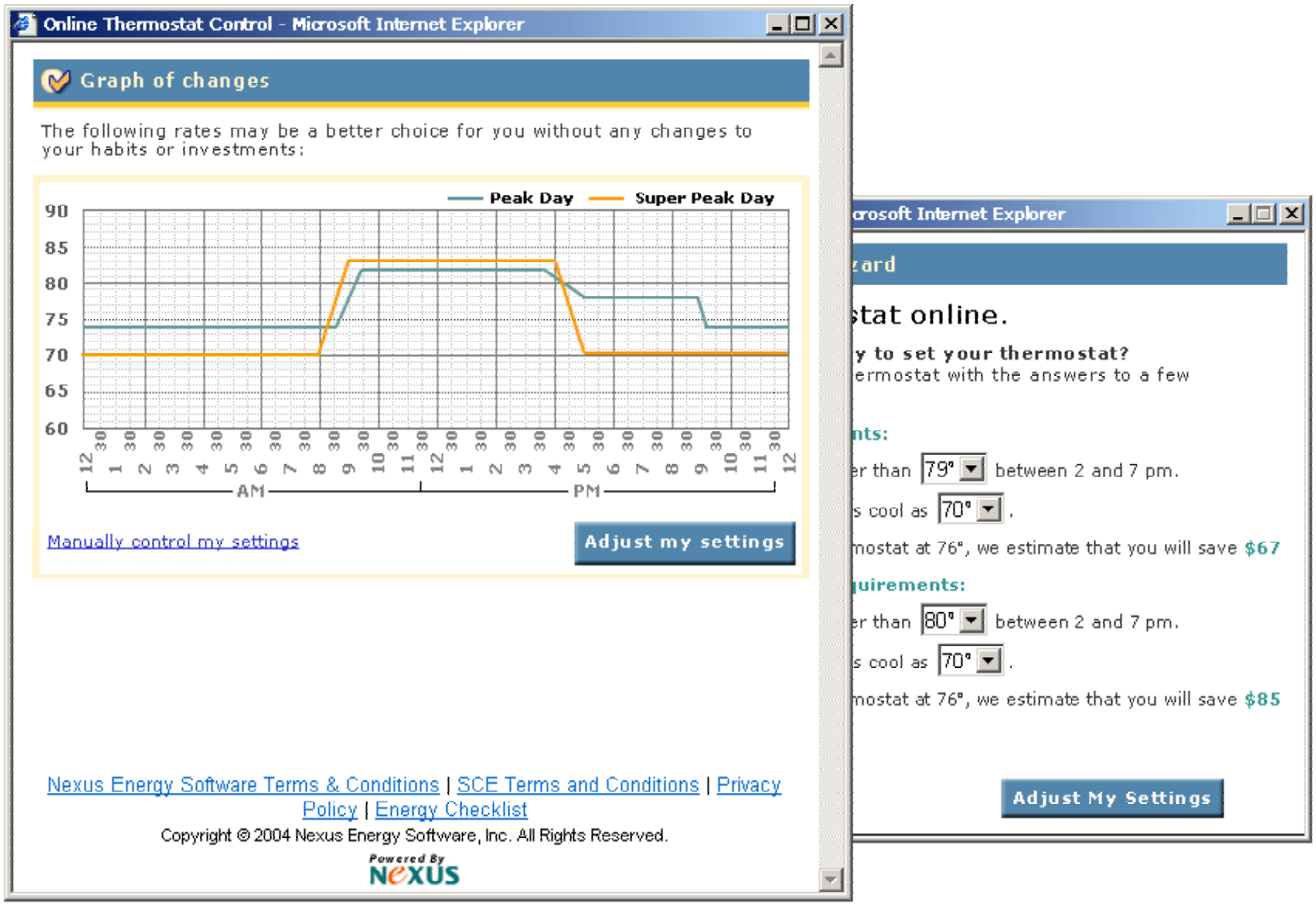

% of energy used vs. % of time passed based on monthly budget
% of energy used vs. % of time passed based on daily budget
End-of-month (EOM) projections based on past and current usage
August 15, 2004 6:36 PM
Daily
Monthly
EOM
32%
77%
37%
48%
83%
USE
TIME
USE
TIME
USE
EMS 2020
Home Utility Management

Centameter (Energy Display Device):

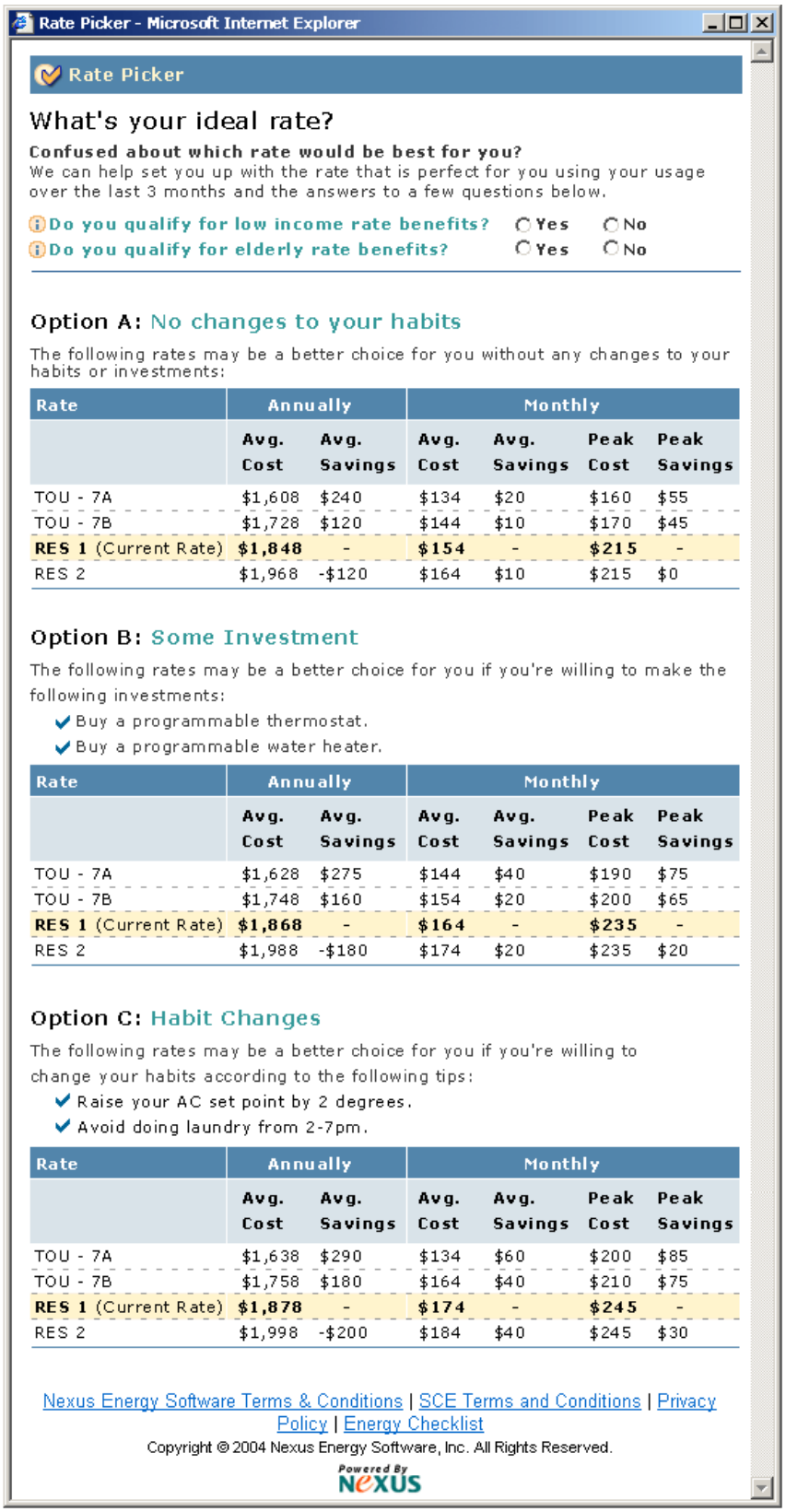


Online Controls:




Online Thermostat Control - Microsoft Internet Explorer
Graph of changes
The following rates may be a better choice for you without any changes to your habits or investments:
Peak Day
Super Peak Day
90
85
80
75
70
65
60
AM
PM
Manually control my settings
Adjust my settings
Nexus Energy Software Terms & Conditions | SCE Terms and Conditions | Privacy Policy | Energy Checklist
Copyright © 2004 Nexus Energy Software, Inc. All Rights Reserved.
Powered By NEXUS
stat online.
y to set your thermostat?
ermostat with the answers to a few
nts:
er than 79° between 2 and 7 pm.
s cool as 70° .
mostat at 76°, we estimate that you will save $67
uirements:
er than 80° between 2 and 7 pm.
s cool as 70° .
mostat at 76°, we estimate that you will save $85
Adjust My Settings

Rate Picker:



Rate Picker - Microsoft Internet Explorer

Rate Picker

What's your ideal rate?

Confused about which rate would be best for you?
We can help set you up with the rate that is perfect for you using your usage over the last 3 months and the answers to a few questions below.

Do you qualify for low income rate benefits? ○ Yes ○ No
Do you qualify for elderly rate benefits? ○ Yes ○ No

Option A: No changes to your habits

The following rates may be a better choice for you without any changes to your habits or investments:

Rate	Annually		Monthly			
	Avg. Cost	Avg. Savings	Avg. Cost	Avg. Savings	Peak Cost	Peak Savings
TOU - 7A	$1,608	$240	$134	$20	$160	$55
TOU - 7B	$1,728	$120	$144	$10	$170	$45
RES 1 (Current Rate)	**$1,848**	-	**$154**	-	**$215**	-
RES 2	$1,968	-$120	$164	$10	$215	$0

Option B: Some Investment

The following rates may be a better choice for you if you're willing to make the following investments:

- ✔ Buy a programmable thermostat.
- ✔ Buy a programmable water heater.

Rate	Annually		Monthly			
	Avg. Cost	Avg. Savings	Avg. Cost	Avg. Savings	Peak Cost	Peak Savings
TOU - 7A	$1,628	$275	$144	$40	$190	$75
TOU - 7B	$1,748	$160	$154	$20	$200	$65
RES 1 (Current Rate)	**$1,868**	-	**$164**	-	**$235**	-
RES 2	$1,988	-$180	$174	$20	$235	$20

Option C: Habit Changes

The following rates may be a better choice for you if you're willing to change your habits according to the following tips:

- ✔ Raise your AC set point by 2 degrees.
- ✔ Avoid doing laundry from 2-7pm.

Rate	Annually		Monthly			
	Avg. Cost	Avg. Savings	Avg. Cost	Avg. Savings	Peak Cost	Peak Savings
TOU - 7A	$1,638	$290	$134	$60	$200	$85
TOU - 7B	$1,758	$180	$164	$40	$210	$75
RES 1 (Current Rate)	**$1,878**	-	**$174**	-	**$245**	-
RES 2	$1,998	-$200	$184	$40	$245	$30

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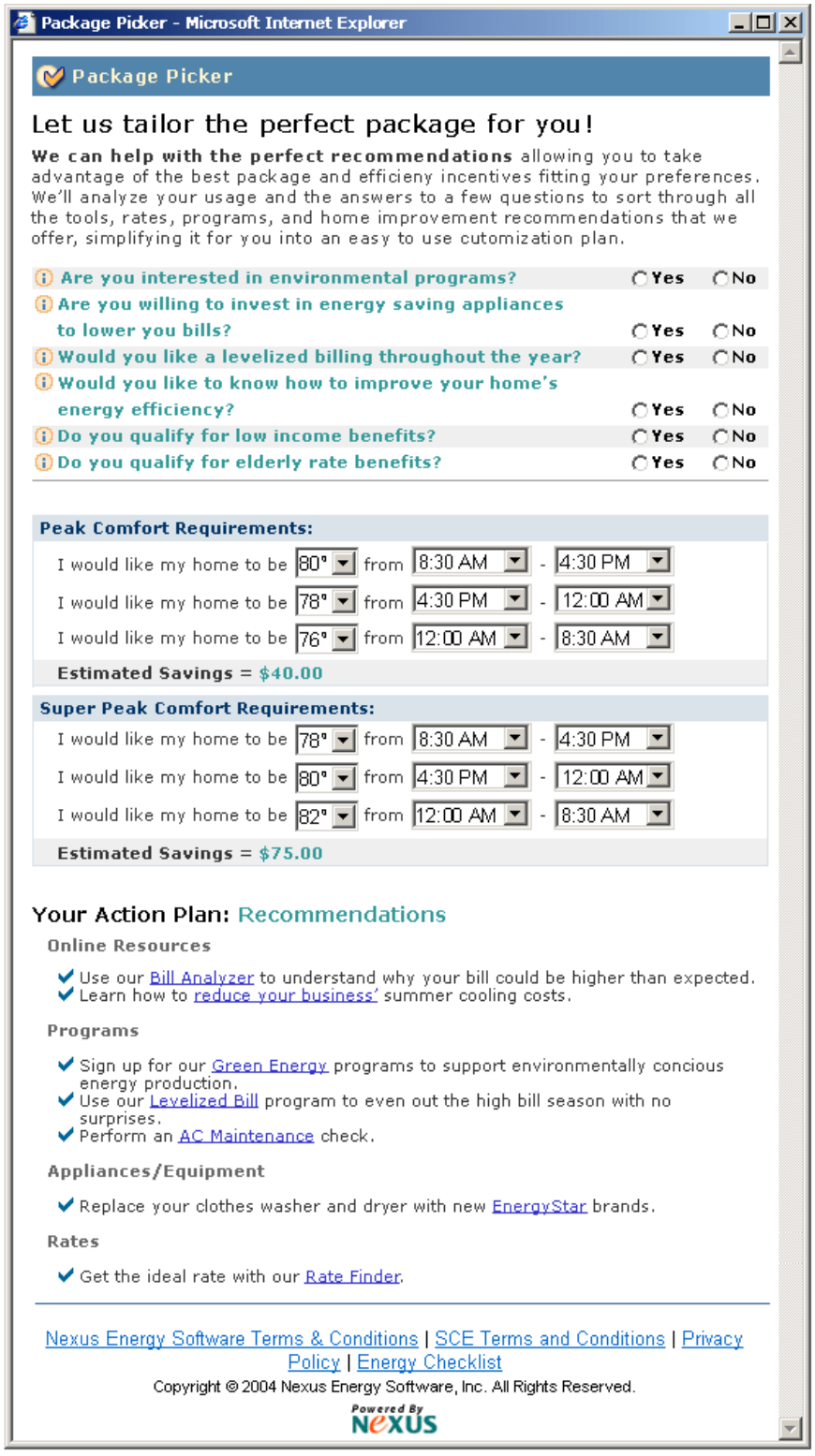
Package Picker - Microsoft Internet Explorer
Package Picker
Let us tailor the perfect package for you!
We can help with the perfect recommendations allowing you to take advantage of the best package and efficieny incentives fitting your preferences. We'll analyze your usage and the answers to a few questions to sort through all the tools, rates, programs, and home improvement recommendations that we offer, simplifying it for you into an easy to use cutomization plan.
Are you interested in environmental programs? Yes No
Are you willing to invest in energy saving appliances to lower you bills? Yes No
Would you like a levelized billing throughout the year? Yes No
Would you like to know how to improve your home's energy efficiency? Yes No
Do you qualify for low income benefits? Yes No
Do you qualify for elderly rate benefits? Yes No
Peak Comfort Requirements:
I would like my home to be 80° from 8:30 AM - 4:30 PM
I would like my home to be 78° from 4:30 PM - 12:00 AM
I would like my home to be 76° from 12:00 AM - 8:30 AM
Estimated Savings = $40.00
Super Peak Comfort Requirements:
I would like my home to be 78° from 8:30 AM - 4:30 PM
I would like my home to be 80° from 4:30 PM - 12:00 AM
I would like my home to be 82° from 12:00 AM - 8:30 AM
Estimated Savings = $75.00
Your Action Plan: Recommendations
Online Resources
Use our Bill Analyzer to understand why your bill could be higher than expected.
Learn how to reduce your business' summer cooling costs.
Programs
Sign up for our Green Energy programs to support environmentally concious energy production.
Use our Levelized Bill program to even out the high bill season with no surprises.
Perform an AC Maintenance check.
Appliances/Equipment
Replace your clothes washer and dryer with new EnergyStar brands.
Rates
Get the ideal rate with our Rate Finder.
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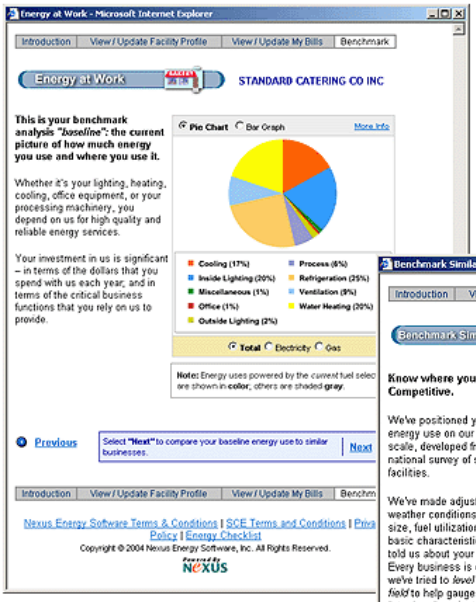
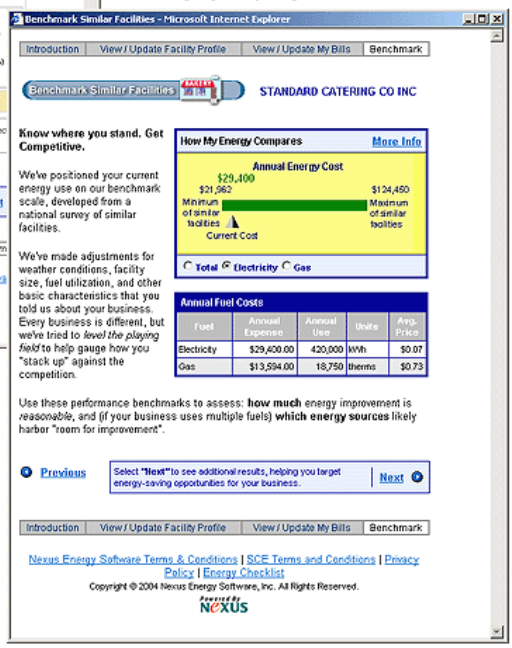
Small Commercial Focus Group Handouts

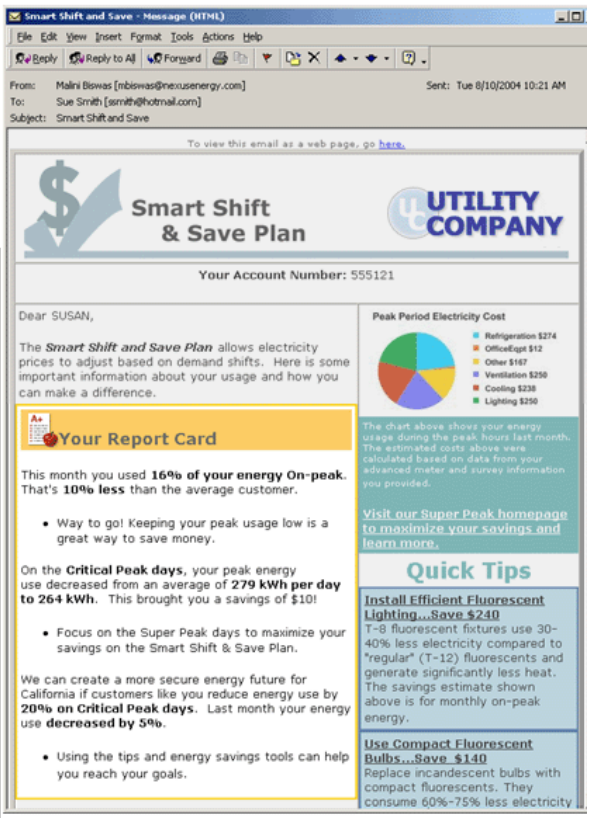
Pie Chart



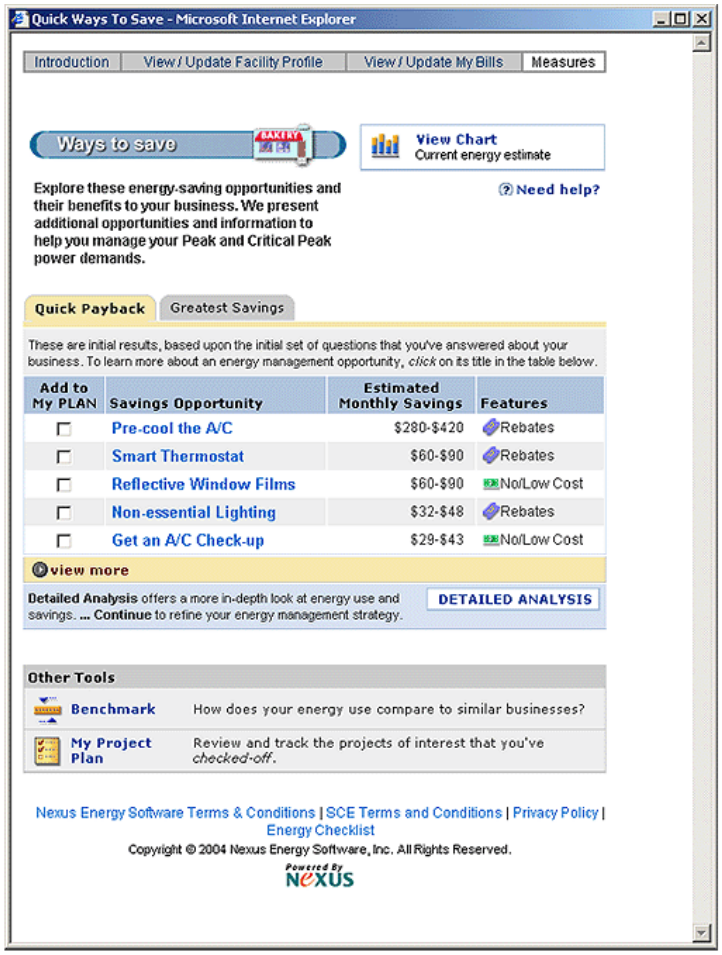
Benchmarks



Report Card



Web Tools:


Quick Ways To Save - Microsoft Internet Explorer
Introduction
View / Update Facility Profile
View / Update My Bills
Measures
Ways to save
View Chart
Current energy estimate
Need help?
Explore these energy-saving opportunities and their benefits to your business. We present additional opportunities and information to help you manage your Peak and Critical Peak power demands.
Quick Payback
Greatest Savings
These are initial results, based upon the initial set of questions that you've answered about your business. To learn more about an energy management opportunity, click on its title in the table below.
Add to My PLAN
Savings Opportunity
Estimated Monthly Savings
Features
Pre-cool the A/C $280-$420 Rebates
Smart Thermostat $60-$90 Rebates
Reflective Window Films $60-$90 No/Low Cost
Non-essential Lighting $32-$48 Rebates
Get an A/C Check-up $29-$43 No/Low Cost
view more
Detailed Analysis offers a more in-depth look at energy use and savings. ... Continue to refine your energy management strategy.
DETAILED ANALYSIS
Other Tools
Benchmark
How does your energy use compare to similar businesses?
My Project Plan
Review and track the projects of interest that you've checked-off.
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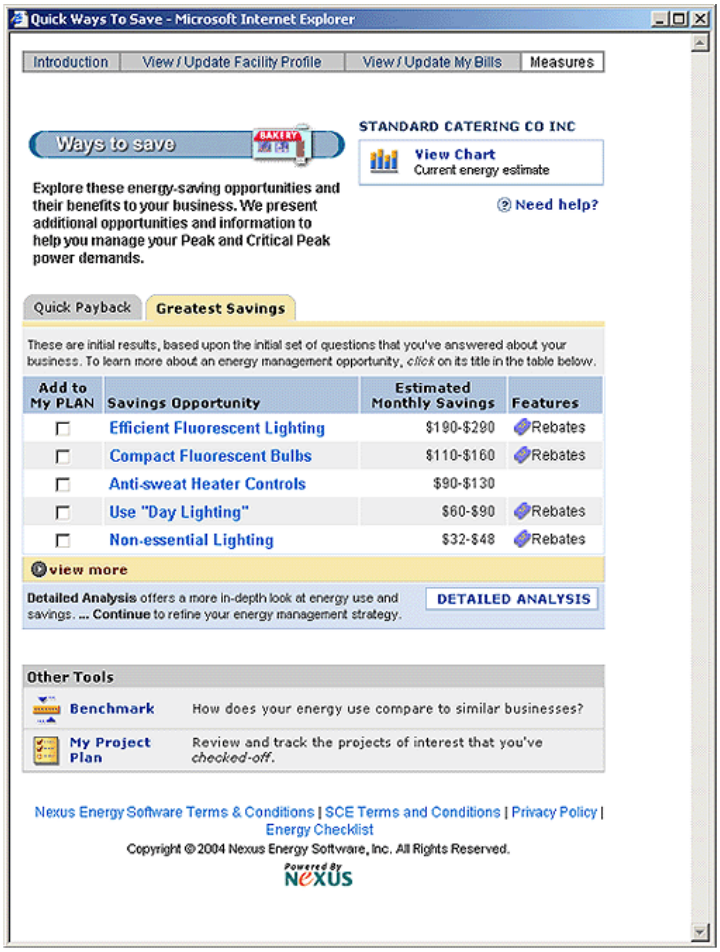
Quick Ways To Save - Microsoft Internet Explorer
Introduction
View / Update Facility Profile
View / Update My Bills
Measures
Ways to save
STANDARD CATERING CO INC
View Chart
Current energy estimate
Need help?
Explore these energy-saving opportunities and their benefits to your business. We present additional opportunities and information to help you manage your Peak and Critical Peak power demands.
Quick Payback
Greatest Savings
These are initial results, based upon the initial set of questions that you've answered about your business. To learn more about an energy management opportunity, click on its title in the table below.
Add to My PLAN
Savings Opportunity
Estimated Monthly Savings
Features
Efficient Fluorescent Lighting $190-$290 Rebates
Compact Fluorescent Bulbs $110-$160 Rebates
Anti-sweat Heater Controls $90-$130
Use "Day Lighting" $60-$90 Rebates
Non-essential Lighting $32-$48 Rebates
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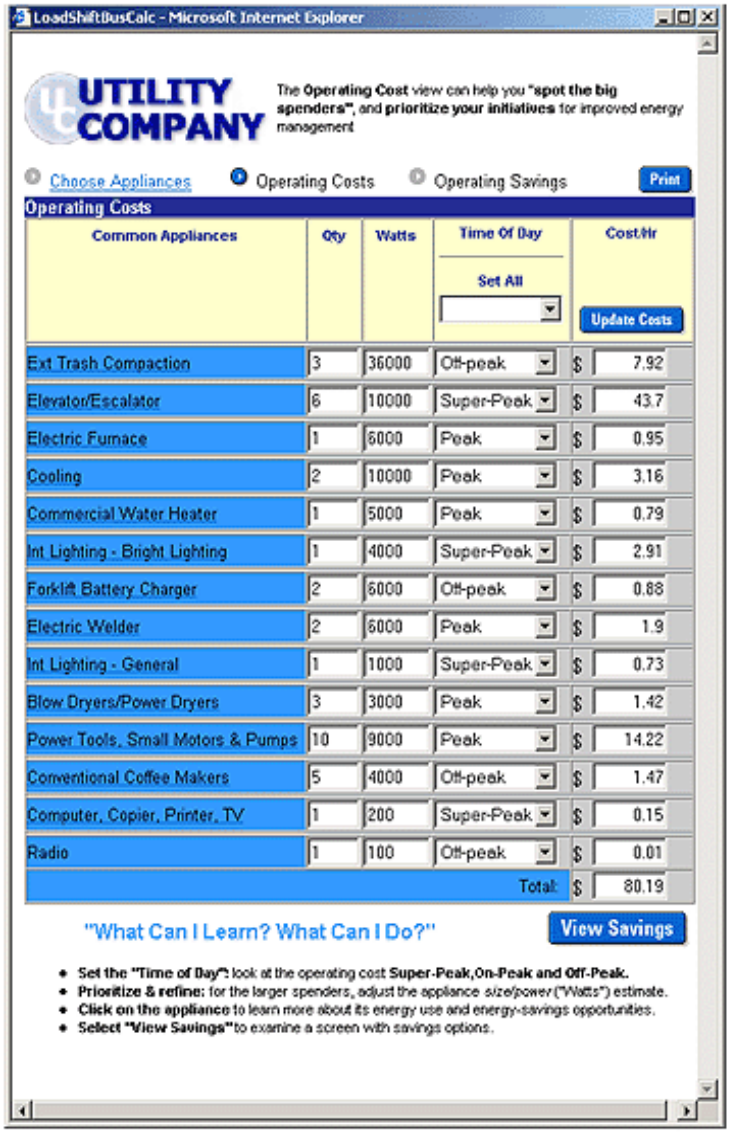
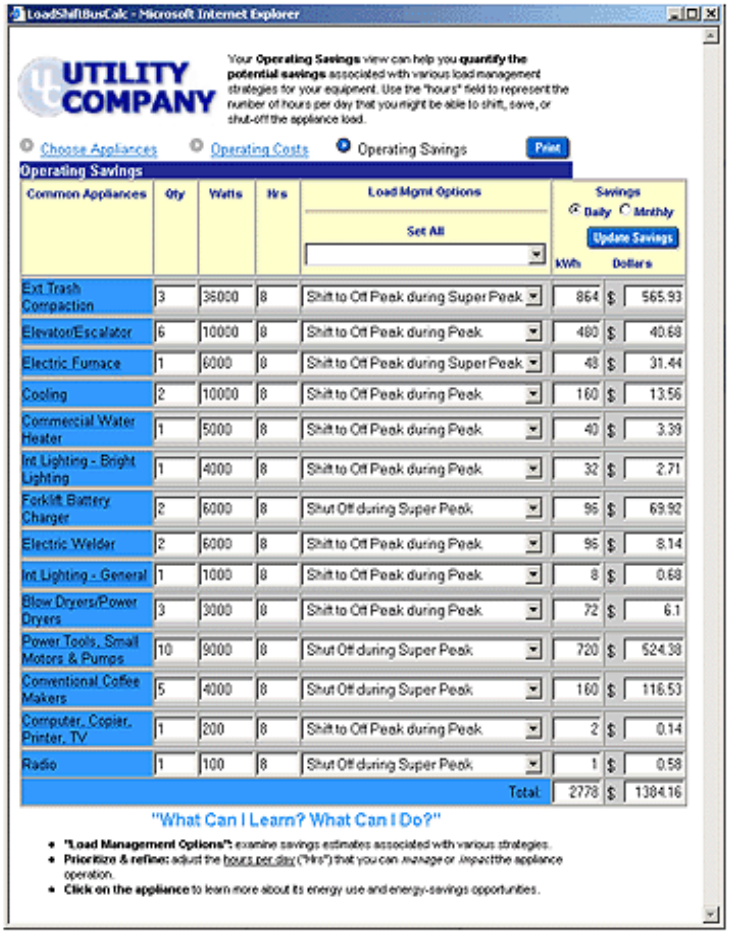
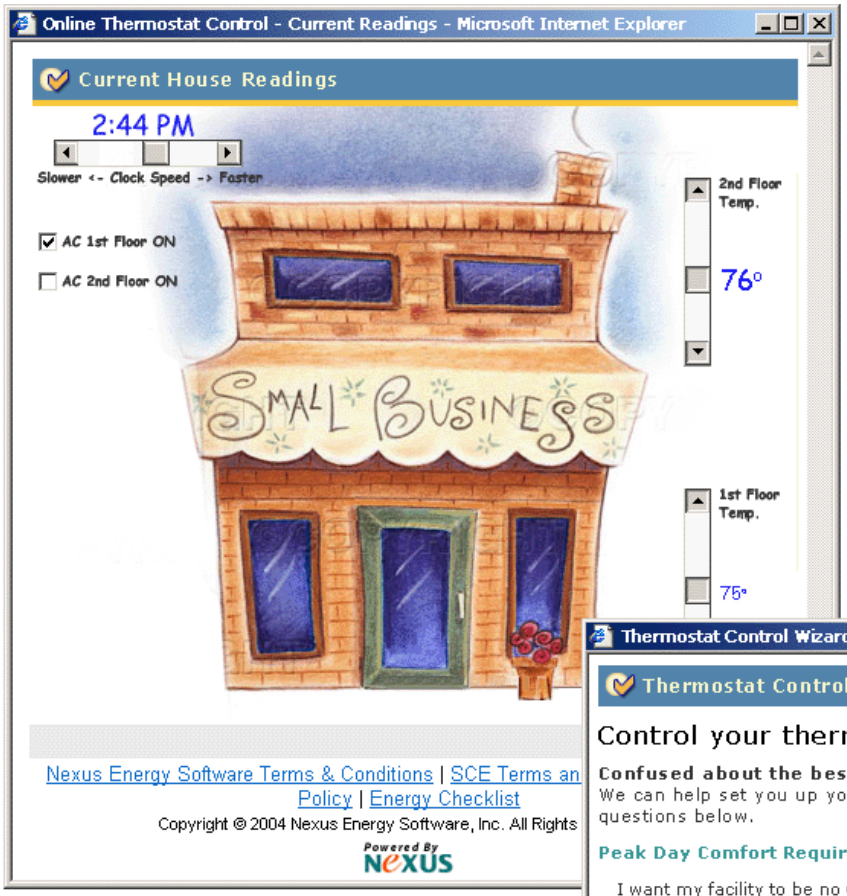
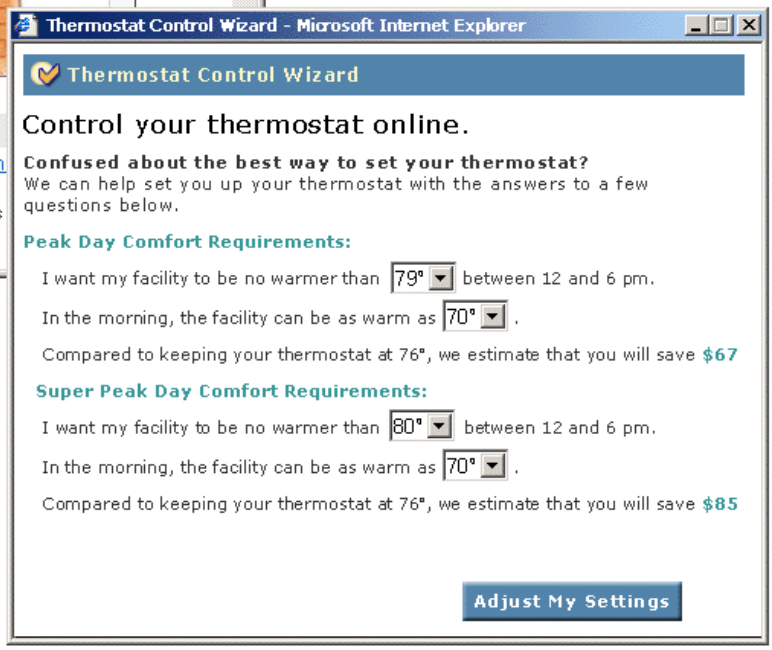
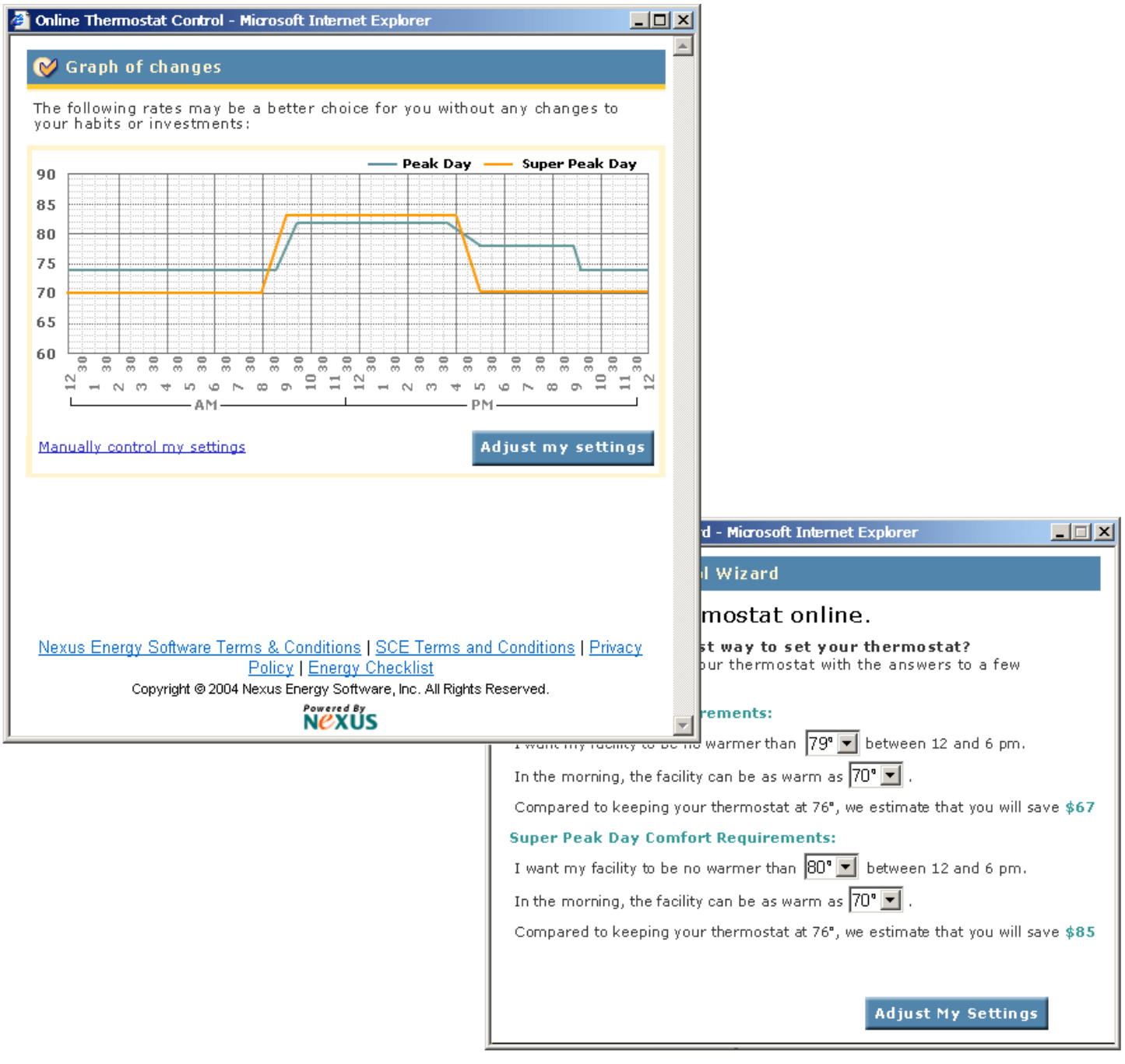

LoadShiftBusCalc - Microsoft Internet Explorer
UTILITY COMPANY
The Operating Cost view can help you "spot the big spenders", and prioritize your initiatives for improved energy management
Choose Appliances
Operating Costs
Operating Savings
Print
Operating Costs
Common Appliances
Qty
Watts
Time Of Day
Set All
Cost/Hr
Update Costs
Ext Trash Compaction 3 36000 Off-peak $ 7.92
Elevator/Escalator 6 10000 Super-Peak $ 43.7
Electric Furnace 1 6000 Peak $ 0.95
Cooling 2 10000 Peak $ 3.16
Commercial Water Heater 1 5000 Peak $ 0.79
Int Lighting - Bright Lighting 1 4000 Super-Peak $ 2.91
Forklift Battery Charger 2 6000 Off-peak $ 0.88
Electric Welder 2 6000 Peak $ 1.9
Int Lighting - General 1 1000 Super-Peak $ 0.73
Blow Dryers/Power Dryers 3 3000 Peak $ 1.42
Power Tools, Small Motors & Pumps 10 9000 Peak $ 14.22
Conventional Coffee Makers 5 4000 Off-peak $ 1.47
Computer, Copier, Printer, TV 1 200 Super-Peak $ 0.15
Radio 1 100 Off-peak $ 0.01
Total: $ 80.19
"What Can I Learn? What Can I Do?"
View Savings
Set the "Time of Day": look at the operating cost Super-Peak,On-Peak and Off-Peak.
Prioritize & refine: for the larger spenders, adjust the appliance size/power ("Watts") estimate.
Click on the appliance to learn more about its energy use and energy-savings opportunities.
Select "View Savings" to examine a screen with savings options.


LoadShiftBusCalc - Microsoft Internet Explorer
UTILITY COMPANY
Your Operating Savings view can help you quantify the potential savings associated with various load management strategies for your equipment. Use the "hours" field to represent the number of hours per day that you might be able to shift, save, or shut-off the appliance load.
Choose Appliances
Operating Costs
Operating Savings
Print
Operating Savings
Common Appliances
Qty
Watts
Hrs
Load Mgmt Options
Set All
Savings
Daily
Monthly
Update Savings
kWh
Dollars
Ext Trash Compaction 3 36000 8 Shift to Off Peak during Super Peak 864 $ 565.93
Elevator/Escalator 6 10000 8 Shift to Off Peak during Peak 480 $ 40.68
Electric Furnace 1 6000 8 Shift to Off Peak during Super Peak 48 $ 31.44
Cooling 2 10000 8 Shift to Off Peak during Peak 160 $ 13.56
Commercial Water Heater 1 5000 8 Shift to Off Peak during Peak 40 $ 3.39
Int Lighting - Bright Lighting 1 4000 8 Shift to Off Peak during Peak 32 $ 2.71
Forklift Battery Charger 2 6000 8 Shut Off during Super Peak 96 $ 69.92
Electric Welder 2 6000 8 Shift to Off Peak during Peak 96 $ 8.14
Int Lighting - General 1 1000 8 Shift to Off Peak during Peak 8 $ 0.68
Blow Dryers/Power Dryers 3 3000 8 Shift to Off Peak during Peak 72 $ 6.1
Power Tools, Small Motors & Pumps 10 9000 8 Shut Off during Super Peak 720 $ 524.38
Conventional Coffee Makers 5 4000 8 Shut Off during Super Peak 160 $ 116.53
Computer, Copier, Printer, TV 1 200 8 Shift to Off Peak during Peak 2 $ 0.14
Radio 1 100 8 Shut Off during Super Peak 1 $ 0.58
Total: 2778 $ 1384.16
"What Can I Learn? What Can I Do?"
"Load Management Options": examine savings estimates associated with various strategies.
Prioritize & refine: adjust the hours per day ("Hrs") that you can manage or impact the appliance operation.
Click on the appliance to learn more about its energy use and energy-savings opportunities.

Online Controls:






Online Thermostat Control - Microsoft Internet Explorer
Graph of changes
The following rates may be a better choice for you without any changes to your habits or investments:
Peak Day
Super Peak Day
90
85
80
75
70
65
60
AM
PM
Manually control my settings
Adjust my settings
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- Microsoft Internet Explorer
l Wizard
mostat online.
st way to set your thermostat?
ur thermostat with the answers to a few
rements:
warmer than 79° between 12 and 6 pm.
In the morning, the facility can be as warm as 70° .
Compared to keeping your thermostat at 76°, we estimate that you will save $67
Super Peak Day Comfort Requirements:
I want my facility to be no warmer than 80° between 12 and 6 pm.
In the morning, the facility can be as warm as 70° .
Compared to keeping your thermostat at 76°, we estimate that you will save $85
Adjust My Settings