UNDERSTANDING DEMAND RESPONSE OPPORTUNITIES AND BARRIERS: RESULTS FROM A COMPREHENSIVE MARKET ANALYSIS

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Introduction

Although numerous evaluations of demand response (DR) programs have been published to date, there have been comparatively few studies that focus on DR market maturity and receptivity for these programs. In this paper, we present results from a quantitative survey of the eligible market of non-participants in DR programs targeting large commercial and industrial (C&I) customers in California conducted in March 2004.[a] This work was part of a larger, two-year evaluation of large C&I DR programs performed under the guidance of an advisory committee consisting of representatives from the three investor-owned utilities, the California Energy Commission (CEC), and the California Public Utilities Commission (CPUC).[b] The goal of the larger evaluation effort was to provide feedback to program managers and policy makers to help improve programs in the short-term for program years 2004 and 2005 and, in the long-term, to meet the DR goals established by the CPUC for program year 2007.[c] One of the key tasks of the evaluation was to carry out an end-user market assessment that focused on demand response familiarity, receptivity, barriers, opportunities, and potential. Current participants in California's large C&I DR programs represent a fairly small portion of the potential market for these programs. These customers were studied through a variety of evaluation tasks focused on program participants. To complement this participant research, several data collection and research activities were also designed to focus on non-participants, which comprise the vast majority of the market.[d]

The survey described in this paper sought to improve our understanding of large C&I customers (the greater than 200 kW market for PG&E and SCE, greater than 100kW for SDG&E) that were not participating in the Demand Bidding Program (DBP) or Critical Peak Pricing (CPP) tariffs as of March 2004.[e] The specific objectives of the survey were to obtain statistically reliable data on the characteristics, motivations, awareness, knowledge, and infrastructure of the non-participating population. A follow-up survey of the same population is currently in the field as part of the 2005 DR evaluation activities and builds on the results presented here.

The remainder of the paper is organized as follow. First we briefly summarize the features of the 2004 DBP and CPP programs and describe the methodology developed for this study. Next we present some of the key findings related to DR potential, DR program awareness and familiarity, barriers to participation, likelihood of future participation, and building automation. Finally, we discuss the implications of these findings with regards to DR program design, marketing, and administration.

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[a] In this paper, references to "California" DR programs refer to those administered by the three investor-owned utilities – Pacific Gas & Electricity (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E).
[b] See Hungerford et al (2005) for a summary of the 2004 DR evaluation activities, Quantum Consulting (2004a) for the full 2004 evaluation report, and Quantum Consulting (2004b) for the full report on the non-participant market survey.
[c] The CPUC established quantitative DR goals in decision D.03-06-032 (CPUC, 2003) as a part of proceeding R.02-06-001.
[d] Overall, the eligible non-participants comprised 97.7 percent of the total eligible DBP population (19,406 non-participants out of 19,863 eligible) and 99.6 percent of the total eligible CPP population sites (19,027 non-participants out of 19,097 eligible).
[e] Note that the population of eligible customers for this survey does not include direct access (DA) customers, as these customers were ineligible for the 2004 DBP and CPP programs at the time of this research.

Overview of 2004 DBP and CPP Programs

Critical Peak Pricing Tariff

The 2004 CPP tariff was a voluntary summer season program designed to encourage customers with demands greater than 200 kW to shift some of their summertime power usage to the mid- and off-peak time periods during critical peak times. The rate included increased prices during 6 or 7 hours (Noon to 6pm for PG&E and SCE, 11am to 6pm for SDG&E) for up to 12 "Critical Peak Pricing" days and reduced prices during non-critical-peak periods. Specific prices in the tariff were applied based on participating customers "Otherwise Applicable Tariff" (OAT). Critical peak prices varied from 5 to 10 times OAT depending on the utility.

Demand Bidding Program

The 2004 DBP was a voluntary demand-bidding program that offered incentives to customers for reducing energy consumption and demand during specific DBP event periods. The program was available year round to bundled service customers with demands greater than 200 kW and who could commit to reduce a minimum of at least 100 kW per hour (later reduced to 50kW) during a DBP event period. Bidding was an offer to curtail usage by 100 kW or more for two or more hours during program "events" and receive payment equal to the amount of the estimated reduction times the predetermined DBP price incentive. DBP price incentives ranged from $0.15 to $0.50 per kWh reduced depending on market prices and whether the event was a day-of or day-ahead event.

Transitional Incentives

The following two incentives were offered in 2004 to encourage customers to participate in the 2004 DBP and CPP programs:

- The Bill Protection Incentive was intended to assure participants they would not pay more under the new CPP tariff than they would have under their otherwise applicable tariff (OAT) for the first 14 months they participate in the CPP program. Originally, to receive the incentive, the customer must have reduced on-peak usage by an average of 3 percent for each CPP event during those 14 months. Subsequently, based on utilities' requests to the CPUC to modify the incentive, the 3 percent requirement was eliminated.

- The Technical Assistance Incentive offered CPP or DBP participants a cash incentive of up to $50 per kW of estimated curtailable on-peak load reduction to cover the cost of load reduction feasibility studies conducted by CEC-approved professional engineers. Customers were to receive half the incentive upon certification; to receive the other half, customers had to provide actual load reductions averaging at least 50 percent of the certified amount during CPP or DBP peak events. No customers ultimately went through the process of obtaining these incentives.

Methodology

This section describes the methods used to conduct the DR market survey and analysis. Below, we briefly describe the population frame, sample population, survey administration, and the weighting scheme developed to aggregate the results.

Population Frame

A population frame was developed that contained all PG&E, SCE and SDG&E accounts that were eligible for the DBP and/or CPP programs in 2004. Eligibility for these programs was primarily based upon the account having a maximum annual demand greater than 200kW (100kW for SDG&E) and not being a Direct Access account. CPP had an additional requirement that the account not be participating in a conflicting load management program.[f]

Accounts in the population frame were assigned flags indicating their size and business type. These flags were created on an account level, a premise level and a customer level. The premise level flags were selected based on the largest account at that premise. In a similar manner, the customer level flags were selected based on the largest account for that customer. The size flags were defined based on an account's annual maximum demand. Small customers were defined as having a max demand between 200 kW (100 kW was the cutoff for SDG&E) and 500 kW. Medium customers were those with max demand between 500 kW and 1000 kW. Large customers were those with max demand between 1000 kW and 2000 kW. Finally, extra large customers were those with max demand greater than 2000 kW.

The business type flags were defined based on SIC code for SCE and SDG&E and a mapping of NAICS to SIC codes for PG&E. The nine business types used for this evaluation were Office, Retail/Grocery, Institutional, Other Commercial, Transportation/Communication/Utility, Petroleum/Plastic/Rubber/Chemicals, Mining/Metals/Stone/Glass/Concrete, Electronic/Machinery/Fabricated Metals, and Other Industrial/Agricultural.

The size and business type distributions of the accounts in the population frame, along with the sum of their non-coincident demand (in MW) and energy consumption (in GWh) are presented in Table 1. This exhibit also displays the breakdown of accounts eligible for CPP and DBP across the four sizes and nine business types. Note that the customer demand coincident with utility system peaks will be significantly less than the non-coincident demand figures shown in Table 1.

[f] Specifically, participants in the Base Interruptible Program, the Optional Binding Mandatory Curtailment Program, or the Scheduled Load Reduction Program were not eligible to concurrently participate in the 2004 CPP program.

Table 1. Population Frame of 2004 DBP and CPP Eligible Population

3 IOUs	Accounts in Frame	Accounts in Frame MW Sum*	Eligible Accounts	Eligible Accounts MW Sum*	Eligible Account GWh Sum	Eligible for CPP	Eligible for DBP
Size							
Very Small (100-200 kW) - SDG&E Only	2,406	344	2,076	297	897	1,989	2,076
Small (200-500 kW)	13,684	4,420	11,426	3,666	12,337	11,292	11,413
Medium (500-1000 kW)	4,790	3,302	3,957	2,733	9,756	3,744	3,954
Large (1000-2000 kW)	1,818	2,486	1,460	1,991	7,320	1,272	1,460
Extra Large (2000+ kW)	1,299	7,626	960	5,334	13,380	800	960
Business Type							
Commercial and TCU							
Office	3,609	2,328	3,308	2,120	6,192	3,267	3,298
Retail/Grocery	4,034	1,729	2,220	964	3,966	2,215	2,219
Institutional	4,253	2,868	3,703	2,040	6,254	3,658	3,703
Other Commercial	3,288	1,982	2,810	1,707	6,367	2,743	2,808
Transportation/Communication/Utility	1,901	1,524	1,601	1,209	2,762	1,484	1,599
Industrial and Agricultural							
Petroleum, Plastic, Rubber and Chemicals	907	1,350	805	1,108	3,411	697	805
Mining, Metals, Stone, Glass, Concrete	725	1,177	646	716	2,891	540	646
Electronic, Machinery, Fabricated Metals	1,886	1,767	1,638	1,160	4,269	1,555	1,638
Other Industrial and Agriculture	2,773	2,548	2,552	2,109	6,923	2,348	2,551
Unclassified							
Unknown	622	903	596	887	655	590	596
Totals	23,997	18,177	19,879	14,021	43,690	19,097	19,863

*Non-coincident customer peak demand

Sample Selection

Preparing the survey sample dataset began by creating a statewide database of premises eligible to participate in the DR Programs, but not currently enrolled. The sample design targeted 500 eligible non-participating premise decision-makers across the three utilities (PG&E, SCE and SDG&E). Primary quotas were assigned based upon four customer sizes and nine business types with roughly equal points allocated to each category to ensure comprehensive representation. Quotas were further specified by IOU service territory (50 completes for SDG&E and 225 completes for both PG&E and SCE). The sample was then reduced to ensure multiple premises with the same decision maker would not be contacted more than once. The final sample frame included decision-makers who may be responsible for one or more accounts and/or premises.

Data Collection

Telephone interviews were conducted with the sample of customers eligible for the 2004 large C&I DR programs but not participating as of March 2004. The survey was implemented by Quantum Consulting's Computer Aided Telephone Interview (CATI) center. Table 2 presents the final distribution of the completed non-participant interviews by size, business type and utility.

Table 2. Final Distribution of Survey Completes by Industry, Size and Utility

	All			Small (100/200-500 kW) *			Medium (500-1000 kW)			Large (1000-2000 kW)			Extra Large (2000+ kW)		
Industry	PG&E	SCE	SDG&E	PG&E	SCE	SDG&E	PG&E	SCE	SDG&E	PG&E	SCE	SDG&E	PG&E	SCE	SDG&E
Office	30	21	8	7	2	2	4	9	2	11	10	2	8	0	2
Retail/Grocery	26	33	7	7	8	2	6	5	2	7	9	2	6	11	1
Institutional	30	24	9	7	5	2	6	8	1	3	6	2	14	5	4
Other Commercial	24	30	5	7	8	2	6	9	1	7	6	2	4	7	0
Transportation, Communication, Utility	26	26	2	6	7	2	6	9	0	6	4	0	8	6	0
Petroleum, Plastic, Rubber and Chemicals	24	28	5	5	5	2	8	9	1	7	9	2	4	5	0
Mining, Metals, Stone, Glass, Concrete	29	21	4	7	2	2	4	9	1	9	8	1	9	2	0
Electronic, Machinery, and Fabricated Metals	19	25	7	7	8	1	2	5	3	5	7	1	5	5	2
Other Industrial and Agriculture	18	16	3	6	6	1	4	5	2	5	2	0	3	3	0
Total	226	224	50	59	51	16	46	68	13	60	61	12	61	44	9

Weighting

The results of the non-participant quantitative survey were then aggregated using two distinct weighting schemes. The primary weighting scheme was based on energy usage. This weight was calculated based on the ratio of the energy use represented by the surveyed population relative to the respective energy used in the eligible population for each size, business type and utility cell. These weights were then adjusted according to the usage associated with each decision-maker within the cell. The second sample weight was very similar, but based on the number of premises represented in the surveyed population versus the total eligible population.

The sample frame consisted of many decision-makers who were responsible for one or more accounts and/or premises. In order to calculate the appropriate energy weights, it was necessary to determine the appropriate energy consumption (kWh) for each decision-maker. Within the survey, decision-makers were asked how many facilities in the same IOU service territory they were responsible for. They were also asked how many of these facilities their survey responses were applicable to. CIS data were used to corroborate self-reported responses. The additional energy usages of other similar facilities under the decision-makers management are used to adjust the survey weight. By associating survey responses with more than one facility, a measurable variance in the relative importance of surveys within a cell was introduced. Thus, the weight assigned to surveys within a given cell was allocated proportionally according to the energy usage represented by each survey respondent.

Key Findings

The market survey of non-participants in the DBP and CPP programs provides a wealth of information that can be used to better understand both barriers and opportunities for demand response. When reviewing and interpreting the survey results, it is important to consider that the market for the current DR programs is still in an early, developmental stage, and that customers' responses to the questions asked are influenced by a wide variety of factors including their experience with the recent California electricity crisis, their experience with other related programs (e.g., interruptible programs), and their previous exposure to time-of-use rates. The results of the survey have both positive and negative implications with respect to the near-term prospects for increasing participation in the DBP and CPP programs. Because this survey was one part of an overarching evaluation effort, and because the programs are still relatively new and evolving, we believe these results should be used to better understand the potential market for DR and develop ways of improving program offerings and customer support, rather than being used to pre-maturely assess whether the programs are destined to succeed or fail relative to current overall DR load reduction goals. With that perspective in mind, highlights and implications of our key findings are discussed below.

Familiarity with DR Programs

Customers were asked a battery of questions designed to gain an understanding of their level of familiarity with the general DR concept and specific DR programs and incentives. Overall, familiarity with the DR concept was quite high with 92 percent of the market indicating some level of familiarity and half reporting they were "very familiar". Levels of familiarity reported for the DBP and CPP programs were reasonably high and similar (64 percent versus 61 percent of the market, respectively). The main source of information about these programs came from personal contact with their utility.

DR Barriers

Customers indicated that there are numerous barriers that limit their ability and willingness to participate in DR programs. In rating potential barriers to participation and implementation, the number one concern for the market as a whole was "effects on products or productivity" as Figure 1 shows below. In fact, over 60 percent of market rated this concern a 5, meaning it was rated as very significant. The next three most significant barriers were "amount of potential bill savings", "level of on-peak prices or non-performance penalties", and "inability to reduce peak loads". Forty-seven percent of respondents rated these three concerns as very significant. The least significant concern among the respondents was "inadequate program information", which illustrates that simply increasing the level of marketing of these programs will not, on its own, do much to increase participation.

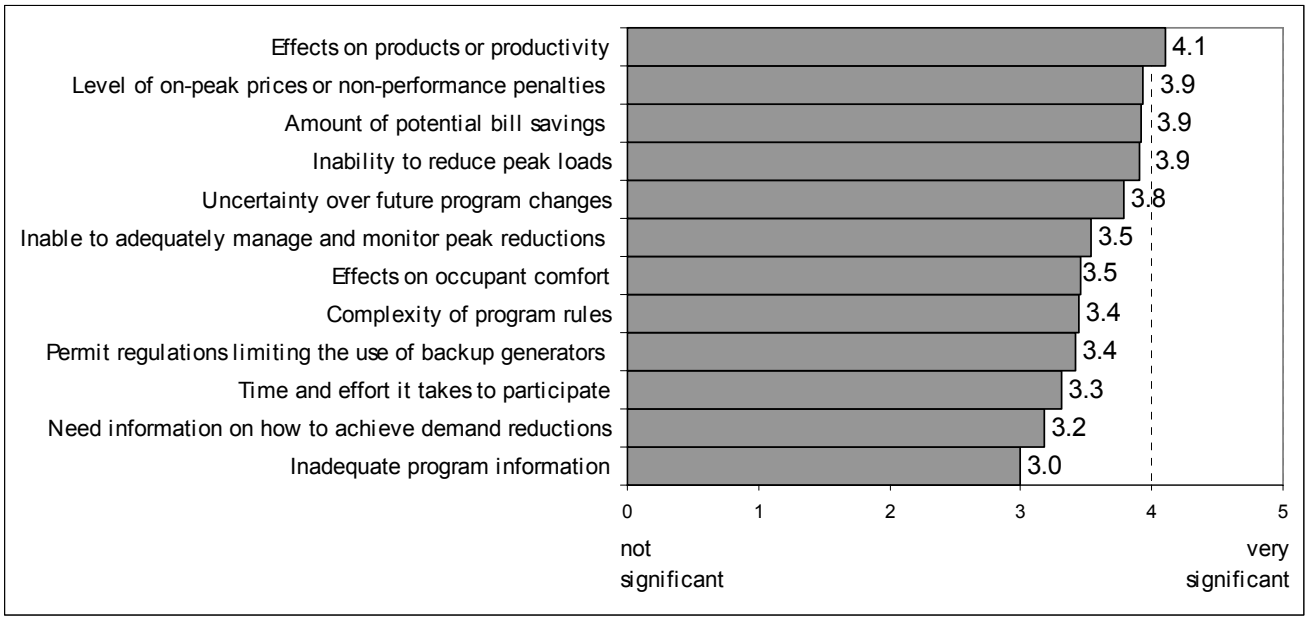

Figure 1. Customer-Rated Significance of Potential Barriers to Program Participation (Mean = 3.6)

While the average significance rating for most barriers ranged between 3 and 4 (the mean was 3.6), there was some interesting variation among the different concerns among industries and customer sizes. Table 3 shows the mean values of customer-rated significance of each potential barrier by business type and customer size. For small and medium sized customers, the two most significant concerns were "amount of potential bill savings" and "level of on-peak prices or non-performance penalties". This result indicates that the smaller scale of operations among these customers makes them much more sensitive to short-term financial concerns compared to larger customers despite the fact that self-reported energy costs represent a smaller share of total annual operating costs for smaller customers compared to larger customers (13 percent versus 15 percent, respectively). Smaller customers are also

more likely to be Retail/Grocery businesses that tend to encounter a cost-competitive, low-margin marketplace. "Complexity of program rules" was also a more significant concern for smaller customers who most likely are not as used to dealing with complicated tariffs or programs and probably do not have sufficient time or resources available to invest in understanding them.

Table 3. Customer-Rated Significance of Barriers by Business Type and Size

		Business Type									Business Size			
	Total	Office	Retail/Grocery	Institutional	Other Commercial	Transportation, Communication, Utility	Petroleum, Plastic, Rubber and Chemicals	Mining, Metals, Stone, Glass, Concrete	Electronic, Machinery, and Fabricated Metals	Other Industrial and Agriculture	Extra Large (2000+ kW)	Large (1000-2000 kW)	Medium (500-1000 kW)	Small (100/200-500 kW) *
Number of Respondents	491	60	36	65	62	49	56	54	57	52	111	132	123	125
Inadequate program information	2.99	3.09	3.12	2.80	3.26	2.57	3.50	2.44	2.88	2.98	2.61	3.00	3.18	3.25
Need information on how to achieve demand reductions	3.18	3.23	3.48	3.24	3.43	2.53	3.58	2.33	3.19	3.11	2.63	3.19	3.33	3.64
Time and effort it takes to participate	3.31	3.32	3.69	3.07	3.41	3.28	3.52	2.97	3.12	3.39	3.31	3.14	3.23	3.47
Permit regulations limiting the use of backup generators	3.42	3.80	3.58	3.35	3.22	3.16	3.25	3.43	2.97	3.64	3.58	3.63	3.16	3.31
Complexity of program rules	3.44	3.43	3.97	3.20	3.89	3.77	2.81	2.85	3.40	3.42	2.94	3.41	3.65	3.83
Effects on occupant comfort	3.46	4.46	3.66	4.48	3.94	2.45	2.70	1.88	3.63	2.41	3.00	3.47	3.89	3.62
Inable to adequately manage and monitor peak reductions	3.54	3.83	4.02	3.91	3.62	3.24	2.77	2.86	3.54	3.35	2.97	3.49	3.60	4.11
Uncertainty over future program changes	3.79	3.73	4.48	3.89	3.90	3.47	3.74	3.69	3.82	3.42	3.59	3.66	3.88	4.00
Inability to reduce peak loads	3.91	3.80	4.25	4.08	3.75	3.23	4.15	3.83	4.19	3.84	3.75	3.92	3.81	4.15
Amount of potential bill savings	3.92	3.86	4.14	4.14	3.88	3.97	3.62	3.94	3.58	4.03	3.69	3.78	3.93	4.24
Level of on-peak prices or non-performance penalties	3.93	3.89	4.43	4.01	4.17	3.82	3.72	3.64	3.96	3.62	3.64	3.83	4.04	4.19
Effects on products or productivity	4.10	3.75	4.56	3.58	3.89	3.96	4.67	4.30	4.79	4.11	4.23	4.06	3.91	4.15

* The minimum cutoff for program participation is a maximum yearly demand of ≥ 100kW for customers in SDG&E territory and ≥ 200kW for customers in SCE and PG&E territory.

For larger customers (peak demand > 1,000 kW), "effects on products or productivity" was the largest concern. For many of these large customers, productivity, throughput, and on-time delivery are what keeps them in businesses, and thus cannot be sacrificed at any cost. This was also a large concern for Retail/Grocery businesses that, for example, may encounter serious losses if their products spoil due to a temperature fluctuation in their cold storage cases.

Not surprisingly, Institutional, Office, and Other Commercial businesses are much more concerned about occupant comfort than Industrial customers. Although degradations in occupant comfort in industrial settings may lead to a reduction in productivity, they are not as likely to lose their customers to competitors as a result of uncomfortable surroundings.

DR Potential

Several questions were asked of customers to develop inputs for estimating the magnitude of load reductions potentially available in the large nonresidential markets of the three IOUs. It is important to note that the resulting estimates of potential are based on customer self-reports and have not been independently confirmed with on-site engineering analyses. Somewhat surprisingly, the vast majority of the market (92%) indicated that they were *willing to consider* taking specific DR actions on a limited number of hot summer afternoons if motivations were sufficient. In terms of the self-reported *capability* to temporarily reduce a portion of their load assuming sufficient financial motivation, the average technical DR potential reported from the market was 16 percent. However, reported technical potential varied widely by market segment, as Figure 2 shows. Based on estimates of the range of coincident peak demand for this population (~10,000 MW), we estimate the total technical DR potential of the large C&I market to be roughly 1,600 MW.

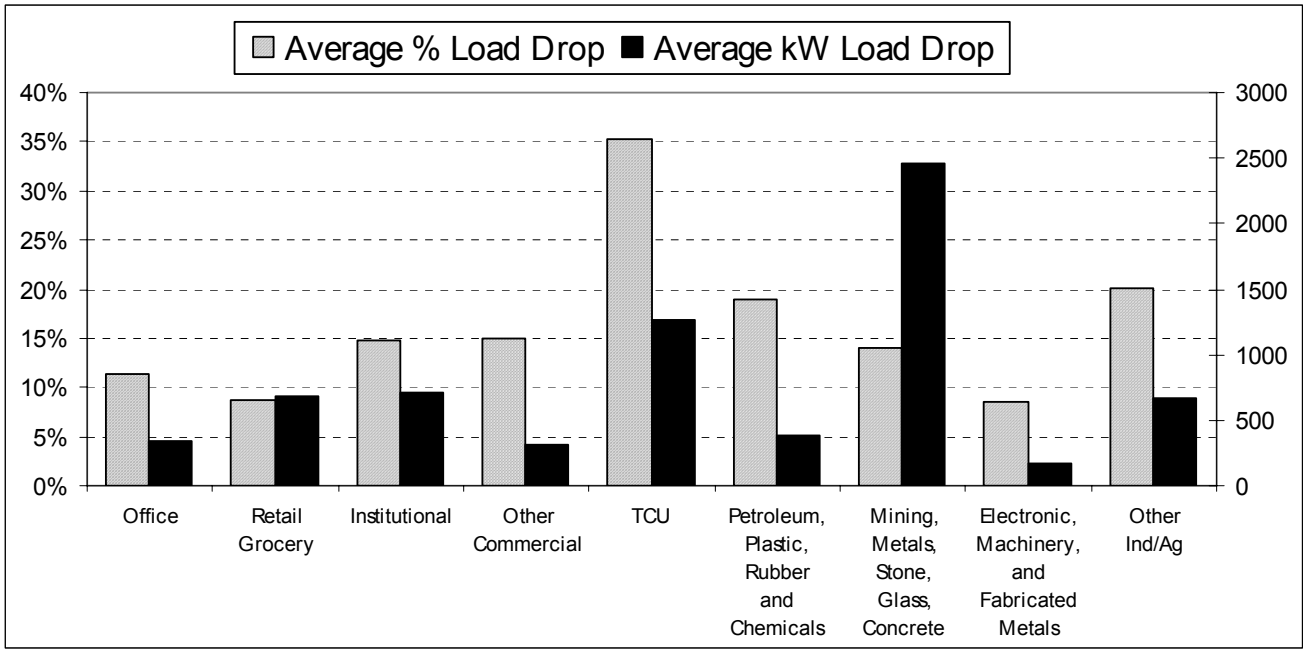

Figure 2. Average Technical Potential as Average Percentage Load Drop and as Average, Non-Coincident kW Load Drop

When the market was broken down by whether or not the customer was participating in interruptible programs, we found a significant difference between these two populations.[g,h] Customers who participated in an interruptible program reported their technical potential was nearly 30 percent, which was more than double what was reported by customers who were not participating in interruptible programs (14 percent). Although only 67 of the 500 customers indicated they were participating in an interruptible program (13 percent), their maximum demand represented 21 percent of the total population's non-coincident demand. Figure 3 shows the average technical potential as a percentage of total load for participants and non-participants in interruptible programs.

[g] Interruptible programs include the Base Interruptible Program, the Optional Binding Mandatory Curtailment Program, the Agricultural and Pumping Interruptible Program, the Rolling Blackout Protection Program, and traditional interruptible service tariffs ("Schedule 19/20 Nonfirm" in PG&E, "Rate I-6" in SCE, and "Rate AL TOU CP" in SDG&E).

[h] Note that the CPUC draws a distinction between interruptible programs, which are day-of notification and reliability-triggered, and day-ahead notification programs like DBP and CPP which are more associated with system load triggers.

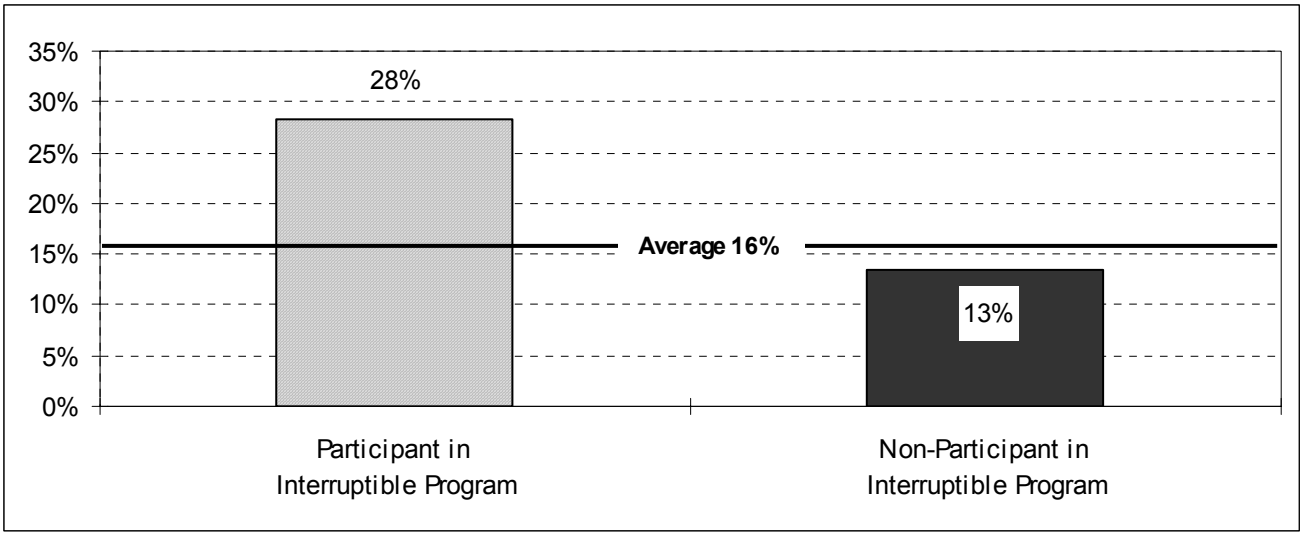

Figure 3. Average Technical Potential as a Percentage of Total Load for Participants and Non-Participants in Interruptible Programs

To benchmark the technical potential results described above, the survey included two questions that sought more information on how much financial motivation customers would need to achieve specific levels of DR. Specifically, we asked what percentage of their annual electricity bill they would need to save as an incentive to reduce their demand by 5 percent and 15 percent, respectively, for a few hours in the late afternoon on four non-sequential weekdays in the summer. As Figure 4 shows, nearly half of the market responded that either no monetary amount would be adequate to compensate such load reductions or that they did not know what level of bill savings they would require for such reductions.

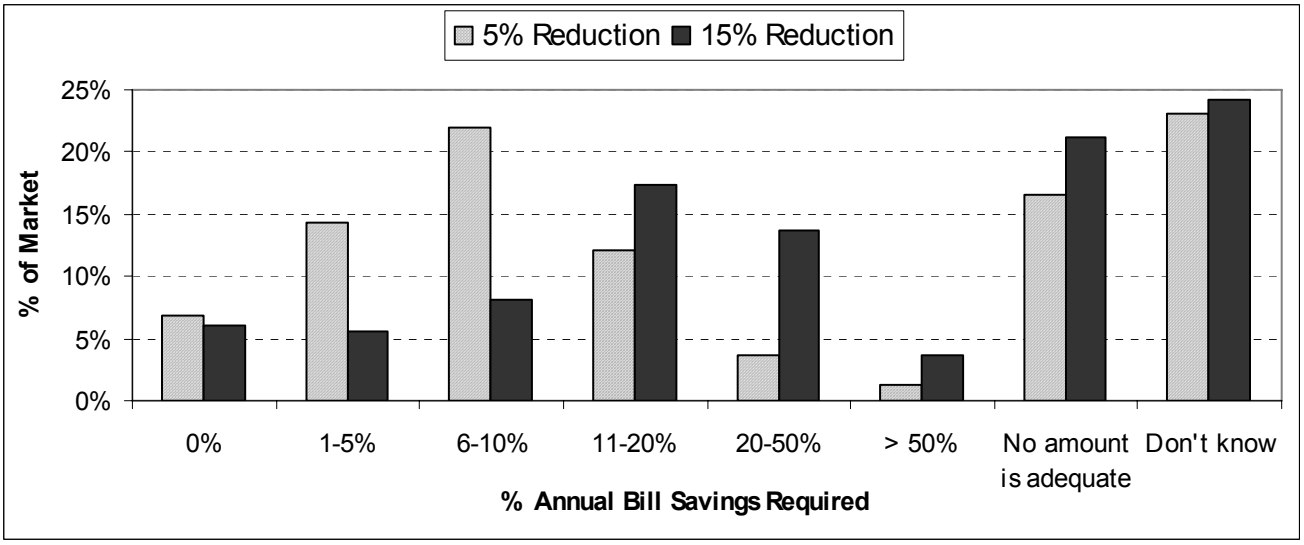

Figure 4. Percent Annual Bill Savings Required to Reduce Demand by 5 and 15 Percent on Four Non-Sequential Summer Weekday Afternoons

By taking the proportion of the market that indicated a level of required bill savings similar to those associated with the current DBP and CPP programs (i.e., less than five percent of annual bills) and multiplying it by the coincident demand of the population, we arrived at a first estimate of economic DR potential, i.e. the DR capability of customers who actually face sufficient financial motivation, of 100 to 200 MW, roughly an order of magnitude lower than our estimate of technical potential.

Likelihood of Participating in DBP/CPP

At the time of this survey, enrollment in both the DBP and CPP programs was low, and we designed a series of questions to explore customers' likelihood of participation based on the level of information they had at the time. Somewhat surprisingly, 19 percent of the market indicated some likelihood that they would participate in either DBP or CPP, and 10 percent said they were "highly" likely. The percentage of customers reporting they are going to participate in either the DBP or CPP program was much larger than the number of customers that have signed up for the programs since the survey.

Likely participants reported the main reason they may participate was to lower their energy bills (54 percent). Other significant reasons reported for considering participation were because there were no risks or penalties associated with program participation and because they believed it would help mitigate power outages. It is important to note that customers mainly participating to avoid outages may be less likely to enter a DBP bid based solely on high market prices unless it seems a blackout is looming. A fairly sizable portion of the market (13 percent) indicated they were likely to participate since doing so fit easily within their normal business operations. Customers who indicated they were unlikely to participate in any of the new DR programs said the main reason was their inability to shed load (53 percent). Financial reasons, conflicts with other program participation, lack of information and concerns over comfort were also reported as reasons for low likelihood to participation.

Effects of Existing TOU Rates and CA Energy Crisis

Customers were asked a series of questions about their current energy rates and what, if any, changes they had made to their energy use in the past as a result of being on time-of-use (TOU) rates or reacting to the California energy crisis. Sixty-seven percent of the market reported to be taking service on TOU rates at the time of the survey.[i] Of this population, roughly half reported they had shifted some of their usage to lower priced hours. The distribution of those taking action to shift load off peak had a fairly similar distribution across small, medium and large sized businesses. Those customers who reported they had shifted usage to lower priced hours were then asked what actions they had taken. Fifty-eight percent said they rescheduled staff/production to off-peak and 21 percent said they reduced the use of certain equipment. On a statewide basis respondents who took these actions, reported they did so equally before and after the California energy crisis.

Fifty-seven percent of the market reported they have made other significant changes in electricity usage since the crisis. Office and Retail/Grocery businesses reported the highest level of changes at 81 percent and 76 percent, respectively. Small and medium sized customers also reportedly made more changes than large and extra large customers. Customers who had taken actions were asked how much they thought their average peak load usage had changed as compared to their peak usage prior to the energy crisis. Nineteen percent reported they were not sure, however the average of the remaining was nearly 10 percent. These results are consistent with those obtained from other surveys of this customer group and the system-wide load reductions documented by the CEC after the energy crisis.[j] The frequency with which the major changes were reported, along with the estimated peak usage reduction that resulted from these changes, are displayed in Figure 5.

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[i] Note that 13 percent reported not knowing what type of rate they were on at the time of the survey. The actual market share of TOU customers in the survey population is much higher, with approximately 90% of all customer accounts taking service on some form of TOU tariff.

[j] See, for example, Quantum Consulting (2004c).

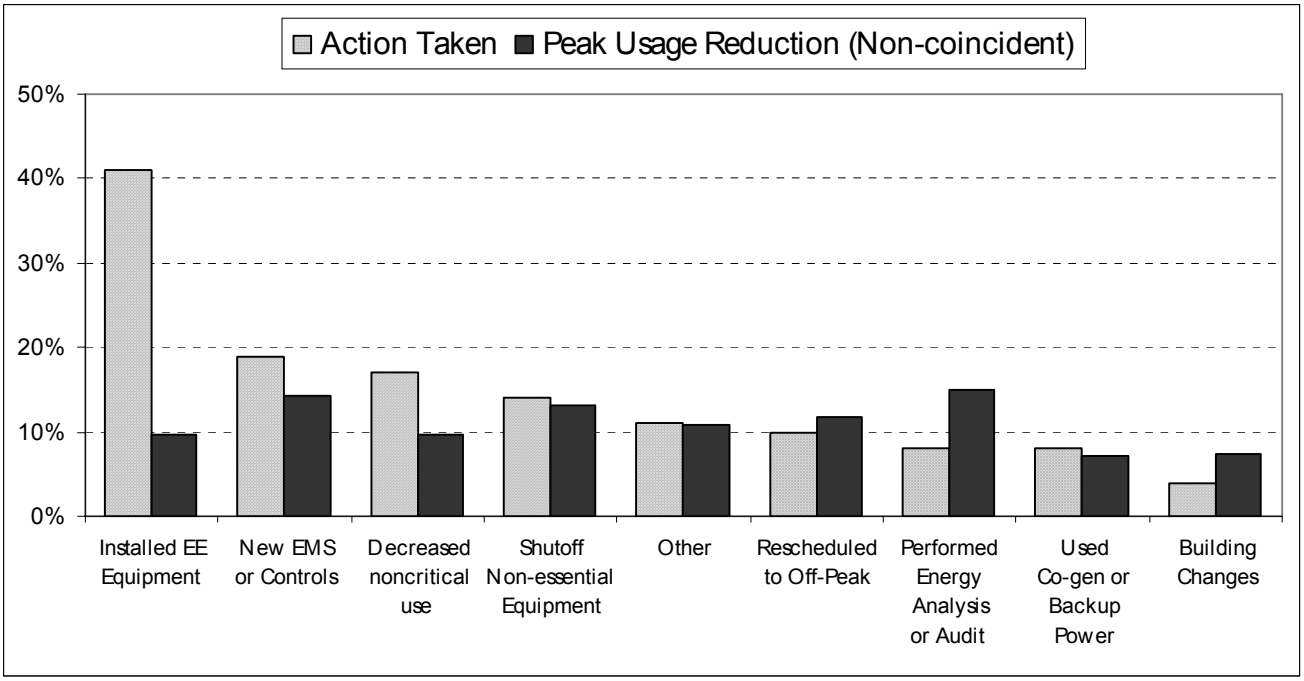

Figure 5. Frequency and Peak Demand Reduction from Customer Actions Since 2000 CA Energy Crisis

Figure 5 illustrates that although installing energy-efficient equipment was the most frequently occurring change (reported by 40 percent of the market who made changes), the portion of the market that reported they had an energy analysis or audit performed reported the largest reduction in their peak load. The second largest reported impact came from installing a new EMS system or other type of control. Note, however, that sample sizes for these actions are small and the results shown in Figure 5 do not capture the effects of multiple actions.

Enhanced/Building Automation

Because building automation and energy information systems can help to facilitate demand response, customers were asked several questions about the relevance and use of such systems currently. Three-quarters of the market indicated that information about building automation and controls was relevant to their business. One-third of the market said they had installed automation investments to manage their energy use within the past two years. Of those who had made the investments, the majority reported they had upgraded their EMS (66 percent). The current level of self-reported building automation was relatively high with 59 percent of the market reporting being able to view hourly demand on their utility's website, 54 percent stating they could automatically control a portion of their energy load on an in-house EMS, and 41 percent able to view hourly demand on an in-house energy information system.[k] Industrial customers reported having increased access to usage information, but less control capability, and institutional and commercial customers reported having increased control capability, but limited usage information.

Implications of Survey Findings

The results of this market assessment point to both opportunities and challenges associated with achieving significant levels of participation in the DBP, CPP, or similar voluntary, price-responsive

[k] In light of recent site-level research conducted by Quantum Consulting, this self-reported estimate appears to be a significant overestimate related to differing perceptions of EMS capabilities that enable DR-type actions.

programs. On the one hand, almost twenty percent of the market reported they are somewhat or very likely to participate in the DBP or CPP (as of March 2004, the time of our survey). Since then, however, actual participation increases have been significantly less than what these self-projections would suggest. This could be due to a number of factors. For example, customers may not believe the level of financial compensation for program participation is acceptable; they may believe it is too difficult to get final internal approval to participate; they may believe participation itself is too complicated or entails significant hassle costs; or they may believe that there is no immediate need for them to participate because power supplies are adequate in the short term. In the case of the CPP, there are additional complexities. For example, customers may not fully understand or trust that they can save money without significant changes in their load profiles.[1]

Despite limited increases in participation in the DBP and CPP since this survey was conducted, our survey results indicate that there is a significant pool of DR potential available as well as a broad willingness to take specific DR actions on a limited basis. What is still somewhat unclear is the extent to which financial versus civic duty or reliability-related motivations are the key to tapping this potential and, concomitantly, how to convert these DR motivations into reliable DR resources.

Specific actions that should be considered in response to the findings from this survey and related research are presented below:

- Consider increasing the financial benefits of program participation (though only if cost-effectiveness can be maintained) or making it even easier for customers to participate in programs (e.g., lower customers' decision making and hassle costs).

- Aggressively market the recent changes in the Bill Protection Incentive for the CPP to ensure customers understand that they can try the tariff with no initial risk.

- Consider reducing the 100 kW DBP bid minimum or otherwise facilitating the participation of chains or other aggregation groups.

- Take steps to actively mitigate the top customer-perceived barriers to program participation, for example:

    - "Effects on Products or Productivity" – Continue utilizing existing and develop additional segment-specific case studies that demonstrate successful customer experiences with DR actions and provide strategies for minimizing or eliminating negative effects.
    - "Inability to Reduce Peak Loads" – Develop and test new approaches to providing high-value, customer-specific technical assistance to identify load reduction opportunities and strategies for implementation. Investigate leveraging of energy efficiency program investments in audits and control systems to provide DR benefits at low marginal cost.
    - "Level of On-peak Prices or Non-performance Penalties" – Continue and re-iterate customer communication messages that emphasize the no risk/low risk attributes of the DBP and CPP.
    - "Amount of Potential Bill Savings" – Emphasize significance of bill savings as fractions of monthly or summer bills in addition to annual bills.

[1] This barrier may have been adequately addressed in recent changes to the Bill Protection Incentive and is one of the research foci of the survey currently in the field.

- "Uncertainty over Future Program Changes" – Continue regulatory, utility, and working group efforts to develop and maintain consistency in all peak load reduction programs, including reliability programs, while still making improvements where necessary (possibly by guaranteeing minimum program features for set periods of time).

- Continue utilizing and consider expanding technical support materials and related tools (e.g., Enhanced Automation Guidebooks, DR action cut-sheets, cases studies, on-line software, etc.).

Since the time of this study, changes were made to the DBP and CPP programs to address a subset of the issues raised above. These changes were implemented before the summer of 2005, and a follow-up survey is currently in the field to examine the effect of these program changes on customer perceptions of barriers and self-reported estimates of technical and economic DR potential.

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