Stimulating Investment in Demand Responsive Capability

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ABSTRACT

This paper presents the results of research conducted to support the marketing effort of the California Energy Commission's (CEC) Demand Responsive (DR) Program. This research consisted of focus groups and in-depth interviews with customers targeted for participation in this program during summer 2001.

Findings from this research suggest that reliability concerns were the main driver for DR program activity in California this past summer. Reliability concerns also appear to have motivated considerable demand reduction outside of formal DR programs.

This research also sheds light on the current state of investment in DR infrastructure in California, and assesses the remaining barriers to increasing investment in DR capability. As suggested through this research, there is considerable potential for increasing the penetration of enhanced energy management systems among California's medium-to-large commercial, industrial and institutional customer segments. However, key barriers remain – i.e., lack of technical knowledge and expertise, lack of certainty regarding financial benefits, and concerns regarding occupant comfort.

The CEC has addressed these barriers by developing a comprehensive marketing campaign that focuses on customers' specific information needs, financial concerns, and technical considerations. The new marketing focus has shifted away from crisis-oriented reliability concerns and moved toward promoting sustainable benefits of enhanced energy management and information systems, such as reduced energy costs, reduced O&M costs, and improved monitoring and control capabilities. The marketing effort will also promote, but not emphasize, some of the more traditional DR benefits, such as taking advantage of real-time pricing options as they become available and improved electric grid reliability.

Introduction

This paper presents findings from recent market research identifying key barriers and opportunities for increased penetration of demand responsive (DR) energy management systems in California. Demand response refers to the capacity of electricity customers to reduce their consumption as prices rise on an hourly basis in wholesale markets or to reduce their consumption in response to emergency calls for curtailment to forestall the need for rolling blackouts (Messenger 2002).

This research was commissioned by the California Energy Commission (CEC) to support the development of DR marketing and facilitation materials, including introductory brochures, case studies, and guidebooks detailing both technical options and business case specifics. These marketing materials are intended to increase awareness of DR and enhanced energy management and information systems, reduce key barriers to investments among targeted customer groups, and ultimately lead to increased investments in these systems in California over time.

It should be noted that this research was commissioned to specifically support the marketing of the CEC's on-going DR Program during 2001 and 2002. This research was not intended to provide either qualitative or quantitative evidence of the effectiveness or efficacy of California's DR programs. Nor was it intended to serve as a basis for comparing California's experience with that of other states. However, this research has shed light on some of the barriers to and opportunities for marketing DR programs across different customer segments, and these results have been used to design a more effective marketing program to support efforts in California (and elsewhere) to increase penetration of enhanced energy management and information systems.

Research Methods

As mentioned above, this research effort focused on identifying barriers to DR program participation and increased penetration of enhanced energy management and information systems in California. The research consisted of both focus groups and in-depth interviews with customers who:

- Participated in the CEC's DR Program in summer 2001 (participants);
- Had considered but rejected participation in the CEC's DR Program (non-participants); and
- Were unaware yet potentially interested in participating in DR programs (non-participants).

Five focus groups were conducted throughout California in September 2001, and in-depth interviews were conducted via telephone in October 2001. A total sample size of 71 was achieved through this research, as shown in Table 1.

Table 1. Sample Size for CEC DR Market Research Study

	Participants	Non-Participants	Total
Focus Groups	8	22	**30**
In-Depth Interviews	14	27	**41**
Total	**22**	**49**	**71**

For both the focus groups and the in-depth interviews, participants were recruited from lists provided by DR program aggregators, and non-participants were recruited from Dunn & Bradstreet marketing lists. The sample frame for non-participants was designed so that its characteristics would closely resemble participants. Generally, these characteristics included:

- Commercial customers – large property management firms, hotel chains
- Industrial customers – large manufacturing firms
- Institutional customers – large government, colleges and universities, hospitals

Non-participating customers recruited for the focus groups and in-depth interviews were screened to ensure that the discussion of DR capabilities was of some relevance to their operation, and to identify the appropriate contact within the organization to participate in the

research (a mix of facilities managers and economic decision-makers were ultimately represented).

Reliability Key Driver in Summer 2001

According to this research, concern about reliability was the driving factor in getting businesses to participate in demand responsive (DR) programs in California this past summer. Interviews with program participants and non-participants suggest that reliability concerns also contributed to significant demand reduction activity outside of the California programs.

Participation in California's summer 2001 DR programs occurred in large part because customers were fearful of being affected by rolling blackouts. This research has shown that businesses often participated because they felt their actions would in some way contribute to reducing the potential for or frequency of rolling blackouts. Interviews with representatives from California's manufacturing industry indicate this sector was particularly concerned about reliability because of the impact outages would have on production processes (i.e., the industry's bottom line).

In addition, government and institutional customers in California may have been more likely to participate in summer DR Programs in response to directives received from the Governor or other civic/institutional leaders. Interviews with these types of customers indicated that directives to participate in DR programs (as well as other energy efficiency programs) often "came down from the top" and facility managers were officially encouraged to look for opportunities to participate in these types of programs.

According to this research, it appears that few businesses signed up for California's DR programs in 2001 primarily because of the financial incentives. None of the focus group respondents and less than 5% of the in-depth interview respondents reported that financial incentives were the primary motivator for participating in the programs this past summer. Instead, participants interviewed through this research most frequently regarded the potential for financial incentives as an added "bonus" on top of other perceived benefits. In addition, very few businesses mentioned during the focus groups and interviews that the equipment, software, and training offered through the CEC's DR Program were strong motivators to participate. However, it is possible that these aspects of the DR programs might have been regarded as more valuable had participants been exposed to more curtailment activity in California this past summer. There was only one official curtailment call in California during the summer of 2001.

In addition, reliability concerns also appear to have motivated a significant level of demand reduction activity among non-participating customers (i.e., outside of California's formal DR programs). Nearly all of the non-participating customers interviewed through this research reported that their organization responded to the Governor's call to "do your part" and reduced energy usage this past summer, either during peak times, or during Stage 2 and 3 emergencies. These non-participating businesses responded to the crisis in much the same way that DR program participants did – e.g., manually adjusting thermostats and reducing lighting levels – although they did not formally participate in the DR programs available to them. According to these non-participants, the motivation for taking action was to do what they could to reduce the effects of the energy crisis on the California business economy.

However, as the energy crisis fades and concerns over reliability diminish, this research suggests that customers may need new reasons to participate in DR Programs and invest in enhanced energy management and information systems. As discussed below, there is considerable technical potential for installing these enhanced systems but there are also considerable economic and marketing barriers.

Potential Exists for Expanding DR Capability

This research indicates that there is considerable technical potential for expanding DR capability – both in terms of adding/enhancing energy management systems, as well as energy information systems. Most of the medium-to-large facilities represented in this research are currently equipped with some type of energy management system to control their HVAC loads. However, there is considerable potential for improvement in the area of enhanced controls and information systems.

Building operators represented in the focus groups and in-depth interviews complained that their existing energy management systems often have not been properly specified or configured to provide enhanced controls capability. As one focus group respondent put it, these systems are essentially "expensive time clocks." In addition, these systems are often used to control only some equipment – for example, in only a few cases did respondents report using sophisticated lighting control systems. Also, respondents reported that existing systems are often set up to control only a portion of the facility or facilities managed by the building operator.

Most of the facility and energy managers we interviewed understood the potential benefits of enhanced energy management and control systems. These businesses reported that controlling energy costs and reducing time and labor spent on energy management were the greatest potential benefits. In addition, firms that currently use energy management systems recognized the benefits they would receive by modifying their existing systems to control a greater portion of the facility and/or additional end-uses. Even the few facilities that were not currently equipped with energy management systems understood that they would benefit from increased control over energy costs and from being better equipped to more efficiently respond to occupants' needs.

In addition, this research suggests that most energy management systems provide basic data to help building operators monitor energy consumption, but very few are equipped with software or other systems that turn this data into information. Our research indicates that many businesses would find value in the ability to extract more useful information from these systems to better manage building energy consumption through automated and pre-programmed control strategies.

Additional benefits of enhanced energy management and information systems included better tracking and quantification of energy savings and demand reductions. Adding these enhanced energy management and information capabilities would help customers apply for energy efficiency grants and participate in DR programs because they would be able to more reliably predict/verify energy savings and peak demand reductions.

Remaining Barriers Present Marketing Opportunities

Despite this level of awareness and interest among target customer segments, there are still significant barriers to making investments in enhanced energy management and information systems. Some of the barriers identified through this research include:

- **Lack of knowledge/expertise.** Many of the building operators interviewed through this research expressed uncertainty regarding the specific actions they could take to expand their energy management and control capabilities. While recognizing that there probably are a number of improvements that could be made to their facilities and control systems, these building operators indicated that they did not have the knowledge or expertise to assess what their specific options might be, nor do they feel capable of selecting the appropriate technology and equipment.
- **Financial thresholds/certainty.** Many of the businesses included in this research cited payback considerations as a major barrier to further investment in energy management and enhanced control systems. Even some of the more sophisticated energy managers we spoke with have not been convinced that these types of investments can yield an acceptable payback. Generally, this research indicates that most building operators do not have enough information or the in-house expertise to accurately estimate the costs and benefits, making payback calculations speculative at best.
- **"Comfort" concerns.** Even some of the most sophisticated customers – those that already have fairly extensive energy management and control technologies in place – will be extremely reluctant to consider investments in DR capability or enhanced control systems if these changes have the potential to negatively impact occupant comfort. Some building operators deal with occupants' comfort complaints on a regular basis and will want assurances that investments in enhanced energy management and control technologies give them the flexibility to address the varying needs of their clients.

Identifying barriers presents opportunities to improve the marketing of DR programs by focusing on customers' specific information needs, financial concerns, and technical considerations. Marketing campaigns keyed to these concerns are likely to be the most successful. Conveying the "value proposition" to customers in an understanding and compelling manner will be an important component to future DR program marketing, as supported by the results of recent customer preference and attitude research (Neenan 2002). This study found that providing customers with technical assistance and support on how to reduce load is an important predictor of program participation (nearly as important as prior program experience). In addition, this study goes on to point out that effective program marketing – that is, marketing that is tailored to the customer's specific value proposition – can also help target scarce program resources by recruiting customers who are educated and motivated to participate.

The CEC has also recognized that information, financial and technical barriers to investment decision-making can represent important marketing opportunities. As suggested through this research, most commercial, industrial and institutional customers are no longer attracted to the emergency-response marketing messages that were introduced in the summer

of 2001. Instead, the CEC's approach has been to support a marketing program that includes technical assistance and support services (Messenger 2002). This campaign features the concept of "Enhanced Automation," which is based on the idea of increasing the capability of existing energy management or energy information systems to help businesses better manage both energy use and the comfort of the building occupants. The benefits of enhanced automation can be tailored to address specific customer needs and priorities. For example, enhanced automation technologies can be used for minimizing total energy use, achieving specific demand reduction targets, monitoring total energy costs, and increasing the level of control available in a building (e.g., allowing facility managers to monitor and control conditions at multiple locations).

A comprehensive listing of the benefits of enhanced automation technologies that can be packaged and promoted to specific customer segments depending on their business needs and priorities are summarized in Table 2 (XENERGY 2002).

Marketing Strategy Should Be Tied to Investment Decision-Making Stages

As highlighted above, the numerous benefits of enhanced automation technologies have been incorporated into the CEC's comprehensive marketing strategy. In addition to packaging benefits that speak to the specific needs of customer segments, this strategy has been designed to attract both facility managers and corporate financial officers at different points in the investment decision-making process. As illustrated in Figure 1, as customers move forward in terms of investment decision-making, different types of materials and different levels of information and emphasis will be disseminated through tailored marketing efforts (Barnes 2002).

For example, for customers who are primarily in the general *"awareness stage,"* it will be most appropriate to provide high-level introductory brochures, outlining the benefits of improving energy management capabilities and installing enhanced automation solutions. These brochures will be distributed with the intention of raising general awareness of the concepts and tempting facility managers to look for solutions for their buildings.

Customers who have progressed toward the *"interest stage"* will be presented with more detailed and specific marketing materials, such as case studies that provide industry-specific automation success stories and highlight key elements of decision-making processes. A variety of industries will be profiled – i.e., office buildings, schools, hotels, etc.

For customers who have expressed more than general awareness and interest (i.e., have entered the *"intent stage"*), marketing materials will focus on providing specific information and assistance that will help the customer to make the actual investment decision. For example, information and technical support for business case development will be useful at this stage. This will include a framework for quantifying costs and benefits of DR investments, as well as guidance for developing successful financial presentations to convince senior management.

Table 2. Benefits of Enhanced Automation Technologies

Reduce Energy Costs
- Maximize building energy efficiency
- Match schedule/load to system operations
- Reduce load when rates are high or incentives are offered
- Shift loads to benefit from utility rate structures
- Adjust energy use in response to real-time price signals
- Earn incentives through energy-efficiency and demand-response programs

Monitor and Analyze Energy Use
- Track and trend energy use
- Verify energy savings
- Produce system and energy cost profiles
- Improve information management, data extraction and reporting
- Improve meter-reading and operating controls interface
- Access meters and controls remotely
- Automate alarms and signals
- Assess EMS/EIS reaction to curtailment
- Control/monitor on-site generation
- Aggregate and dissaggregate building load profiles into end-use components
- Limit losses from power disruptions

Reduce Operation and Maintenance Costs
- Pinpoint problem areas quickly
- Receive automated alerts to maintain or replace equipment
- Cycle/schedule/rotate equipment efficiently
- Eliminate unnecessary maintenance

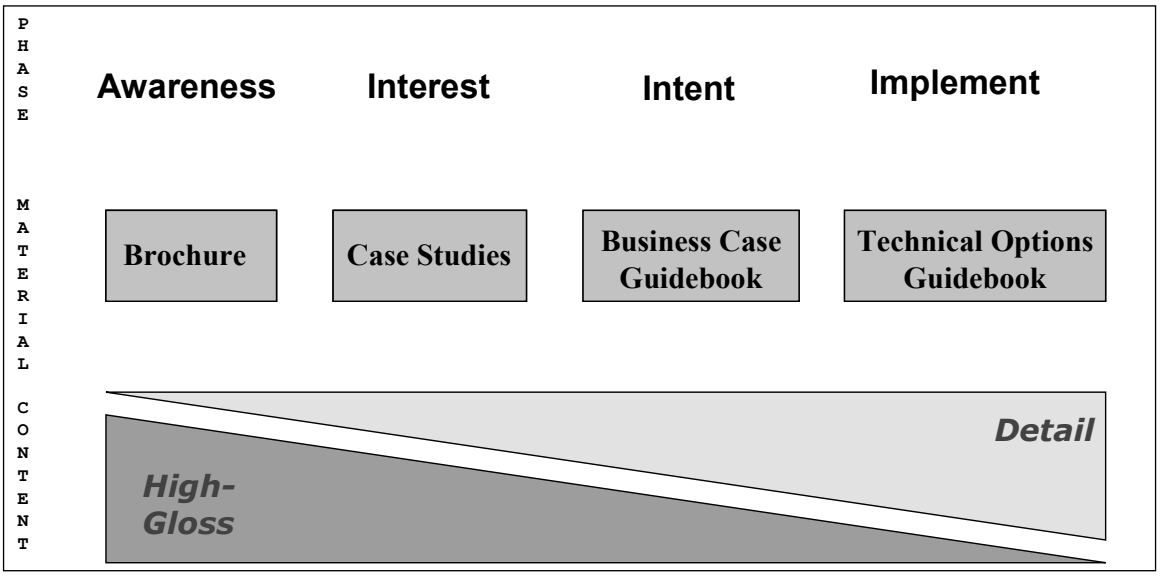
Improve Occupant/Customer Comfort
- Increase productivity, increase sales, retain existing tenants
- Improve comfort by controlling lighting and temperature levels in building zones
- Respond quickly to occupancy/customer comfort complaints

Provide Long-term Benefits to Company
- Identify new energy-saving opportunities
- Schedule energy-intensive equipment upgrades more easily
- Forecast energy needs more accurately
- Negotiate with power marketers
- Win approvals for future energy management projects more quickly
- Take advantage of real-time pricing options
- Enhance corporate culture and image
- Increase building asset value

Provide Societal Benefits
- Improve reliability for all on the electricity grid
- Stabilize and reduce energy prices
- Reduce power plant pollution

As customers move along to the *"purchase/implementation strategy stage,"* they will be in need of more detailed technical information and assistance. At this stage, customers (and vendors) will be provided with more detailed technical guidebooks and technical assistance services. The technical guidebooks should provide detailed information regarding enhanced energy management and information equipment options, decision-making guidelines, and implementation details.

Figure 1. Marketing Strategy Tied to Investment Decision-Making Stages



Information and Assistance Needs Vary by Customer Segment

The above discussion centered on the barriers and opportunities for marketing enhanced energy management and information systems, and introduced the CEC's strategy to encourage investments in these types of systems. This strategy also involves presenting the right kind of information and assistance to customers based on their specific needs.

Our research has shown that information and assistance needs are broad and vary by customer segment. Almost every organization that we spoke with indicated that they would benefit from some sort of information or assistance. The type of information and assistance needed ranges from very basic information, such as how to go about selecting the appropriate equipment/vendors, to more sophisticated analyses, such as assistance in making a business case for additional investments in enhanced DR systems. Only those few organizations that already utilize highly sophisticated control systems indicated that information and technical assistance of any kind was not needed.

As summarized in Table 3, customer information and assistance needs vary depending on the nature of the industry/business and the type of equipment/controls already in place. For example, some of the city government energy managers we interviewed were most interested in receiving information and assistance related to selecting the appropriate technology and equipment. This group, overall, appeared to be the most in need of this basic information because they currently are working without energy management systems or with relatively old, outdated systems. While they are certain they would benefit from new equipment or upgrades, this group seemed the least aware of how to go about making these kinds of changes.

Table 3. Information and Assistance Needs by Customer Segment

Customer Segment	Existing Control Systems?	Type of Information/Assistance Needed				
		General Info	Custom Info	Technical Info/Asst	Financial Info	Financial Incentives
Government	Some	Medium	Low	High	Low	Medium
Property Management	Yes	Low	Low	Medium	High	High
Manufacturing	Some	Medium	High	Medium	Medium	Low
Hotel	Yes	Low	High	High	Medium	Low
Restaurant	No	Low	High	Medium	High	Medium
College/university	Yes	Low	Medium	Medium	High	High

Property management firms expressed a need for information related to the financial benefits of expanding DR capability. As a whole, this group was most concerned about investment return or payback, and many of those interviewed felt that the return on investments in DR capability would not meet the criteria or thresholds set by their management for facility upgrades (i.e., two years or less). Compared to some of the other customer segments, this group appeared to be fairly sophisticated in its awareness of ways to upgrade existing energy management systems and controls. However, as a group, property management firms do not appear to be willing to consider these investments because of the uncertainty regarding the future stream of benefits. Representatives from property management firms therefore expressed interested in information and/or technical assistance to help quantify the benefits of such investments, as well as assistance in helping present the business case to management.

Given the emphasis on payback, it is not surprising that representatives from property management firms also expressed interest in financial incentives to encourage DR investments. While financial incentives were not necessarily favored over information and technical assistance, property management firms considering investments in facility upgrades would naturally look for financial incentives to offset their initial investment outlay (and resulting reduced payback).

Representatives from the manufacturing industry expressed a range of different information and technical assistance needs. For example, according to the interviews, some of the more sophisticated manufacturing firms that already utilize energy management and control equipment to run their process equipment would be open to receiving information and technical assistance to understand what more could be done. These firms would be interested in assistance in developing the business case for investments in enhanced energy management and information systems, as well as demonstrations to help them become familiar with technical applications that are feasible within different manufacturing segments.

There are also smaller, less sophisticated manufacturing firms that do not currently have energy management systems installed. While this group may be aware of the potential benefits from energy management systems and enhanced automation capability, they are in need of considerable assistance – including basic information about the type of equipment and technologies available, case studies applicable to their specific industry/process, and assistance in developing and presenting the business case to management.

Overall, the hotel segment appears somewhat more sophisticated in the sense that many of the representatives interviewed indicated that their organizations have already

performed energy efficiency upgrades, and most report they already utilize energy management systems. Given this, most indicated that they would not benefit from generic information on the benefits of these types of investments, especially if this information was not tailored to their specific industry. Instead, this segment expressed interest in information and technical assistance that would help them convince management that enhanced control and automation systems could help them better manage energy costs and more cost-effectively respond to occupants' needs. Basically, this segment is in need of information that shows how energy costs can be better managed without sacrificing the comfort of hotel guests. This information need was also expressed by some of the hospital representatives we spoke with. That is, this group needs to be convinced that expanding energy management systems to include enhanced automation features would not compromise patient care.

The restaurant segment also expressed similar needs for information and technical assistance that was tailored to their specific industry. While the group we interviewed appears to have invested very little into energy management to-date, they do recognize that their business might benefit from enhanced capabilities. They need information, however, on how specifically they would benefit, and how investments in enhanced energy management and information systems can be cost-effective. Similar to the hospital and hotel segments, this group also needs to be convinced that investments in automated controls are possible without sacrificing customer comfort and negatively affecting normal business operations. This segment expressed an additional need for unbiased information and recommendations concerning enhanced automation technology and equipment.

The college and university segment appears to be somewhat ahead of the game in terms of its understanding of the benefits of energy management systems and enhanced DR capabilities. The group we interviewed was quite knowledgeable about the benefits these systems offered in terms of reduced energy costs, labor costs, O&M costs, etc. However, they cited internal budgetary constraints as the main barrier that keeps them from proposing these facility upgrades to management. They need assistance in demonstrating that these investments can yield a relatively short payback, and they need this information to develop and present the business case.

Summary

This paper has presented the results of research supporting the marketing of the CEC's DR Program. This research has shown that crisis-oriented reliability concerns will no longer sufficiently motivate customers to take part in DR programs or invest in enhanced energy management and information systems. New directions in program marketing and support are needed to encourage DR program participation and increased investments in DR capability.

This research also indicates that significant technical potential exists for adding or expanding existing energy management capabilities within the medium-to-large commercial, industrial and institutional customer segments. However, considerable marketing and economic barriers need to be overcome to encourage increased penetration of enhanced automation technologies. Many businesses lack technical knowledge and expertise, are uncertain of financial benefits, and have concerns regarding occupant comfort and satisfaction.

The CEC has recognized that these barriers represent important marketing opportunities and has developed a comprehensive marketing campaign that focuses on business customers' specific information needs, financial concerns, and technical considerations. The CEC's strategy is to provide customers with the type of information and assistance they need, when they need it, and in a format that is valuable and useful for making investment decisions.

The marketing focus has shifted away from short-term reliability concerns and moved toward promoting sustainable benefits of enhanced energy management and information systems – i.e., reduced energy costs, reduced O&M costs, improved ability to monitor/analyze energy use, and improved ability to control/monitor occupant comfort. The marketing effort will also promote, but not emphasize, some of the more traditional DR benefits, such as taking advantage of real-time pricing options as they become available and improved electric grid reliability.

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