

Industrial Customer Perspectives on Energy and the Environment

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Abstract

Industrial facilities in California are faced with a host of challenges. In addition to competitive pressures to minimize costs and maximize production in a changing global marketplace, industrial facilities are required to meet stringent environmental controls and operate with limited resources. While the goals of energy efficiency and load management are often complementary to industrial efforts, experience has proven that key decision-makers are so preoccupied with day-to-day concerns that participation in even the best DSM programs is viewed as peripheral to their core responsibilities. However, with accurate information about the real concerns of these customers, DSM planners and implementers can leverage the interplay between energy use and other concerns to enhance appeal and increase participation in the industrial sector.

This paper explores the perceptions of industrial decision-makers, focusing on the interaction between energy use and other key factors, such as air emissions, water and wastewater, and greenhouse gas mitigation. An approach for a primary survey of managers and engineers at California industrial facilities is outlined. In addition, the survey results are discussed in the context of improving energy efficiency and demand response performance in the industrial sector.

A key finding from the responses to both the online questionnaire and the follow-up phone survey is that energy and environmental issues, although typically addressed by separate entities within the organization, are viewed as a potential synergy. Specifically, managing conventional air emissions and implementing energy efficiency measures are identified as high interest areas that could potentially be coupled under comprehensive incentive programs.

Introduction

The industrial sector presents an interesting challenge for Demand Side Management (DSM) planners and energy utilities. In contrast to the residential and commercial sectors, most utilities serve a relatively small number of industrial customers that account for a sizeable portion of their total energy sales. Such large usage per account implies a need for close customer relationships and a customized experience for industrials participating in energy efficiency program offerings. This condition is compounded by the fact that many of the decision-makers at industrial facilities are also responsible for day-to-day operation, including troubleshooting, repairing and optimizing extremely complex systems. Often facing a host of pressing demands, these individuals might spend little of their workday thinking about their energy use, and even less time navigating the application process that accompanies a utility efficiency program. Furthermore, strict return-on-investment requirements can limit the participation of even the most active energy managers. These financial constraints present a formidable barrier to DSM efforts, aggravated by the deepening recession.

In recent years, rising costs and difficult economic conditions have caused additional strain on industrial operations in California. Simultaneously, an array of stringent environmental regulations such as air emissions limitations and wastewater treatment has intensified this pressure. These circumstances have combined with the infrastructural challenge of high usage, technically challenging facilities operated by

extremely busy people to pose a difficult challenge to DSM program designers and implementers targeting the industrial sector.

Despite these challenges, there are several examples of energy efficiency and load management programs that have demonstrated remarkable effectiveness. While it is beyond the present scope to explore the best practices applied under such programs, their existence can be interpreted as evidence of a considerable potential for DSM in the industrial sector. This potential is evident in the findings of the planning community as well:

- A recent estimate of the potential savings for California industry in 2016 is 5,425 GWh (Itron 2006)
- EPRI National Potential Study estimated a maximum achievable potential for the industrial sector in the Western census region to be over 100,000 GWh by 2020, representing 9.9% of the baseline consumption (EPRI 2008)

Underlying this potential is an alignment of the primary goals of industrial firms and the offerings of DSM programs. As an example, the selection and installation of energy efficient equipment leads to reduced energy costs, often “paying back” the initial investment in one or two years. A more subtle effect is that efficient equipment can increase production or reduce the cost of operation and maintenance, further contributing to the bottom line. In addition to overcoming the barriers to participation, some successful DSM programs leverage these benefits to obtain significant energy savings in the industrial sector.

Environmental issues are another example of a potential alignment between the goals of industrial facilities and energy efficiency programs. In California, all combustion equipment is regulated by a local air board, which stipulates limits on pollutants such as SO_x, NO_x, mercury, and particulate matter. In addition, these air boards monitor all sites above a moderate level of emissions. Because industrial facilities typically utilize individual combustion units and also maintain above-average emissions levels, they are subject to both regulatory mechanisms. In addition, industrial sites must comply with regulation from both the federal and state environmental protection agencies that regulate chemical and other pollutants and general environmental issues. Finally, the usage of fresh water and the disposal of wastewater are also a major consideration of industrial operations in California.

Because energy use often coincides with environmental impacts and resources such as water, there are potential advantages to considering energy in the context of these other priorities. The objective of this paper is to explore this potential for effective approaches to DSM in the industrial sector, with specific focus on the alignment of energy and environmental issues addressed above.

Background

The California Public Utilities Commission and the utilities it regulates have recognized the value of targeting the industrial sector to obtain energy efficiency savings. Successful programs targeting industrial customers have demonstrated the existence of a large and potentially cost-effective DSM resource. However, the barriers discussed above have hindered efforts targeting California industrial customers.

One of the longest-standing programs offered to industrial customers is the statewide Standard Performance Contract (SPC) program, which provides financial incentives for customized energy efficiency measures on a per-kWh basis. This program design is conducive to customers who possess both the capability and the motivation to perform energy savings calculations and communicate them to the implementer as part of the incentive application process.

In a complementary effort, the California Investor-Owned Utilities (IOU's) have contracted a portion of their DSM budget to third-party program implementers. In the industrial sector, these third parties apply expertise in a particular sub-segment to provide customized support and a participant experience that suits the needs of individual customers. While these programs build on the SPC and other statewide and utility-specific offerings, they are characterized by the implementer's unique approach to promoting and achieving energy efficiency among specific industrial segments.

A recent trend in the design and implementation of industrial programs such as these has been the integration of energy efficiency with other priorities. Specifically, the IOU's have included other electricity-related areas that typically fall outside the bounds of energy efficiency programs, such as demand response and distributed solar generation. A recent Request for Proposal issued by Southern California Edison for a Third Party implementation program describes an ideal program as one that includes spillover "to other technologies or sustainability options by providing Customers with increased awareness of program options and benefits, feedback on savings / performance data, and cross-program coordination that provides for seamless and ease of use on by the Customer." (SCE 2008) Greenhouse gas emissions and water issues are also discussed in the literature relating to industrial DSM programs.

In parallel, the advocates for efficient energy use among California industry have initiated their own push for the diffusion of best practices. Spanning segments from high-tech manufacturing in Silicon Valley to marginal oil wells in the Central Valley, a subset of energy decision-makers has stepped forward as an important component to the overall goals of increasing the energy efficiency of California industrial sites.

While energy has received attention among trade groups such as the California Independent Petroleum Association, it has played a minor role in comparison to the increasing focus on greenhouse gas emissions. With the passage of AB32 and the ongoing development of a scoping plan for its implementation¹, many responsible for industrial operations have become preoccupied with carbon, whether assessing their own emissions, registering with the voluntary Climate Registry, investing in reductions and mitigation, or simply educating themselves. With the recent passage by the California Air Board (CARB) of a finalized scoping plan delineating the emissions limits and regulatory policies that will lead to the reduction in greenhouse gases called for in AB32, a cap and trade system has emerged, to be administered by CARB in addition to the other regulatory mechanisms.

The factors discussed in this section are encouraging for DSM efforts in the industrial sector. However, there are formidable barriers that complicate the program design and implementation process. The research described below attempts to shed some light on these barriers and explore potential synergies between conventional DSM and the priorities of industrial customers.

Research Approach

In order to better understand the perspectives of industrial decision-makers on energy and environment issues, an online questionnaire was developed. Respondents were asked a series of questions about the relative importance of environmental concerns and energy issues. The objective of this research is to obtain a directional assessment of prevailing perspectives in these areas, as well as a general understanding of the thinking that underlies energy decisions. One of the central questions investigated is

¹ In 2006, the California State Legislature passed Assembly Bill Number 32 (AB32), titled the Global Warming Solutions Act. This legislation stipulates that California's greenhouse gas emissions will be reduced to 1990 levels by the year 2020. Further, the law specifies that the details of this statewide reduction will be determined by the California Air Board (CARB) through "an open public process," known as the Scoping Plan, which has elicited numerous comments and input by a range of stakeholders. The Scoping Plan was officially adopted by CARB on December 11, 2008, and becomes fully effective beginning January 1, 2010 (CARB website 2008)

the appeal of combining energy efficiency with other priorities to maximize the involvement of industrial electricity and gas customers.

In addition to the online questionnaire, respondents were asked to participate in a follow-up telephone discussion. The intent of these conversations was to explore the motivating factors, past experience, and desired program attributes, providing a qualitative foundation for the trends identified in the online survey results. Even with a low expected participation rate, these discussions add depth to the study and allow for a more accurate representation of the attitudes of the respondents.

Respondents

To optimize the limited resources available for this study, survey respondents were recruited from existing industrial contacts, many of whom have participated in the energy efficiency implementation programs administered by Global Energy Partners for PG&E and SCE. Ranging from day-to-day production engineers to environmental resource planners, this group has demonstrated an interest in improving the way their organization uses energy, biasing this group as a “best case” – customers who have already participated in DSM and likely to do so in the future. The set of respondents is further biased by their self-selection to participate; there was no incentive offered to take the survey, only a request from a personal contact at Global. Because of this recruiting structure, several conclusions can be drawn about the group of respondents:

1. They do not comprise a statistical representation of California industry, but are centered in the industrial segments in which Global has the most long-standing relationships.
2. They are self-selected proponents of energy efficiency, and therefore likely to convey more favorable opinions than would a truly random sample.

There were 27 unique respondents to the online survey, including a subset of five volunteers to participate in a follow-up discussion by phone. The breakout of respondents by industry is represented in Figure 2. The dominant segments are oil and gas, wastewater, and food processing. Each of these areas has been targeted by multiple implementation programs and consulting projects by Global over the past thirty years. Despite the skewed representation, these segments are certainly significant. For example, the California Air Board specifically mentions the oil and gas sector in the scoping plan for the implementation of AB32 (CARB 2008).

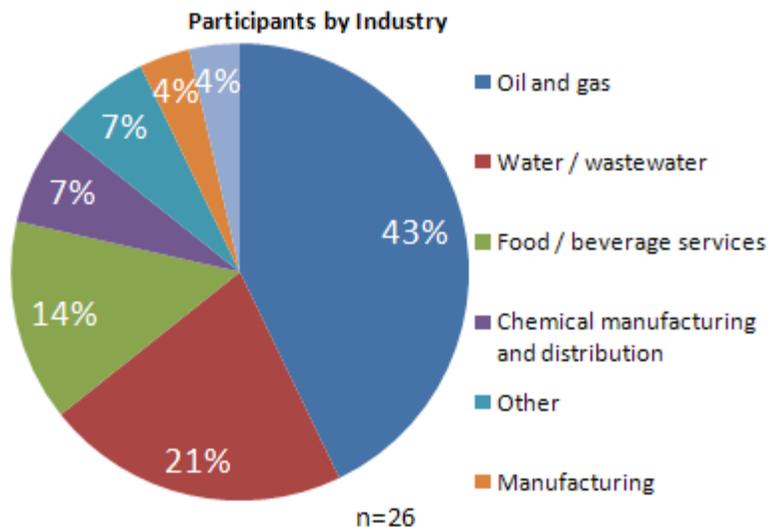


Figure 1. Distribution of Respondents by Industry

In addition to understanding the industry breakout of respondents, it is also useful to identify the primary function of the individual within the organization. Experience with implementation of energy efficiency programs has shown that perspectives and priorities can vary significantly within a single organization, reflecting the diversity of objectives, level of training, and even the personality of the individual. Respondents were asked to divide their average workday into several categories. Table 1 displays the aggregate results for the group, indicating an emphasis on technical issues. While the dominance of engineering personnel could skew results toward those priorities viewed as “practical,” or with a clear affect on the day-to-day objectives of the particular industry, many of these respondents also included environmental issues and operations as holding a place among their primary activities. This could result from an organizational emphasis on environmental compliance and operational efficiency, as well as suggesting a perceived alignment between these efforts.

Table 1. Mean Task or Activity for Respondents

Activity	Percentage of Work-day
Technical / Engineering	40%
Operations Management	26%
Environmental / Regulatory	22%
Business strategy	7%
Other	5%
n=27	

Caveat

Although noted in the discussion above, it is important to reemphasize that this research is not intended as a rigorous, statistically representative sampling of industrial customers. Such an effort falls outside the scope of this paper. Rather, it is a simple questionnaire and follow-up approach designed to efficiently obtain directional information about the perspectives of industrial customers. The results presented here should be viewed as qualitative indicators of the current trends in attitude toward environment and energy among California industrials, particularly in those segments best represented here.

Online Survey Results

A primary objective of this study is to understand the way decision-makers at California industrial facilities perceive the interplay between energy and environmental issues. This was examined first by a question about the perceived importance of several areas, followed by an assessment of the likelihood of the respondent’s firm to make financial investments in the same areas. The results of these questions are displayed in Figures 2 and 3, respectively.

In both cases, the highest priorities were identified as energy efficiency and local air pollutants. Both of these areas have a relatively long history and an established infrastructure for the behavior of industrial firms; in the case of energy efficiency, they have worked through utility or third party incentive programs, while their air emissions are regulated by state and regional air boards.

Electric load management was also perceived as an important area. In a world of rising energy costs and increasing financial demands, demand response and similar program offerings are gaining

traction as not only an energy solution, but also as a potential revenue stream. In some Independent System Operator (ISO) territories in the Eastern United States, for example, large industrial sites frequently bid load shed into wholesale electricity markets as an alternative to generation resources. These types of strategies seem to be of interest to the California industrial decision-makers surveyed, who also rank load management as third on the list in terms of likelihood to spend money in the next 1-2 years.

It is interesting to note that roughly half the respondents ranked greenhouse gas reductions as either neutral or unimportant, despite the passage of AB32 and the ongoing preparation for its implementation in the coming years. This could be a reflection of the relatively short history associated with greenhouse gas issues, as well as an uncertainty about how the new state law and speculated federal legislation will affect specific aspects of their operations. However, the respondents ranked greenhouse gases higher when asked how likely their firm is to spend money in the next 1-2 years, suggesting a perceived increase in attention in this area, especially when compared to other priorities.

Also of note are the perceptions regarding water management. Although few of the respondents ranked water issues as important, an even smaller minority ranked them as unimportant. It could be inferred that water issues are an essential but unchanging aspect to business, representing neither a great threat nor an interesting opportunity for meeting the objectives of the respondents surveyed. Here again, however, the likelihood to spend on water issues is ranked relatively higher than its perceived importance.

Similarly, the importance of onsite renewables is ranked lowest, but the likelihood to spend receives a higher rating. In contrast, conventional distributed generation is perceived as a relatively important issue in the present, but ranks lowest in likelihood to spend in the coming years.

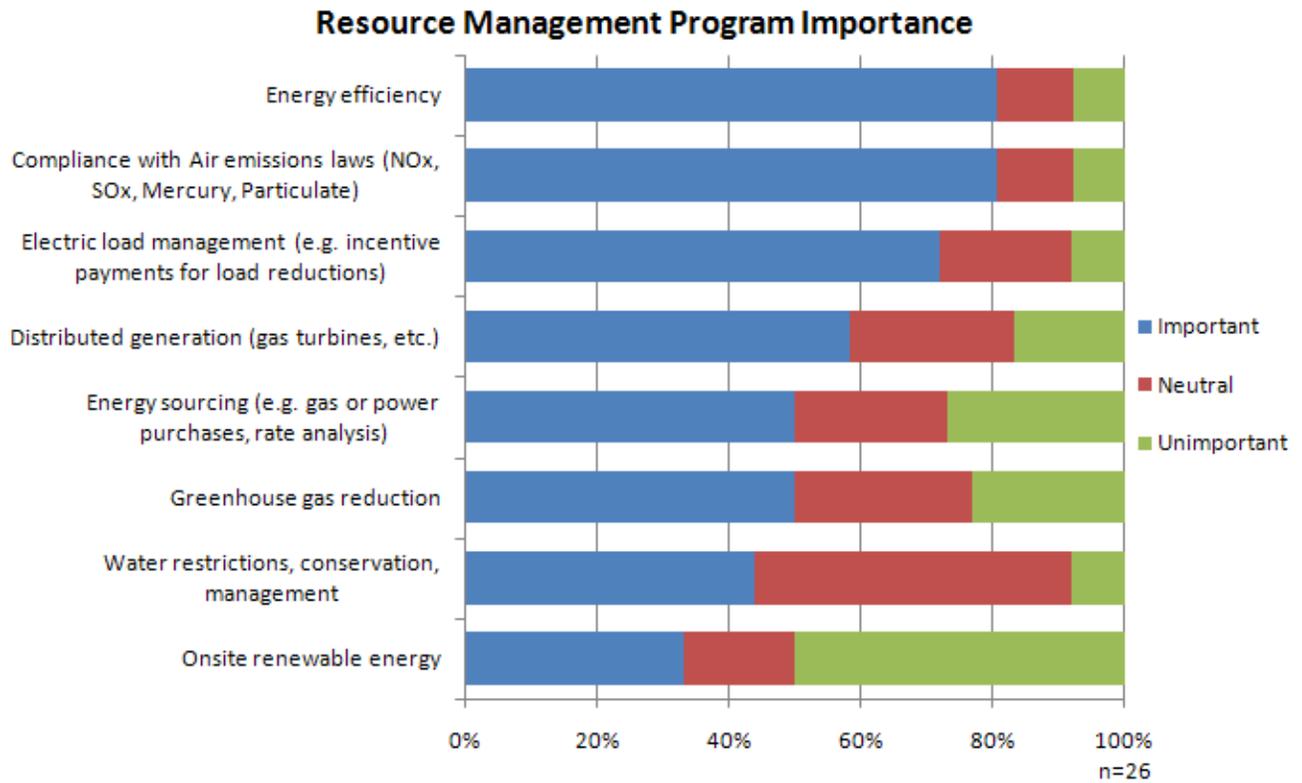


Figure 2. Energy and Environment Priorities Ranked by Importance

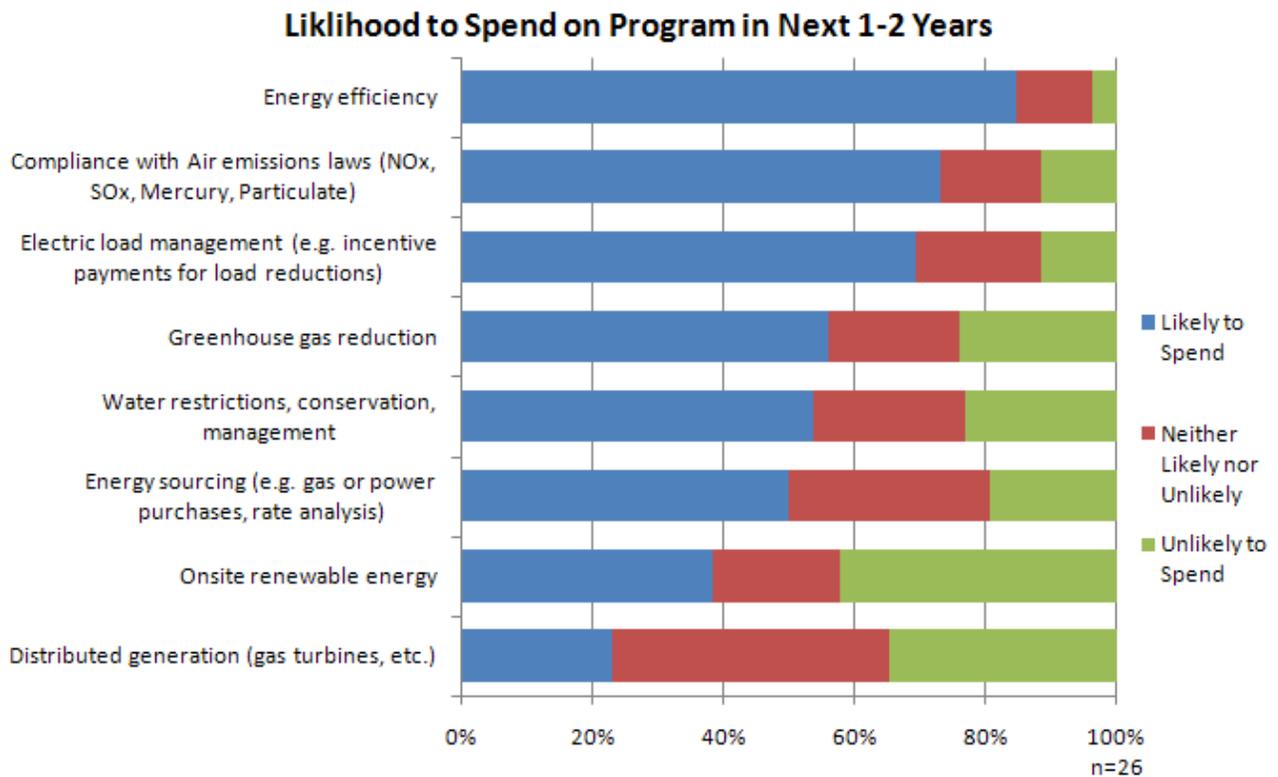


Figure 3. Energy and Environment Priorities Ranked by Likelihood to Spend

In order to estimate the relative importance of the environmental and energy-related issues discussed above, respondents were also asked to compare these topics to their “day-to-day duties,” as defined by the respondents themselves. Figure 4 summarizes these responses. While less than a fourth of the respondents ranked energy and environment higher than their typical work, 77% found them to be at least as important, and only 4% found these issues to be significantly less important.

From these responses, it is evident that there is a perceived overlap between the primary objectives of the organization and energy and environment. This alignment is reinforced by comparing the 77% of respondents finding environment and energy to be at least as important as their day-to-day efforts to the mean work activities reported in Table 1, showing an average of 22% of time devoted to environmental and regulatory issues.

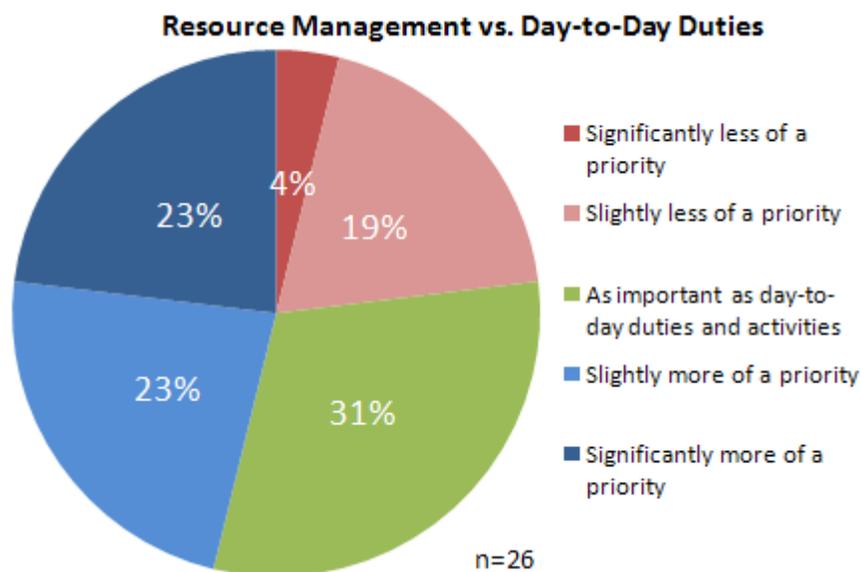


Figure 4. Relative Importance of Energy and Environment Compared to Other Responsibilities

In an effort to understand the perspective of the respondents on energy efficiency program offerings, they were asked how their interest in DSM would change if energy efficiency were coupled with another priority. As presented in Figure 5, a majority of respondents indicated that they would be more interested in a DSM program that was integrated with another environmental, energy or resource issue. Only 8% of respondents indicated that they would be less interested in such a coupling, while almost a third would have no change in interest.

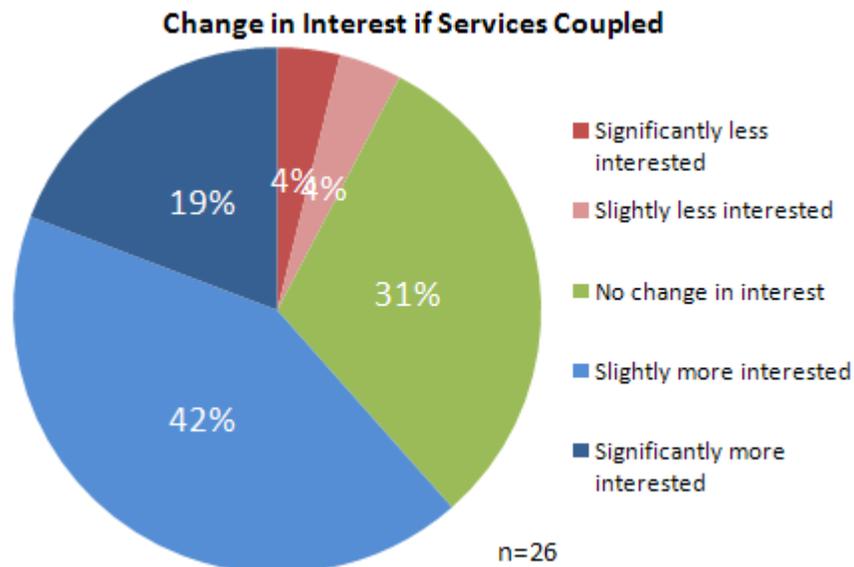


Figure 5. Interest in Coupled Energy and Environment Services

Building on the responses about coupling energy efficiency with other priorities, participants were asked to identify a specific topic that would be of greatest interest as part of an integrated energy efficiency program. Consistent with the rankings of priorities discussed above, the majority of respondents to this open-ended question referred in some way to their air emissions requirements, specifically mentioning local and regional pollutants such as SO_x and NO_x.

In addition to the connection between energy and environmental issues, the survey explored the program attributes of an energy efficiency offering from the perspective of the industrial customers surveyed. Respondents were asked to choose from a set of features that could be included in a DSM program, selecting all that they would find desirable. Figure 6 displays the results. As evident here, financial incentives were included by nearly all the respondents as an essential attribute of an attractive program. This finding could be expected, considering the tight economic conditions by which California industrial facilities are constrained.

Environmental concerns were also included by nearly half the respondents. This coupling between energy and environment, a recurring theme in the results of this survey, differs from other program attributes because it is not grounded in actual program experience. For the most part, energy issues are dealt with through the utility, power or gas wholesaler, and relevant contractors, while environmental matters are handled by the air boards, EPA, other regulators and a set of contractors almost completely exclusive of those operating in energy. The preference of so many respondents toward combining environment and energy could be construed as a latent potential for a synergy between the two areas.

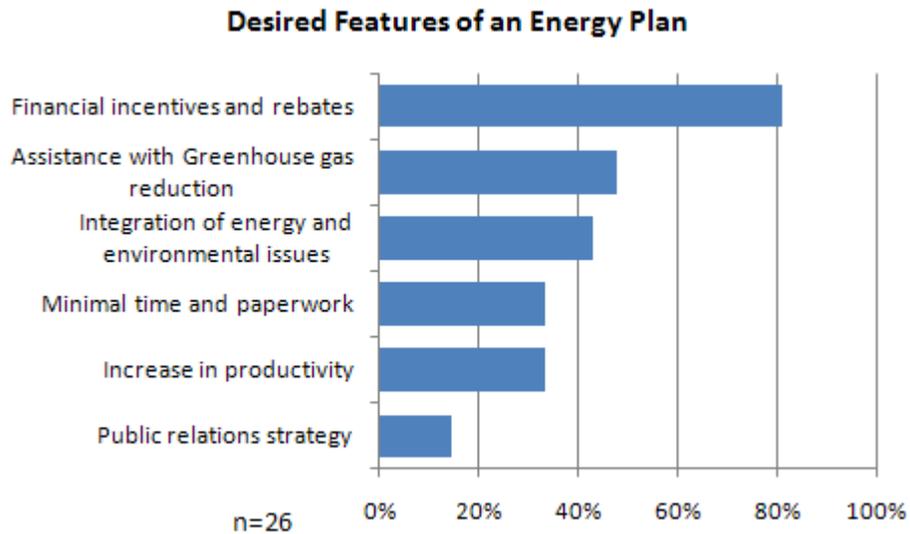


Figure 6. Desired Features of an Energy Efficiency Program

Finally, the unique economic conditions facing American business today could be imagined to have a large effect on the attitudes of industrial decision-makers about energy and environment. This relationship was examined by an additional question asking respondents to assess how their answers would change under different economic circumstances. As evident in Figure 7, the bulk of the respondents indicated that recent economic conditions have not changed their likelihood to invest in energy efficiency. An additional 41% of respondents noted that their likelihood to invest in efficiency has increased as a result of the economy's downturn. These results suggest a prevalent view among the industrial customers surveyed that the efficient use of energy is positively correlated with the overall performance of their company.

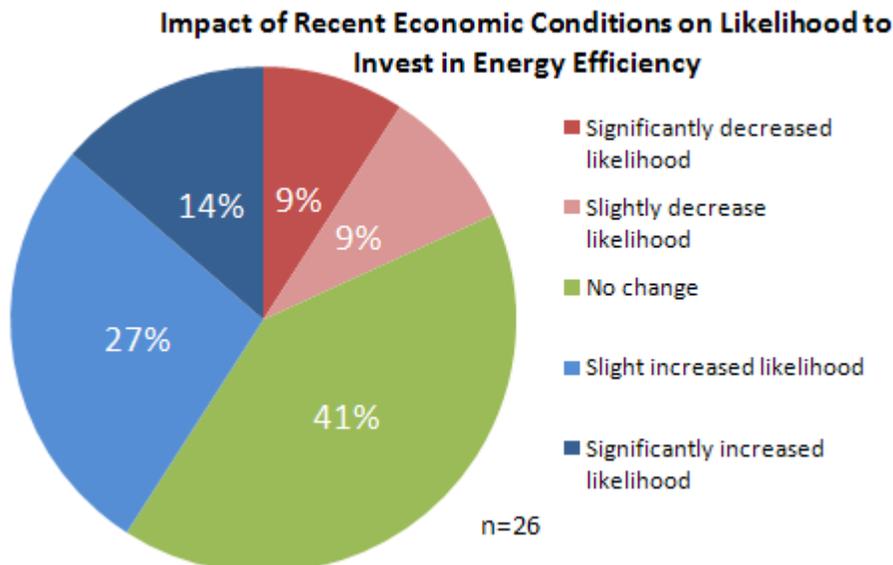


Figure 7. Effect of Economic Circumstances on Energy and Environment Perspective

Follow-up Phone Conversation Results

To explore the trends identified in the responses to the online survey, a follow up conversation was conducted by telephone with four volunteers. With so few respondents and an additional self-selection bias above that of the typical participants, these responses should be viewed as purely anecdotal. Despite the limitations, these interviews provided a level of depth not attainable in the online questions, in addition to a context for the results discussed above.

In line with the findings of the online survey, the respondents interviewed by phone were responsive to the idea of coupling energy and environmental priorities. Principle among the environmental issues discussed were the conventional air pollutants such as SO_x, NO_x, mercury and particulate matter. Each of the respondents was also well informed on the climate change issue and the associated legislation. Each of their organizations has been involved in the public review process associated with the California Air Board Scoping Plan; they are also acutely aware of the regulatory implications on the horizon and their effects on their companies.

While each of the four participants interviewed by phone expressed an interest in an integrated program offering including both energy and environmental issues, they differed in their perception of how such a program would be useful. In one case, energy costs make up more than half of the operating costs for a facility, while conventional air emissions are almost negligent. For this organization, the key driver is to maximize energy efficiency; this individual has pursued multiple incentive programs, participated in detailed audits, and worked closely with the local electric utility. This respondent also expressed an interest in revenue-generating opportunities that will become available through the implementation of AB32.

A respondent at a large beverage processor expressed a slightly different view. While this individual's position is primarily environmental regulation, his perspective about incentive programs was grounded in the need for a clear return on investment and demonstrable benefit to operation. While he also agreed that treating energy and environment together would be beneficial in some cases (e.g. high efficiency gas boilers), the primary emphasis was on the financial and economic aspects. On the topic of greenhouse gases, this firm has been active in the public review of the scoping plan, but at present does not see opportunity in the new regulation. Rather, they are focused on meeting reasonable restrictions as cost-effectively as possible.

A third respondent has been very active in energy management issues and indicated that both energy efficiency and limiting air emissions are important to the organization's core goals. In addition, this individual has attended a workshop hosted by a utility about a specific burner technology with both energy and environmental benefits. This education effort was found to be very useful; coupled with a financial incentive, it is one example of an attractive comprehensive program offering. While this respondent has also been involved and informed on the evolving greenhouse gas regulatory structure, he anticipates that its effect will be a less efficient operation and is searching for ways to reduce his carbon footprint while increasing productivity at his facility.

The fourth respondent interviewed by phone was somewhat removed from the environmental side of his organization, but sits on a cross-divisional sustainability committee. In line with the views expressed during the other interviews, this organization is focused on economically sustainable operations, while also concerned with meeting environmental regulations. While not yet exploring the possibilities in detail, this respondent was optimistic about the changing greenhouse gas landscape in California. He pointed out that mitigating carbon emissions were in line with an organizational focus on sustainability.

An additional observation emerged from the phone conversations, regarding the organizational structure of the respondents' firms. In each of the four companies represented, environmental compliance is treated by a different division than efficiency and energy usage. In the former, the primary objective is to

accurately monitor and report the environmental impacts associated with industrial operations. In contrast, the utilities or energy groups within these organizations are focused primarily on reducing costs and increasing overall efficiency. This internal structure could pose problems to a program offering targeting both priorities together.

Summary

The industrial sector, though recognized as a substantial resource for energy efficiency and other demand-side activities, presents numerous challenges to DSM planners. Among other barriers, industrial facilities in California are often preoccupied with meeting the constraints of environmental regulation. When surveyed about the perceived importance of energy and environmental issues, a sample of respondents from several different industry segments ranked energy efficiency and local air pollutant emissions as the most important priorities, as well as the areas in which their firms are most likely to invest in the next one to two years. By combining these two categories, DSM implementers could present an integrated program with a doubly effective customer appeal. As the regulatory structure for greenhouse gases in California becomes more concrete in coming years, it is feasible that this topic could also be integrated, resulting in comprehensive program offerings that would overcome some of the traditional barriers facing the industrial sector.

Because of the limited scope of the research presented here, these results should not be interpreted as a statistical representation of California industrial customers. However, the coincidence of the responses collected suggests a potential synergy between energy and environmental issues. The present research, then should serve as a springboard to additional investigation of the perspectives of industrial customers in California.

References

- Itron 2006. "California Energy Efficiency Potential Study." Submitted to PG&E, May.
- EPRI 2008. "Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S. (2010-2030)." Draft Technical Report, November.
- SCE 2008. "Request for Proposals for Industrial Market Segment Program." Flight 5 RFP, April.
- CARB 2008. "Climate Change Proposed Scoping Plan." Approved December 11.
- www.arb.ca.gov California Air Board website, information obtained December 2008.