LBNL-63668

ERNEST ORLANDO LAWRENCE
BERKELEY NATIONAL LABORATORY

Strategies to Increase California Food Processing Industry Demand Response Participation: A Scoping Study

Glen Lewis Group

Environmental Energy Technologies Division

November 2007

Disclaimer

Acknowledgments

The work described in this report was coordinated by the Demand Response Research Center and funded by the California Energy Commission (Energy Commission), Public Interest Energy Research (PIER) Program, under Work for Others Contract No. 500-03-026 and by the Assistant Secretary for Energy Efficiency and Renewable Energy, Office of Building Technologies, U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

The author wishes to thank members of the California League of Food Processors for participating in the survey. We appreciate the assistance of Patsy Dugger, Jan Berman, Steve DeBacker, Randy Wong at Pacific Gas & Electric Company as well as Linda Ziegler, Janet Pasker and Danielle Schofield of Southern California Edison. The author also thanks the following individuals and organizations for their support of this research project: Mike Gravely (Energy Commission) and Mary Ann Piette (DRRC, LBNL).

The author appreciates the helpful comments provided by the peer reviewers of this report: Mary Ann Piette (DRRC, LBNL), Roger Levy (Levy Associates), Barbara Atkinson (LBNL), Aimee McKane (DRRC, LBNL), and Anthony Radspieler (DRRC, LBNL).

Preface

The Public Interest Energy Research (PIER) Program supports public interest energy research and development that will help improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

The PIER Program, managed by the California Energy Commission (Energy Commission), conducts public interest energy research, development, demonstration (RD&D) projects to benefit California.

The PIER program strives to conduct the most promising public interest energy research by partnering with RD&D entities, including individuals, businesses, utilities, and public or private research institutions.

PIER funding efforts are focused on the following RD&D program areas:

- Buildings End-Use Energy Efficiency
- Energy Innovations Small Grants
- Energy-Related Environmental Research
- Energy Systems Integration
- Environmentally Preferred Advanced Generation
- Industrial/Agricultural/Water End-Use Energy Efficiency
- Renewable Energy Technologies
- Transportation

Strategies to Increase California Food Processing Industry Demand Response Participation is the final report for the Industrial DR Scoping Study (conducted under contract number 500-03-026) conducted by Glen Lewis Group. The information from this project contributes to PIER's Energy Systems Integration Program.

For more information about the PIER Program, please visit the Energy Commission's website at www.energy.ca.gov/pier or contact the Energy Commission at 916-654-5164.

Table of Contents

List of Figures

List of Tables

Abstract

State energy planners and electric utilities are interested in opportunities to reduce peak electric demand in the food processing sector using Demand Response (DR) programs and technologies. However, the industrial sector and food processing, in particular, pose unique challenges for DR implementation. The feasibility of DR depends on plant operating schedules and supply chain needs, and plant operators have been reluctant to adjust production schedules where productivity and economics may suffer. Hence DR for the industrial sector does not fit the "buildings model" for which DR has been successfully demonstrated and implemented. However, the results of this scoping study indicate that significant potential for DR can be realized in this sector given coordination, tools and incentives planned from a perspective of plant operations. These findings may also apply to other areas of California's industrial sector.

Keywords: demand response, food processing, industrial, manufacturing, electricity use, automation

Executive Summary

Introduction

California's industrial sector represents about 17 percent of the state's coincident peak load (Brown and Koomey, 2002). Hence state energy planners and electric utilities are interested in finding opportunities to reduce demand in this sector using Demand Response (DR) programs and technologies. However, the industrial sector and food processing, in particular, pose unique challenges for DR implementation. The feasibility of DR in this sector depends on plant operating schedules and supply chain needs, and plant operators have been reluctant to adjust production schedules where productivity and economics may suffer. Various supply chain factors such as scheduling of raw material delivery, perishability, labor, logistics, shelf life, and product transport require the food processing sector in particular to carefully plan for operation curtailment or postponement. Hence DR for the industrial sector does not fit the "buildings model" for which DR has been successfully demonstrated and implemented. However, the results of this scoping study indicate that significant potential for DR can be realized in this sector given coordination, tools and incentives planned from a perspective of plant operations.

Purpose

The scoping study intended to discern DR potential, existing levels of participation, experiences, information sources, and use of tools and technologies. The primary means of data gathering was a survey administered to companies that represent over 90 percent of the industrial food processing industry.

Project Objectives

The objectives of this project were:

1. To gain a historical and current understanding of the barriers (e.g. business, regulatory, etc.) contributing to limited food industry DR participation in California.
2. Identify resources, policies, methods, training, and technologies that would stimulate increased food industry DR participation.
3. To provide recommendations that would stimulate increased food industry DR participation and define future research needs to assist in the achievement of statewide DR objectives.

Project Outcomes

1. This scoping study identified and clarified the barriers to DR participation arising from the unique nature of the food processing industry with respect to supply chain needs and the resulting economic constraints.
2. The survey gathered industry views on existing resources, policies, and training and identified preferred methods of information transmission and policy instruments.
3. This report provides recommendations to increase food processors' participation in DR. It also offers recommendations on research needs that could be covered in subsequent phases of the overall DR effort for this industry.

Conclusions

The survey results suggest that opportunities exist to both *reduce and shift* essential demand (i.e. manufacturing-related demand) and non-essential demand (e.g. office buildings, warehousing, etc.). Survey respondent results indicate DR optimization opportunities exist if DR processes and incentives appropriate for industrial supply chain operations were effectively structured statewide. The following specific conclusions are grouped by topic area.

DR Potential and Participation

1. Significant DR opportunities exist to both shift and reduce essential and non-essential demand.
2. The primary reasons cited by respondents for enrolling and not participating in DR are plant production schedule constraints, lack of DR program cost-effectiveness, priorities, and resources.
3. Of those who participate in DR, the primary reasons are corporate environmental citizenship and economics.

Operations and Economics

1. Electricity represented at least 10 percent of total plant operating cost for over half of respondents, indicating that for the majority of plants some fraction of 10 - 15 percent of their operating costs might be addressed by DR.
2. Over half of respondents operated their plants continuously during summer months.
3. Over three-quarters had the opportunity to ***reduce non-essential demand*** (e.g. office buildings, warehouses, etc.). Over half had the opportunity to ***shift non-essential demand***.
4. Almost one-third had the opportunity to ***reduce essential demand*** (e.g. direct manufacturing asset demand, etc.). Almost one-quarter had the opportunity to ***shift essential demand***.
5. Three-quarters would participate in DR with metering and technology investment incentives plus progressive multi-year participation incentives.
6. One-third wanted multiple tariff incentives across utilities (e.g. natural gas, water, wastewater, air emissions, tax credits, etc.).

Regulatory and Administrative

1. Half of energy managers found the DR process adequate to understand and implement.
2. Almost two-thirds of respondents initiated DR administration via their energy managers with utility representative assistance and almost three-quarters of those thought that their utility representatives were knowledgeable on current DR incentive programs.
3. Over three-quarters wanted one combined, uniform statewide strategy, objective and process for both DR and energy efficiency versus multiple, uncoordinated programs and objectives.

DR Education and Training

1. Plant energy managers were generally familiar with the purpose of DR but had limited end-user training and understanding of the technologies.
2. The primary source of DR information was utilities. Utility account managers were either "knowledgeable" or very knowledgeable" on overall energy management but needed to improve their level of knowledge of DR.

Recommendations

The following recommendations arose from the results and conclusions of the scoping study.

DR Potential and Participation

- Research other California food industry DR opportunities to cover all North American Industry Classification System (NAICS) / Standard Industrial Classification (SIC) food industry categories (NAICS 311-319, SIC 2011-2099).

Operations and Economics

- Conduct further research on specific administrative and operational processes and technologies that could reduce both essential and non-essential manufacturing demand.
- Conduct further research on the electricity demand and usage cost components of tariffs to design incentives that optimize both components.

Regulatory and Administrative

- Develop a DR strategy roadmap, aligned with state DR objectives, as a statewide DR-EE resource option provided to food processors and other industrial end-users.
- Bolster utility representative training and knowledge base of DR and make consistent statewide.

Education and Training

- Provide more frequent and structured DR training for plant personnel and facilitate communication about this training.
- Facilitate communication about DR training
- Develop energy information management and decision support systems technologies that correlate and bridge public sector energy resource management metrics with private sector food processor DR decision-making.

Benefits to California

This scoping study suggests that there is significant DR potential in the food processing industry. The study explores the viability of current tools and information and highlights the need for better tools and DR processes. State energy planners may be informed by industry managers' desire for a comprehensive statewide operating, technological and regulatory approach to DR. In addition, the food processing DR survey model, methodologies and application may be transferred to other industry segments to identify additional DR opportunities across industries to the further benefit of California.

1.0 Introduction

1.1 Background and Overview

California is the world's fifth largest producer of food and agricultural commodities (CDFA 2005). With food and agricultural commodities ranging from livestock to floriculture, of the approximately $32 billion gross cash income California food and agriculture contributes to the state's economy approximately $10 billion (31 percent) in gross cash income is attributable to California's food processing industry. The coincident peak load contribution by this sector for California's two largest utilities, Pacific Gas and Electric (PG&E) and Southern California Edison (SCE) in 2005 was almost 143 MW (PG&E 2006, SCE 2006). The state's total industrial sector peak load in 2003 was 6.4 GW and the process industrial peak load was 1.1 GW (CEC 2006).

California's industrial sector represented about 17 percent of the state's 1999 coincident peak load (Brown and Koomey 2002). Hence state energy planners and electric utilities are interested in finding opportunities to reduce demand in this sector using Demand Response (DR) programs and technologies. Peak production of fruit and vegetable processing is in the summer during peak power consumption, when DR is most desirable. However, the industrial sector, and food processing in particular, poses unique challenge for DR implementation. The feasibility of DR in this sector depends on plant operating schedules and supply chain needs. Plant operators are reluctant to adjust production schedules where productivity, economics, and customer service may suffer. Various supply-chain factors such as seasons, weather, crop types, scheduling of raw material delivery, perishability, labor, logistics, shelf life, and product transport make it difficult to interrupt a processing operation even on a day-ahead notice. The food processing sector, in particular, requires careful planning for operation curtailment or postponement. Competition in the industry pushes processors to maximize economies of scale in processing, which increases the potential value of lost load and simultaneously makes it very difficult to shed process load. Hence DR for the industrial sector does not fit the "buildings model" for which DR has been successfully demonstrated and implemented.

DR is comprised of load response and price response components. For purposes of this report applicable to California food processing industry operations, the definition of DR is as follows:

Load response *is managed by the California Independent System Operator (CAISO), utilities and end-users for systemwide electricity supply chain asset safety, reliability and resource balancing purposes (e.g. electricity generation, transmission, distribution and plant operation supply chain assets).*

Price response *is managed by end-users for electricity supply strategic sourcing, pricing risk management and achievement of lowest-effective plant operating cost (LBNL 2004, adapted).*

Load response is typically attained through interruptible tariffs and direct load control programs. Price response can be attained through time-of-use rates, dynamic pricing, and demand bidding programs.

Several recent DR study and assessment efforts have been completed with emphases on specific industrial end-users, including food processors. The primary focus of these recent DR study and

assessment efforts was to determine the reasons for the lack of DR participation with many of the DR programs in effect. (EPRI 2005, LBNL 2004).

This study is different from previous study and assessment efforts due to its focus on root cause[1] analysis and process reengineering coupled with extensive plant operations and industrial business experience inputs. Prior efforts focused on the reasons for lack of DR ***program*** participation with existing DR programs[2] rather than on exploring the development of a fundamental and dynamic continuous improvement DR ***process and incentive*** structure to increase end-user participation aligned with state DR objectives. Specifically, an Electric Power Research Institute (EPRI) report provided an excellent comprehensive identification of key physical, administrative, and technological barriers to DR participation within the food industry (EPRI 2005). Several of the key points identified in the EPRI report were:

- Reliability is a profoundly more potent motivator than energy cost for DR in the food industry. Maintaining plant productivity and resulting customer service is a higher priority than energy cost.
- The "packaging" of DR offerings is perceived as inadequate. Current DR programs are uncoordinated and confusing and aren't effectively matched with business needs.
- A business's profit margin can affect their view of economically-driven DR. In general, economically-driven DR is inversely related to profit margins. For lower-margin businesses, such as food processing in general, economically-driven DR could become a higher priority if DR were effectively structured.
- DR may appear to create a conflict of interest with other energy cost reduction measures. Many energy users don't believe there is significant load available to reduce or shift. Their focus is on energy efficiency measures and not DR.

The EPRI report concluded that the California food industry did not appear to be a promising candidate for participation in DR programs. In addition, a primary emphasis of the EPRI effort was the need to develop DR tools.

1.2 Objectives

This study attempted to dig deeper to determine whether DR could be promising in the food processing industry given an effective design and approach. The specific study objectives were as follows:

- To gain a historical and current understanding of the barriers (e.g. business, regulatory, etc.) contributing to limited food industry DR participation in California.
- Identify resources, policies, methods, training, and technologies that would stimulate increased food industry DR participation.
- To provide recommendations that would stimulate increased food industry DR participation and define future research needs to assist in the achievement of statewide DR objectives.

---

1 Root cause: Analytical methods to determine the core problem(s) of an organization, process, product, market, etc. (from APICS 2002).

2 E.g. Optional Binding Mandatory Curtailment (OBMC), Critical Peak Pricing (CPP), etc.

1.3 Research Scope

The goal of this study was to increase knowledge and understanding of plant operating loads, technological opportunities, and economic decision making with regard to the California food processing industry's participation in statewide DR activity. Significant gaps currently exist between California food industry business needs relative to California's statewide DR objectives. Via public-private cooperation and teamwork, statewide DR activity needs to effectively align with current and future California food industry business competitiveness requirements relative to statewide electricity infrastructure capacity, resources and investment.

This report illuminates the spectrum of barriers and issues that currently preclude effective California food industry participation in structured DR activity. Based upon California food industry end-user inputs, diagnosis of the applicable DR participation barriers and recommended corrective actions are addressed.

1.4 Benefits to California

This scoping study suggests that there is significant DR potential in the food processing industry. The results provide some initial information on the degree of and reasons for participation or lack of participation. The study explores the viability of current tools and information and highlights the need for better tools and DR processes. State energy planners may be informed by industry managers' desire for a comprehensive operating, technological and regulatory approach to DR. In addition, the food processing DR survey model, methodologies and application may be transferred to other industry segments to identify additional DR opportunities across industries to the further benefit of California.

1.5 Report Organization

Section 2 describes the project methods, including baseline data gathering and the survey methodology. Section 3 presents a summary of key results, grouped by category and illustrated with graphs. Section 4 contains conclusions, recommendations, and discussion on the implications of the results. Section 5 provides the references and Section 6 is a glossary of terms. Appendix A displays the results for each survey question in graph or table form, followed by the survey questions. Appendix B contains additional utility peak load and consumption data for the entire food processing industry. Appendix C presents recommendations on that are beyond the scope of PIER.

2.0 Project Results

This section discusses the methodology used in the study. This approach is transferable to most if not all California manufacturing industry segments in addition to the food processing industry.

From August-October 2006, a Demand Response Scoping Study (DRSS) baseline survey was conducted that provided food processors the opportunity to provide input to identify the current issues and barriers for the lack of DR participation as well as recommendations for stimulating DR participation. The detailed research methodology is addressed in section 2.2 below.

2.1 Baseline Data

As part of the study, baseline data on the food processing industry as well as peak demand and energy consumption were gathered. Table 1 shows the California food processor North American Industry Classification System (NAICS) and Standard Industrial Classification (SIC) categories for canned, frozen and preserved fruits, vegetables and food specialties that comprised the initial focus of the study. The primary reason for this focus was the ability to organize and glean information from this targeted segment via the California League of Food Processors (CLFP) trade association resources and general industry network. The CLFP represents approximately 90 percent of California food processors within NAICS 311421-311423 and therefore forms a representative sample of the total NAICS 311421-311423 (SIC 2033 – 2035) population.

Table 1. California key food processor NAICS and SIC categories

NAICS Code	SIC Code	Description
311421	2033	Canned Fruits, Vegetables, Preserves, Jams & Jellies
311422	2034	Dried & Dehydrated Fruits, Vegetables & Soup Mixes
311423	2035	Pickled Fruits & Vegetables, Vegetable Sauces & Seasonings, Salad Dressings

As part of the study, a DR data team consisting of both Pacific Gas & Electric (PG&E) and Southern California Edison (SCE) members quantified specific food processor demand both above and below the 200 kW regulatory threshold to be used for subsequent DR reduction estimation per survey inputs. San Diego Gas & Electric (SDG&E) was not included in the study since the food processors in its service territory represent less than five percent of applicable California food processing activity. Table 2 shows the electricity demand and usage information for the year 2005 for NAICS industry group 311421-311423 (SIC 2033 – 2035) supplied by both utilities for their service territories. The data are presented by number of accounts (both greater and less than 200 kW) per the current DR tariff structures. For PG&E, peak demand was derived from the sum of the maximum demand found for each Service Agreement in 2005. PG&E's annual usage is the sum of electricity usage for each Service Agreement in 2005. For SCE, peak demand is the load coincident with SCE's system peak for 2005.

Table 2. Demand by utility for NAICS 311421-311423

	# of Accounts	2005 Peak Demand (MW)	2005 Annual Usage (TWh)
PG&E			
> 200 kW	65	124.1	309.5
< 200 kW	61	4.1	8.7
PG&E Total	126	128.2	318.2
SCE			
> 200 kW	29	14.8	87.5
< 200 kW	80	NA	6.2
SCE total	109	NA	93.7

Sources: PG&E 2006, SCE 2006
NA: Data not available

The utility data team submitted additional data on the entire food processing sector (NAICS 311 – 319, SIC 20). Appendix B presents these data, along with other information on the energy consumption of this sector. Some of the conclusions and recommendations from this scoping study will be applicable to the rest of the food processing sector.

2.2 Tasks, Objectives, and Approaches

The study was structured with three primary tasks:

- Task #1: Baseline Assessment of Food Processing DR Participation Barriers
- Task #2: Needs Assessment to Increase Food Processing DR Participation
- Task #3: Recommendations for Increased Food Processing DR Participation

The specific objectives and approaches of each of these three tasks are as follows:

Task #1: Baseline Assessment of Food Processing DR Participation Barriers

Objective: To gain a historical and current state understanding of the issues limiting food processing DR participation (e.g. seasonal summer operations, regulatory issues, etc.).

Approach: Meetings, formal surveys, and personal communication.

Task #2: Needs Assessment to Increase Food Processing DR Participation

***Objective*:** Identify resources, policies, methods, training, and technologies that would stimulate increased food processing DR participation.

***Approach*:** Meetings, formal surveys, and personal communication.

Task #3: Recommendations for Increased Food Processing DR Participation

***Objective*:** Provide recommendations that would stimulate increased food processing DR participation.

***Approach*:** Consolidation of inputs and analyses from Tasks #1 and #2 to prepare proposed recommendations for stimulating increased food processing DR participation.

In order to glean food processor inputs per tasks #1 and #2 for use in formulating recommendations per task #3, a 42-question web-based survey questionnaire structure was implemented. Each participant received an e-mail with a web link where they logged in to take the survey. Through CLFP and other industry contacts, 56 companies were contacted. The survey respondents were primarily energy managers. The CLFP and general industry network survey submissions and response information are shown in Table 3.

Table 3. Survey and response data

Total Survey Submissions	56 companies
Total Survey Responses	16 companies
Survey Response Rate	29%

The DR survey structure was segmented into three primary categories:

- Operations and Economics (15 questions)
- Regulatory and Administrative (6 questions)
- Education and Training (21 questions)

For this report, the categories were reorganized, with some questions allocated to a different category than they had appeared in the survey. For this report, some of the questions were allocated to an additional category, Potential and Participation. Key results are shown as figures in the main body of the report. Graphs summarizing the results of all survey question responses are located in Appendix A. A copy of the survey questions follows the presentation of results in this appendix.

In addition, DR meetings were conducted with both PG&E and SCE food processors as well as the California Public Utilities Commission, PG&E, and SCE senior management.

3.0 Project Results

Key survey results are shown and discussed in this section. These results are incorporated in the subsequent recommendations. The detailed DR survey results by category are displayed in Appendix A. The survey was supplied to 56 food California food processors representing approximately 90 percent of state food processors in NAICS codes 311421-311423 (SIC 2033 – 2035). Survey responses were received from 16 companies, for a 29 percent response rate. Results are summarized in the three categories below. Note that respondents may operate more than one plant; hence the totals of percentage responses to some questions are greater than 100 percent.

3.1 DR Potential and Participation Results Summary

The feasibility of DR implementation depends on plant operating schedules and supply chain needs. Various factors such as scheduling of raw material delivery, perishability, labor, logistics, shelf life, and product transport require the industrial sector in general, and the food processing sector in particular, to carefully plan for operation curtailment or postponement. Plants operating 3 shifts (24 hours/day) may have more opportunities to shift their demand to off-peak times. Figure 1 shows that over half of respondents had plants operating 24 hours per day, 7 days per week from July – October, and many had plants operating 3 shifts 5 or 6 days per week. This indicates that a substantial number of plants in California may have DR opportunities.

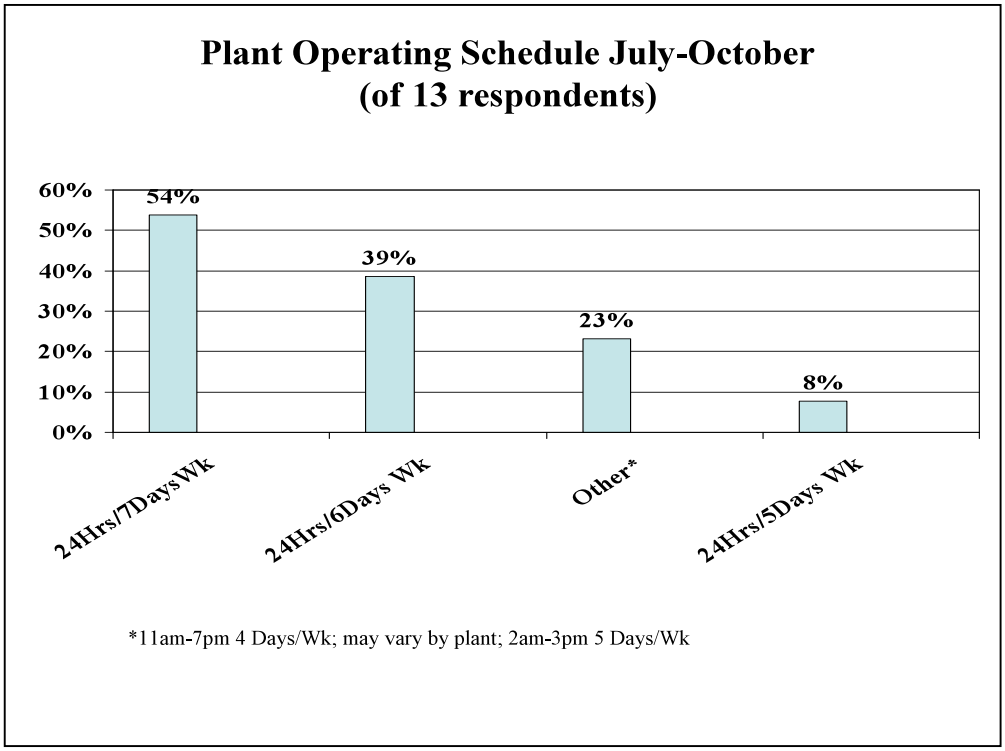


Figure 1. Plant operating schedules during peak season

The survey results illustrating the percentage of respondents able to reduce or shift demand are shown in Figure 2 and Figure 3. As shown, 31 percent of those respondents had the opportunity to reduce essential demand (i.e. manufacturing demand) and 77 percent had the opportunity to reduce non-essential demand (e.g. office buildings, etc.). The operational categories in which respondents could reduce demand are shown in Figure 4. For respondent opportunities to shift demand during the July-October period, 23 percent of respondents had the opportunity to shift essential demand (i.e. manufacturing demand) and 54 percent had the opportunity to shift non-essential demand (e.g. office buildings, etc.). Figure 5 shows the categories in which those respondents could shift their demand.

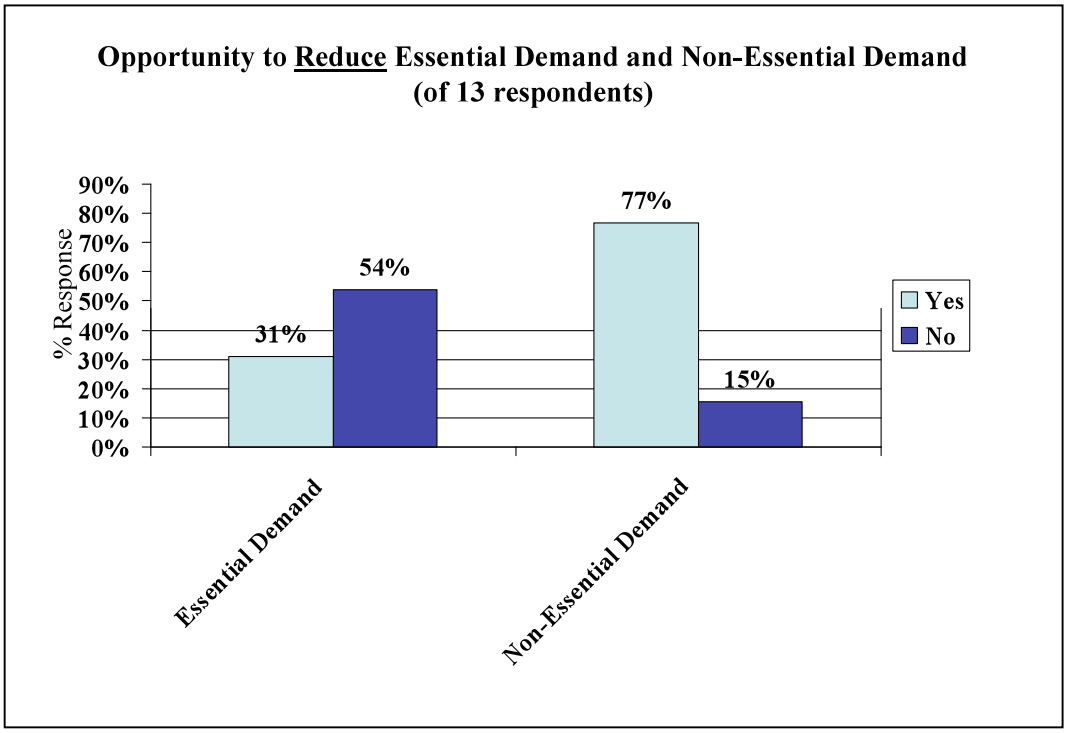


Figure 2. Demand reduction potential (essential and non-essential demand)

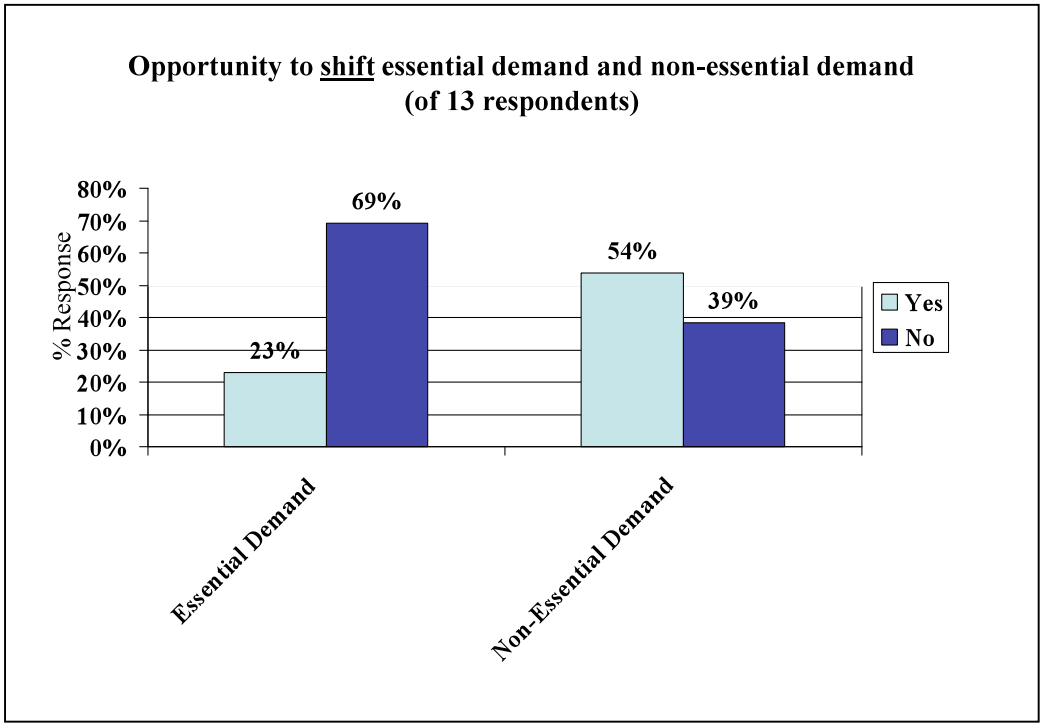


Figure 3. Demand shift potential (essential and non-essential demand)

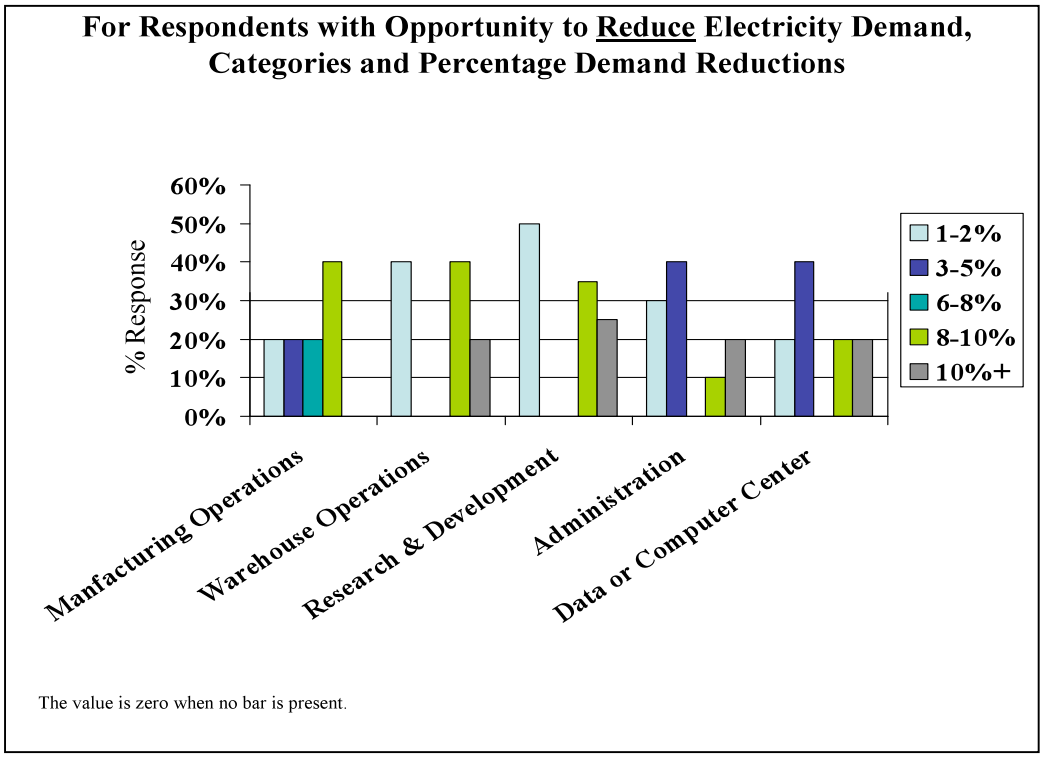


Figure 4. Demand reduction potential by category

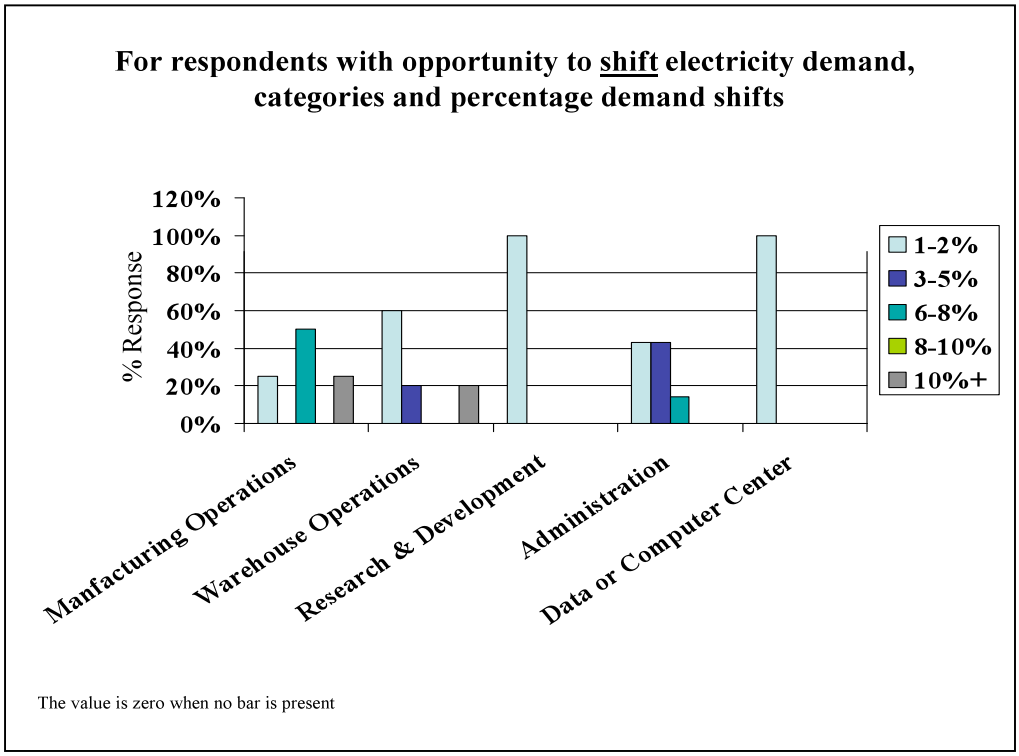


Figure 5. Demand shift potential by category

Figure 6 reflects that 44 percent of all survey respondents were enrolled in a DR program, such as interruptible tariff, demand bidding, or OBMC. Figure 7 shows that of those respondents only half actively participated in their enrolled DR program. Of the 22 percent that actually participated in DR, their primary reasons were event-based rather than process-based. Respondents cited corporate citizenship and favorable economics when plant operating conditions and production schedules allowed (e.g. shifting demand from peak to off-peak periods, operations and supply chain impact, etc.) as their primary reasons for participation.

The primary reasons cited by respondents for enrolling and not participating in DR were plant production schedule constraints ("priorities") and lack of DR program cost-effectiveness. Of these respondents, one quarter chose "Priorities" and one quarter chose "Resources" as the reasons for non-participation. (Management support, interest, and training were not chosen as reasons for non-participation.) Three-quarters of respondents chose "Other," commenting on the need to run according to production schedules, the risk to business being greater than the benefit, and lack of cost-effectiveness.

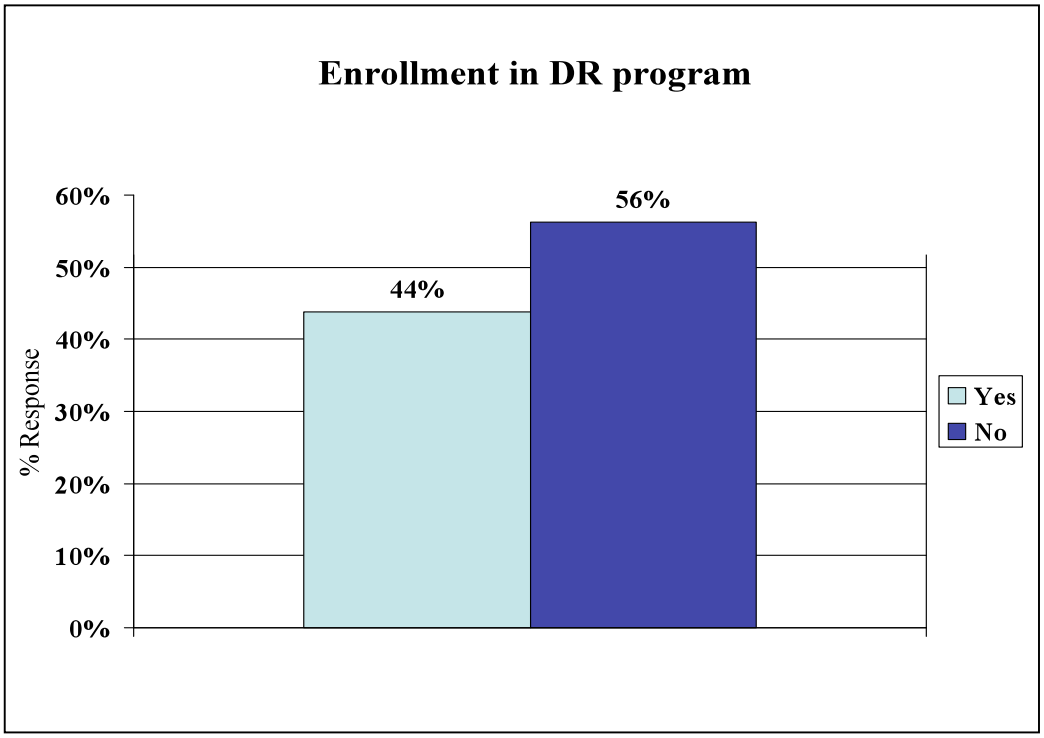


Figure 6. Percentage enrollment in DR programs

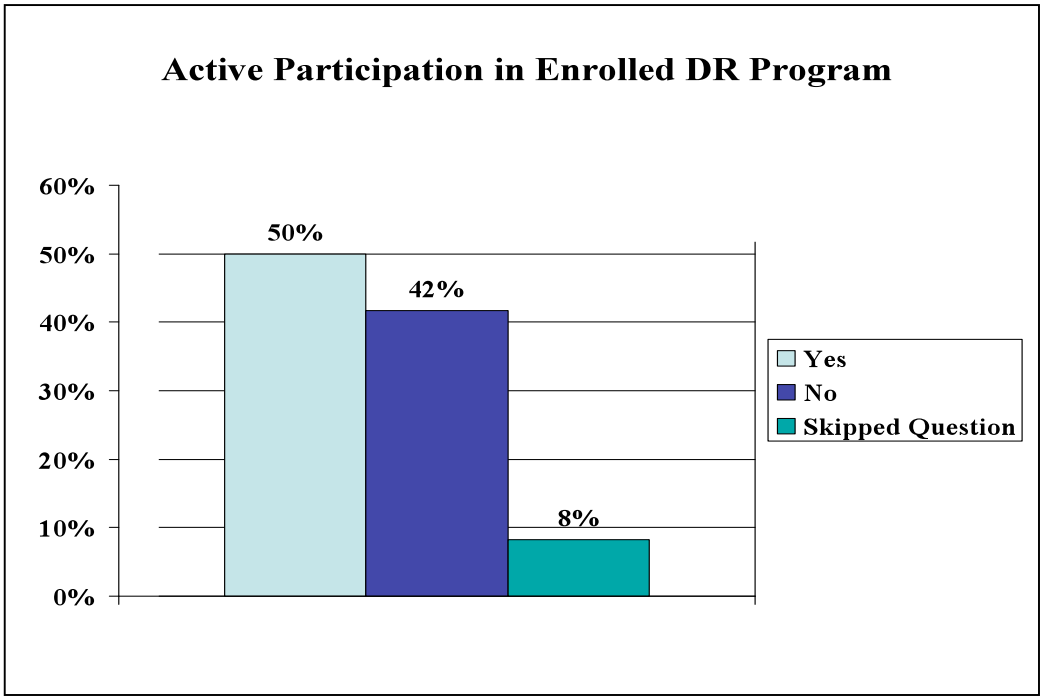


Figure 7. Percentage participation in DR programs

In summary, on DR potential and participation, respondents indicated that:

1. Significant DR opportunities existed to both shift and reduce essential and non-essential demand.
2. While there was some enrollment in DR programs, participation in DR lagged enrollment.
3. The primary reasons cited by respondents for enrolling and not participating in DR were plant production schedule constraints, lack of DR program cost-effectiveness, priorities, and resources.
4. Of those who participated in DR, the primary reasons were corporate environmental citizenship and economics.

3.2 Operations and Economics Results Summary

Respondents indicated that electricity costs comprised the following percentages of total plant operating costs shown in Figure 8. For almost a third of the sample, 15 percent of plant operating cost was electricity, and for almost a quarter, that percentage was 10 – 12 percent. This indicates that for over half of respondents, some fraction of 10 - 15 percent of operating costs could be addressed by DR. In addition, 69 percent of respondents indicated the economic impact (loss) from both reducing and shifting demand outweighed current incentives to reduce or shift demand.

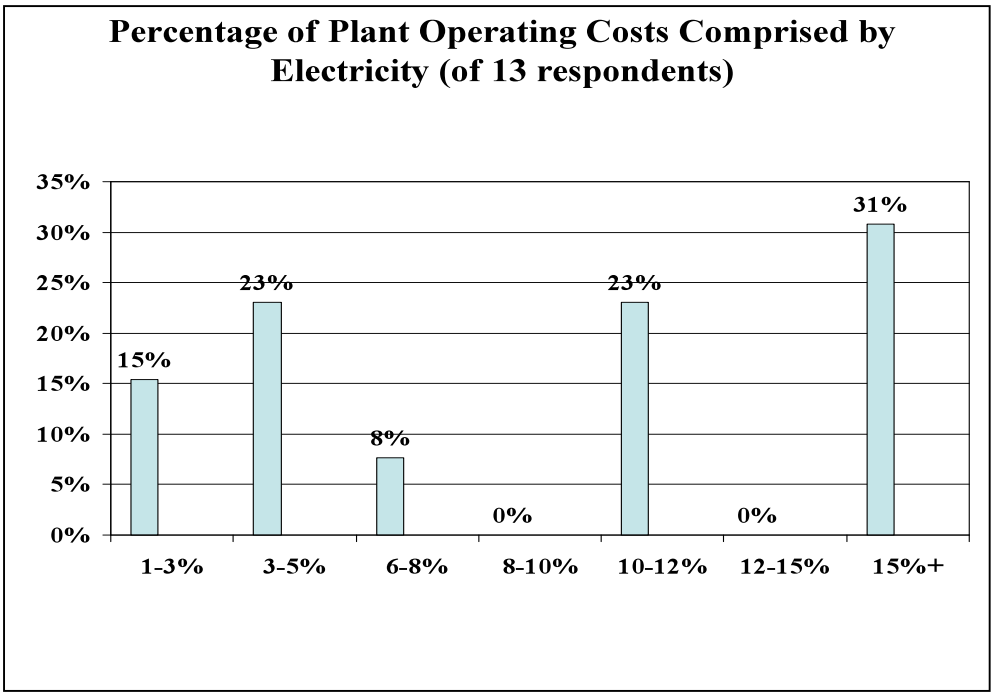


Figure 8. Percentage of plant operating costs comprised by electricity

Survey respondents indicated they would like key incentives to engage in and sustain DR participation. For initial preparatory incentives, 75 percent wanted DR metering and other technologies, 58 percent wanted multi-year participation incentives, 42 percent wanted DR education and training, and 17 percent mentioned other incentives, such as making the value of the incentive equal to production loss and having paybacks commensurate with actual savings

vs. real-time grid pricing. For sustained participation incentives -- longer-term incentives focused on ensuring sustained DR in plant operations -- 67 percent wanted multiple tariff incentives to include other utilities (natural gas transportation, water, wastewater, etc.), 50 percent wanted electricity tariff assistance , 50 percent wanted DR rebate incentives, 17 percent were interested in counter-seasonal incentives (summer demand response in exchange for incentives in the winter natural gas tariff), and 8 percent mentioned standby generation incentives or fuel cell investment incentives.

In summary, on operations and economics, respondents indicated that:

1. Electricity represented at least 10 percent of total plant operating cost for over half of respondents, indicating that for the majority of plants at least 10 percent of operating costs could be addressed by DR.
2. Over half operated their plants continuously from July - October.
3. Over three-quarters had the opportunity to ***reduce non-essential demand*** (e.g. office buildings, warehouses, etc.). Over half had the opportunity to ***shift non-essential demand***.
4. Almost one-third had the opportunity to ***reduce essential demand*** (e.g. direct manufacturing asset demand, etc.). Almost one-quarter had the opportunity to ***shift essential demand***.
5. Three-quarters would participate in DR with metering and technology investment incentives plus progressive multi-year participation incentives.
6. One-third wanted multiple tariff incentives across utilities (e.g. natural gas, water, wastewater, air emissions, tax credits, etc.).

3.3 Regulatory and Administrative Results Summary

When asked about the adequacy of DR enrollment and implementation process, half of the respondents thought that the current DR enrollment and implementation process was adequate to understand and implement, 7 percent thought it was complicated, and 43 percent skipped the question because they were not enrolled.

Figure 9 indicates that almost two-thirds of respondents initiated DR administration via their energy managers with utility representative assistance. Almost three-quarters of respondents thought that their utility representatives were knowledgeable to completely knowledgeable on current DR incentive programs.

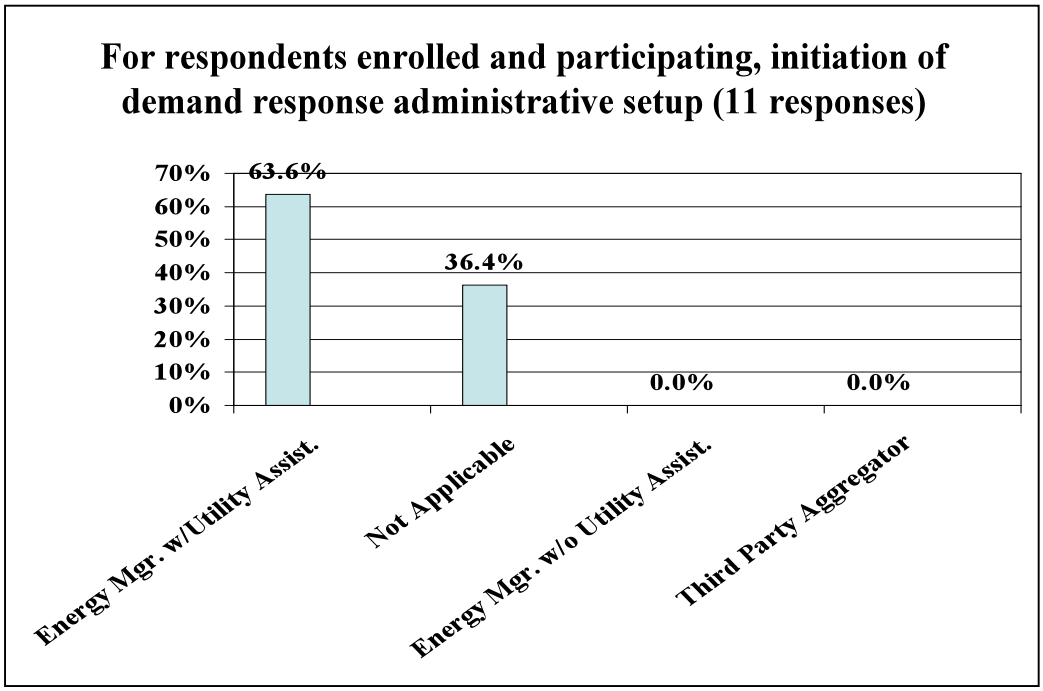


Figure 9. Source of DR administration assistance

Over three-quarters of respondents wanted consolidated, uniform, and standardized statewide demand response and energy efficiency activity.

In summary, on regulatory and administrative issues, respondents indicated that:

1. Half of energy managers found the DR process adequate to understand and implement.
2. Almost two-thirds of respondents initiated DR administration via their energy managers with utility representative assistance and almost three-quarters of those thought that their utility representatives are knowledgeable on current DR incentive programs.
3. Over three-quarters wanted one combined, uniform statewide strategy, objective and process for both DR and energy efficiency versus multiple, uncoordinated programs and objectives.

3.4 Education and Training Results Summary

As shown in

Figure 10, 56 percent of respondents were familiar with DR. (Note that the totals in this figure are greater than 100 percent because respondents gain information from multiple sources and selected more than one category in their responses.)

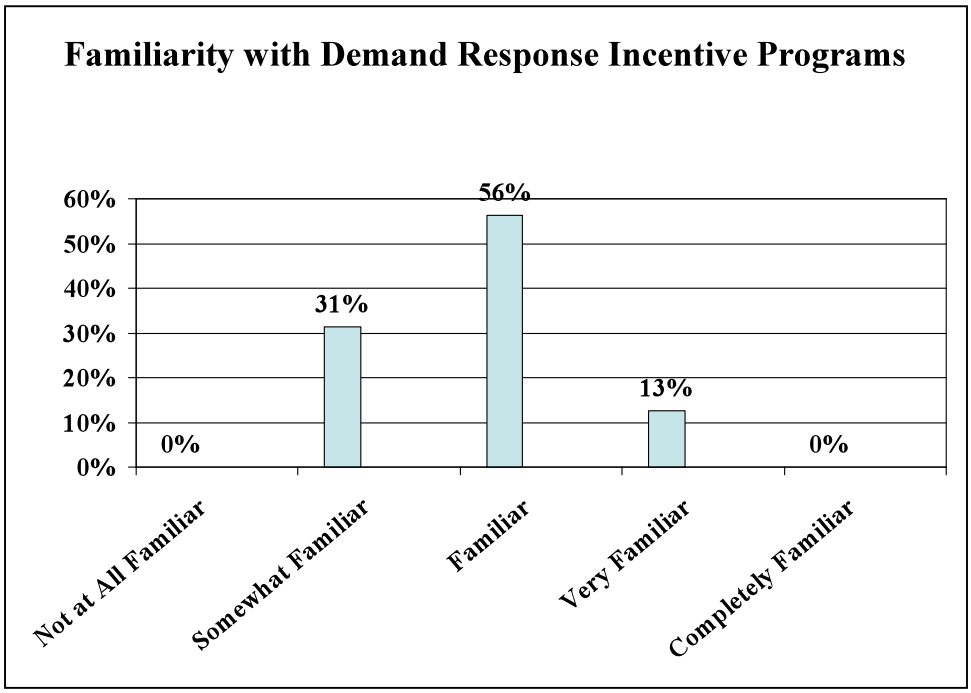


Figure 10. Familiarity with DR incentive programs

On sources of DR program information, 100 percent of respondents got information from their electric utilities, 38 percent from general media, 38 percent from trade associations, 25 percent from the California Flex Your Power program, 25 percent from consulting firms and informal networks, 19 percent from the Energy Commission, 19 percent from the California Public Utilities Commission, 6 percent from the Department of Energy, and 6 percent from the Environmental Protection Agency. (Note that the total is greater than 100 percent because respondents gain information from multiple sources and selected more than one category in their responses.)

Only 19 percent of all respondents and only 25 percent of plant operations management or hourly personnel received formal DR training. In contrast, almost half of all respondents and 40 percent of operations and hourly personnel were trained in energy-efficiency issues.

For respondents who signed up for DR but were not participating, Figure 11 shows that 60 percent of respondents cited DR being an overall low priority in the scope of plant operations as their primary reason for not participating in DR training. Forty percent of the respondents were

in the "Other" category and referenced lack of resources, awareness, training materials, interest, and operations and economics issues as specific reasons.

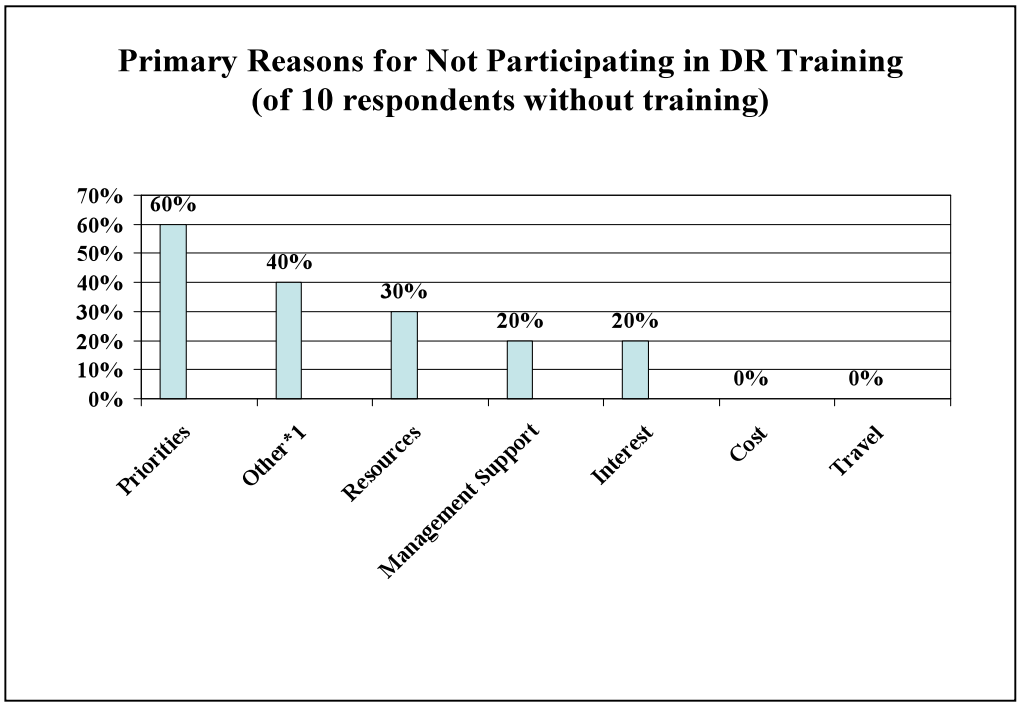


Figure 11. Reasons for non-participation in DR training

As suggestions to improve the participation rate and effectiveness of DR training, respondents cited:

1. More frequent and structured DR training
2. Improved awareness and communication of DR training
3. DR training specific to their operating needs
4. Convenient training options with preferred training methods being CD/DVD, webinars, and seminars

Although survey respondents were fairly familiar with existing utility energy management systems such as Pacific Gas & Electric's InterAct™ (PG&E-IA) and Southern California Edison's Cost Manager (SCE-CM), only roughly one-third used either tool. About two-thirds of PG&E respondents and one-third of SCE respondents were familiar with using their respective utility energy management systems. However, the systems were being used on a limited basis by respondents. PG&E-IA was primarily used less than once per month by 57 percent of applicable respondents and SCE-CM was used less than once per month by 67 percent of applicable respondents. Although not specifically addressed in the survey and noted as a follow-up item with survey respondents, it is inferred that the minimal per month usage of InterAct™ and Cost Manager may be for plant accounting needs versus actual energy management operations.

Survey respondents' suggestions on how to improve PG&E-IA and SCE CM included improved data integrity, more user-friendliness, and better understanding of the concepts and processes, more cost-effectiveness of the tools.

Over half of respondents did not have energy information management tools and technologies to effectively measure and manage DR. In preparing California food processors to effectively participate and conduct DR, providing technology incentives for DR metering and technology investment were weighted heavily by survey respondents.

In summary, on education and training, respondents indicated that:

1. Plant energy managers were generally familiar with the purpose of DR but have limited end-user training and understanding of the technologies.
2. The primary source of DR information was utilities. Utility account managers were knowledgeable to very knowledgeable on overall energy management but needed to improve their level of knowledge on DR.
3. Energy managers reported limited use of Pacific Gas & Electric (PG&E) InterAct™ and Southern California Edison (SCE) Cost Manager for DR and overall energy management.
4. Lack of DR knowledge, resources and incentives had relegated DR to a low end-user priority for some energy managers.
5. Over half of respondents did not have DR information tools and technologies.

4.0 Conclusions and Recommendations

4.1 Conclusions

Survey results indicate opportunities exist to both *reduce* and *shift* essential demand (i.e. manufacturing-related demand) and non-essential demand (e.g. office buildings, warehousing, etc.). Survey respondent results indicate DR optimization opportunities exist if DR processes and incentives were effectively structured. A statewide coordinated DR process with industry-friendly incentives needs to be in place before effective DR tools can be designed and provided. The following recommendations address participation and optimization of the state's DR potential for the food processing sector.

4.2 Recommendations

These recommendations related to the PIER program arose from the knowledge gained from the study.

Education and Training Recommendations

DR tools and technologies that enable applications are very important to end-users. Measures are needed that would provide incentives for more people, including those involved in daily operations, to participate in DR education and training. Ideas suggested by participants include:

- More frequent and structured DR training;
- Communication about DR training;
- Training tailored to operating needs, and use of convenient methods such as CD/DVD, webinars, and seminars.

Many more people have taken EE training than DR training because EE incentives have been active for so many years and therefore their process is mature and better organized. EE incentives have existed for two decades, while in contrast DR is in its initial stages. Therefore the industry has been much more familiar with EE. The survey responses point to the need for DR incentives to be organized at the same level, as well as the need for education among the industry on DR.

Operations and Economics Recommendations

The survey indicates that respondents have some incentives and some disincentives toward implementing DR in their facilities. They want more DR incentives. A combined 62 percent of respondents use PG&E's InterAct™ and SCE's Cost Manager on only a limited basis. The following actions are recommended:

- Further research on the specific non-tariff processes, methodologies, and technologies that could progressively reduce both essential and non-essential manufacturing demand up to 10 percent. (Note that additional research needs to be conducted to determine the current status of controls technologies in plants, the ability of these controls to receive AutoDR signals, and techniques that would enhance this capability.)

- Further research on the electricity demand and usage cost components and opportunities to optimize both components could be addressed in future research efforts.
- Development of energy information management and decision support systems tools that correlate and bridge public sector energy resource management metrics with private sector food processor DR decision-making.
- Research on DR opportunities for all California food industry NAICS / SIC categories (NAICS 311 - 319, SIC 2011-2099).

Regulatory and Administrative Recommendations

Survey respondents stated that their primary channel for learning about DR was their electric utility company. Respondents also expressed their desire for a statewide DR structure. Therefore, the following actions are recommended:

- Utility representative training and knowledge base of DR could be bolstered and made consistent statewide.
- Creation of a joint public and private sector clearinghouse. This could be designed by a collaborative DR team consisting of representatives from utilities, end-users, California Energy Commission (CEC), California Public Utilities Commission (CPUC), Demand Response Research Center (DRRC), trade association representation, and general media (e.g. Flex Your Power, etc.). Their goal would be to achieve the following:
    - Develop a strategic roadmap for current and future DR processes, methodologies, audits, technologies, education, training, and communication.
    - Provide a joint public-private clearinghouse forum and effective distribution channels for clear communication and dissemination of DR objectives, training, technologies, administration, incentive and DR progress achievement information relative to DR objectives.
- Improvements in efficiency of DR administration
- Food processor plant personnel and utility account management training
- Development of a DR technology roadmap as a statewide DR-EE resource option provided to food processors and other industrial end-users.
- Alignment of DR process standardization with state DR objectives

4.3 Discussion

Although the focus of this survey was to provide input for PIER, it is clearly recognized that the scope of DR corrective actions needed are not all within the specific purview of PIER. Subsequent phases of the survey initiative would include the following considerations. As discussed in the recommendations above, effective public-private sector coordination and cooperation is required, including coordination and cooperation from multiple public sector agencies, if sustainable statewide DR achievement is to be realized. Appendix C discusses such non-PIER recommendations. This section presents further discussion on PIER-related activities.

Currently, there is much end-user subjectivity in the ability to effectively engage in plant operation DR activity. In addition to the existing DR education and training gaps, the

aforementioned lack of effective DR processes and incentives are primary factors in cursory and subjective assumptions and resulting decisions not to participate in DR. Once the education, training, processes and incentives issues are effectively corrected then DR technology enablers, including the possible option of automated-DR integrated with plant production planning, can be introduced to facilitate end-user DR planning, decision making, and execution.

The plethora and complexity of current state DR programs, and the associated regulatory and utility implementation strategy, are tangential to the core problem in lack of DR participation by California's food industry as well as other industry segments.

Although technology is an important aspect of DR, there are more fundamental root issues in correcting the lack of DR participation that need to be a precursor to DR tools and technologies. Having an emphasis on DR tools and technologies without addressing the core DR process and incentive issues will not result in improved DR participation and effectiveness. Once DR processes and incentives are effectively redesigned, appropriate DR tools can be mapped and integrated into the new DR process as an effective technological enabler for sustainable, successful DR. Mapping and integrating DR tools into the current state of DR programs will result in an inefficient investment of IT resources and funding if applied to the present DR programs offered. The net result of a tools-emphasized approach to DR without effectively addressing the fundamental DR process and incentive issues will continue to yield minimal end-user participation in both DR programs <u>and</u> existing tools applications, let alone proposed DR tools applications. The resulting net effect could be a failed or at best non-optimized DR effort.

The Phase I and future efforts attempt to recommend a DR ***pull strategy*** with applicable DR processes and technologies to glean greater DR participation by food industry end-users. A pull strategy reflects tangible end-user needs as specifically defined by the end-use customer and not inferentially derived by utilities and/or regulating entities. A ***push strategy*** is the direct opposite of a pull strategy as it does not take into account actual, specific requirements defined by the end-use customer. In a push strategy, the utility and/or regulating entities make assumptions about end-use customer needs and operations that are not based on field experience or feedback. The result of a typical push strategy is limited participation by end-users or a program failure in the worst-case. Existing DR programs have essentially been a public sector and utility push strategy that has not effectively addressed or understood business needs of food processors or other industry segments. The push strategy coupled with the lack of effective understanding of food processor business and competitiveness issues has resulted in the lack of significant DR participation and lost DR opportunities in plant operations.

As discussed above, included in the DR participation 'cure' is the need for a DR ***<u>joint public and private sector clearinghouse structure</u>***. This structure would effectively screen proposed and existing DR strategic and tactical activity from utilities and other sources to ensure current and future DR resources and processes are effectively designed, administered, implemented and aligned in accordance with appropriate statewide energy and environmental objectives in addition to California food processor business objectives. This would represent a holistic, comprehensive and statewide objectives-based **<u>pull strategy</u>** approach to DR versus the current state of piecemeal, uncoordinated strategy DR activity. Both DR and energy efficiency (EE) activity could be included in the clearinghouse structure to plan and administer DR-EE together

to ensure coordinated DR-EE objectives and application as well as resource efficiencies and economies.

4.4 Benefits to California

This scoping study suggests that there is significant DR potential in the food processing industry. The results illuminate the degree of and reasons for participation or lack of participation. The study explores the viability of current tools and highlights the need for better tools and DR processes. Industry managers indicated their desire for a comprehensive operating, technological and regulatory approach to DR. In addition, the food processing DR survey model, methodologies and application can be transferred to other industry segments in order to identify additional DR opportunities across industries to the further benefit of California.

The study's survey format may prove useful for conducting scoping studies on other food segments (e.g. beverages) and non-food industrial segments (e.g. electronics, petroleum, machinery, etc.). This Phase I Scoping Study fostered communication and identified collaboration opportunities between industry representatives, utilities, and state DR planners. With a well-structured program the mutual benefits of reducing electricity demand for the states' utilities and increasing food processor operating competitiveness can be achieved.

The primary benefits of DR to California include:

- Reduction of system-wide electricity demand
- Minimization of transmission grid capacity constraints, safety and reliability issues during summer months
- Creation of a DR process and structure to optimize and institutionalize annual operating demand and environmental impacts (e.g. C02 emissions, etc.) during counter-seasonal months as well as targeted summer seasonal months
- Effective generation resource capacity procurement and operations planning
- Greenhouse gas emissions reduction from natural gas-fired generation
- Reduction of water resource usage for hydroelectric generation

5.0 References

APICS. 2002. *APICS Dictionary: 10th Edition*. The Association for Operations Management (then Educational Society for Resource Management). Alexandria, Virginia.

Brown, R.E. and J.G. Koomey. 2002. *Electricity Use in California: Past Trends and Present Usage Patterns.* Lawrence Berkeley National Laboratory. Berkeley, California. LBL-47992. May. http://enduse.lbl.gov/Projects/CAdata.html.

CDFA. 2006. "California Agriculture: Highlights 2006." California Department of Food and Agriculture, Sacramento, CA.

CEC 2006. California Energy Commission. Demand Analysis Office.

EPRI Solutions Inc. 2005. *Demand Response Analysis and Tool Development for Industrial, Agricultural, and Water (IAW) Energy Users.* Electric Power Research Institute. Troy, New York.

KEMA. 2006. *California Industrial Existing Construction Energy Efficiency Potential Study*. KEMA, Inc., Oakland, California. Final Report to Pacific Gas and Electric Company. CALMAC Study ID: PGE0252.01. May. http://www.calmac.org/publications/Industrial_Potential_Vol_1_Main_Report_KEMA.pdf, http://www.calmac.org/publications/Industrial_Potential_Vol_2_Appendixes_KEMA.pdf

LBNL. 2004. *PIER Demand Response Research Center Plan*. Lawrence Berkeley National Laboratory and California Energy Commission. Berkeley, California. January 30. Version 3.

PG&E. 2006. Personal communication, Andrew Scott, Pacific Gas and Electric Account Services. September 8.

SCE. 2006. Personal communication, Cyrus Sorooshian-Tafti, Southern California Edison.

6.0 Glossary

APICS	Advancing Productivity, Innovation, and Competitive Success
Auto-DR	Automated demand response
CAISO	California Independent System Operator
CEC	California Energy Commission
CLFP	California League of Food Processors
CPUC	California Public Utilities Commission
DR	Demand response
DRRC	Demand Response Research Center
DRSS	Demand Response Scoping Study
EAM	Enterprise Asset Management
EE	Energy efficiency
EEM	Enterprise Energy Management
EPRI	Electric Power Research Institute
ERP	Enterprise Resource Planning
LBNL	Lawrence Berkeley National Laboratory
M&V	Measurement and verification
OBMC	Optional binding mandatory curtailment
PG&E-IA	Pacific Gas and Electric InterAct™
PIER	Public Interest Energy Research
SCE-CM	Southern California Edison Cost Manager
SDG&E	San Diego Gas and Electric
SIC	Standard Industrial Classification

Appendix A. Survey Results and Survey Instrument

This appendix contains the survey results presented in graph and table format. Many of these results are also reported in the main report. It also contains a copy of the survey questions.

A.1 Demand Response Potential and Participation Results

Figure A.1 Plant operating schedules during peak season

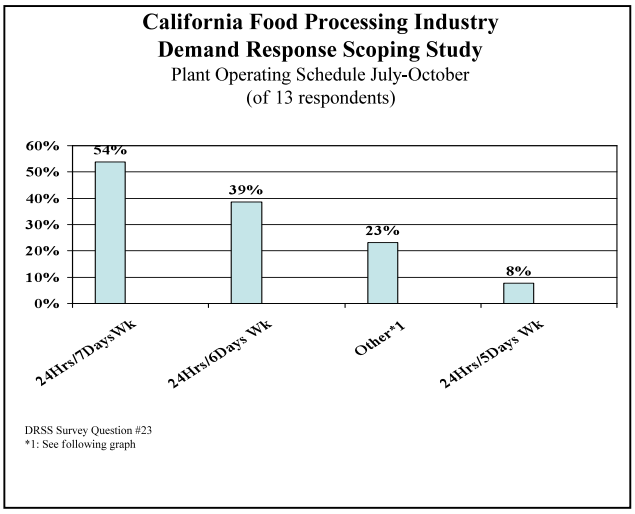


Figure A.3 Voluntary action to reduce demand

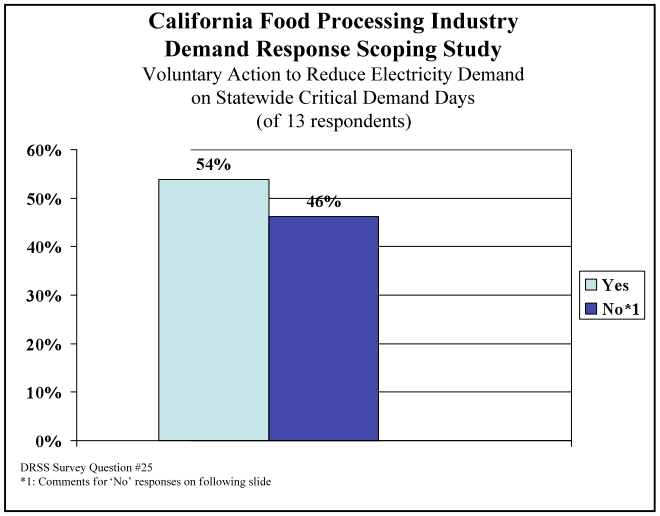


Figure A.2 Other plant operating schedules

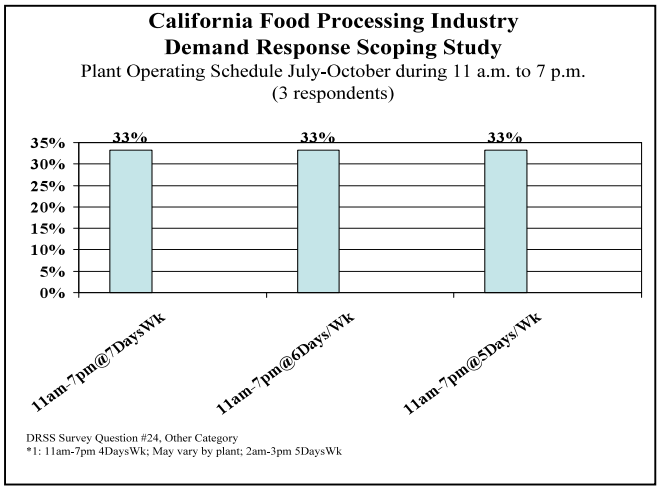


Table A.1 Reasons for not reducing demand

California Food Processing Industry
Demand Response Scoping Study
Reasons for not Taking Action to Reduce Electricity Demand on Statewide Critical Demand days

'Production and quality impact to operations.'

'Have yet to be requested by PG&E.'

'Have no mechanism in place to know when there is a critical demand day.'

'Management requirements to meet production schedules.'

'Not cost-effective to disrupt production.'

DRSS Survey Question #25 Comments

Figure A.4 Demand reduction potential

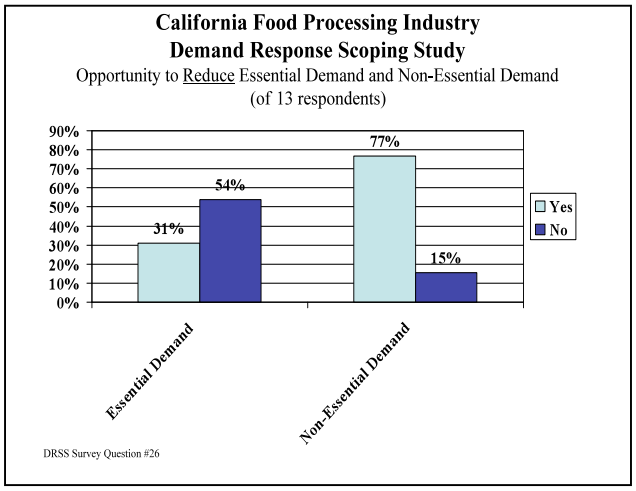


Figure A.5 Demand reduction potential by category

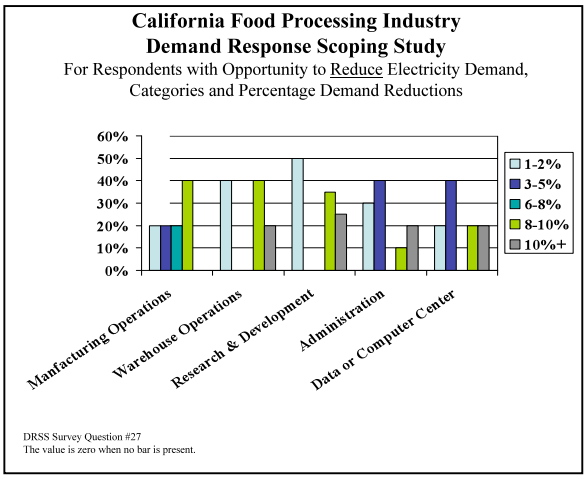


Figure A.6 Demand shift potential

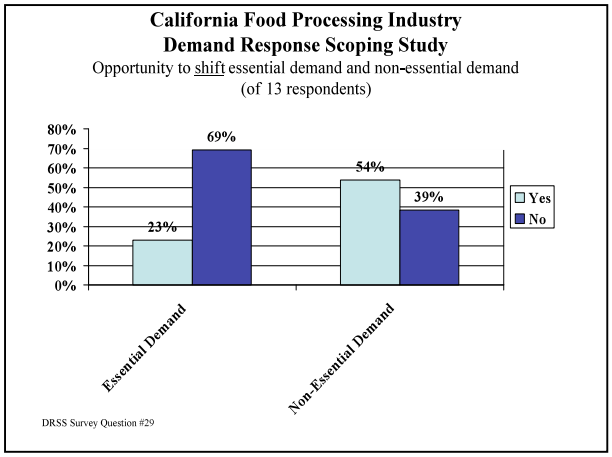


Figure A.7 Demand shift potential by category

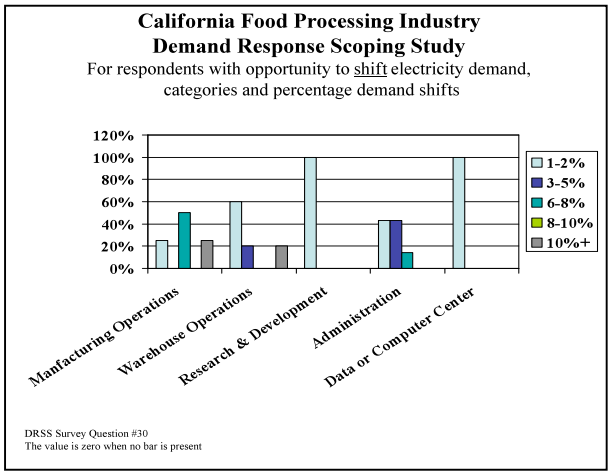


Figure A.8 Percentage enrollment in DR programs

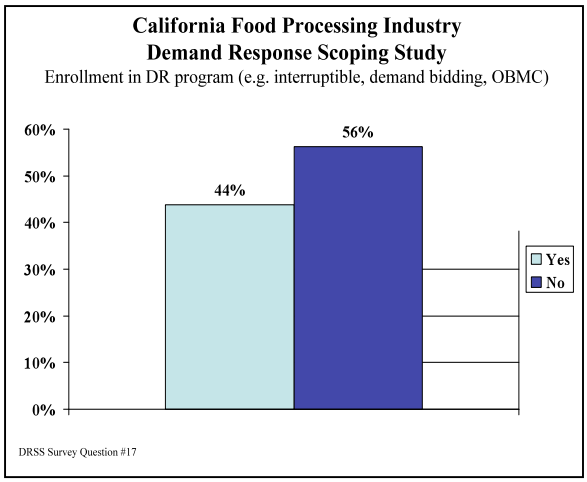


Figure A.9 Percentage participation in enrolled DR programs

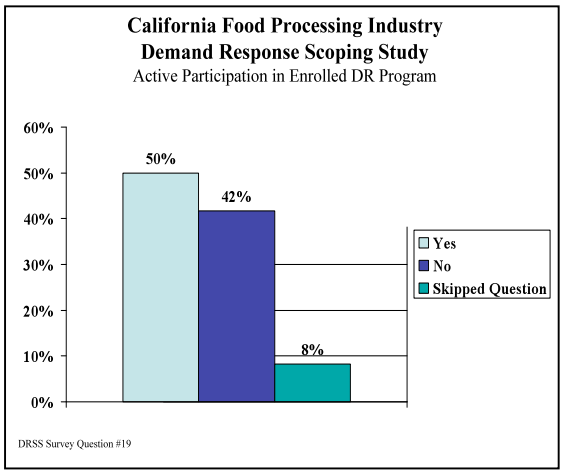


Figure A.10 Reasons for enrollment/non-participation

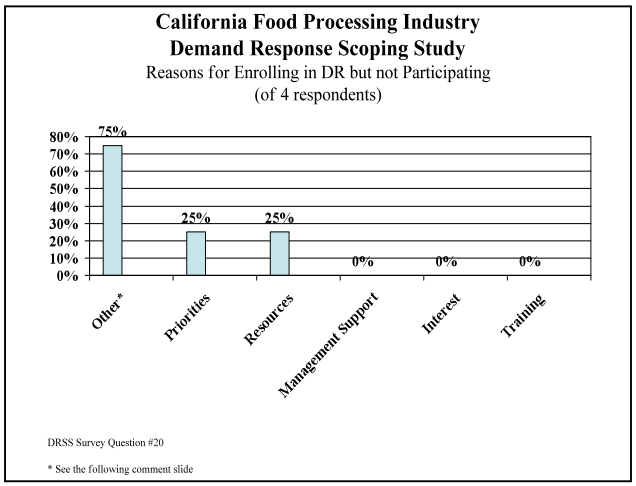


Figure A.11 Onsite generation applications

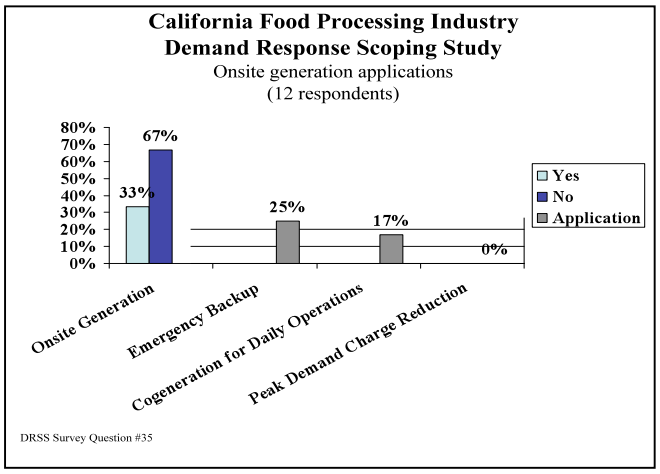


Table A.2 Comments on enrollment/non-participation

California Food Processing Industry
Demand Response Scoping Study
Comments on enrolling in DR but not effectively participating

'The need to run according to production schedules.'

'Risk to business is greater than benefit.'

'Not cost effective.'

DRSS Survey Question #20 Comments

A.2 Demand Response Operations and Economics Results

Figure A.12 Percentage of plant operating costs comprised by electricity

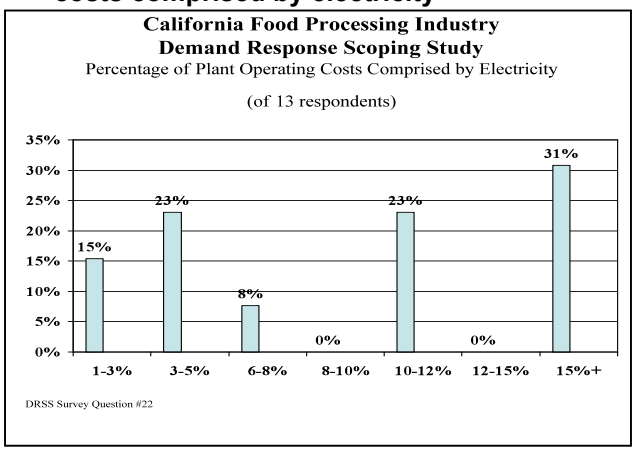


Figure A.13 Demand reduction economic losses vs. current incentives

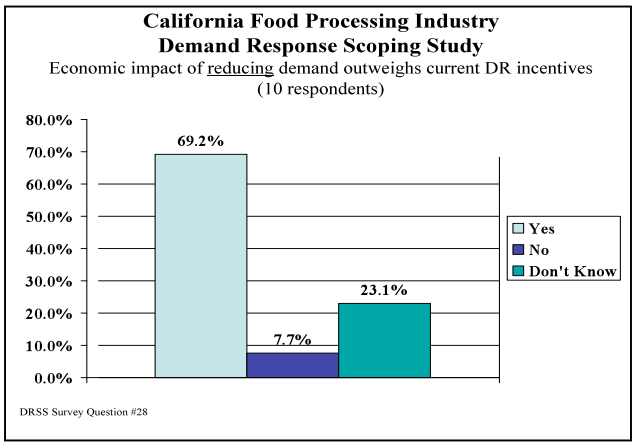


Figure A.14 Demand shift economic losses vs. current incentives

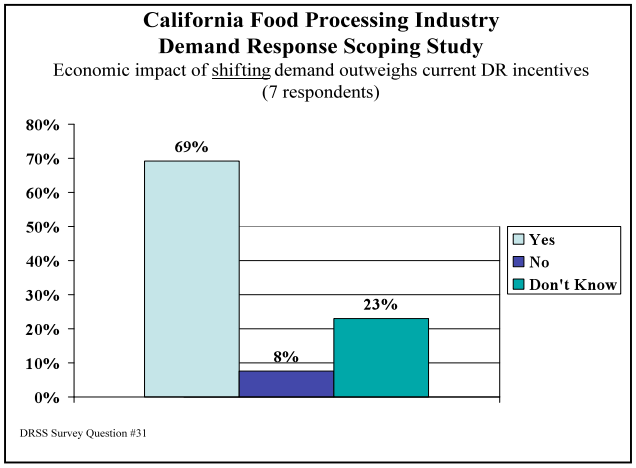


Figure A.15 Interest in DR preparation incentives

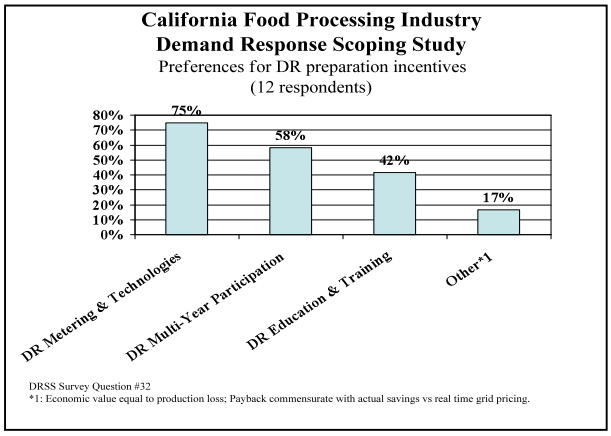


Figure A.16 Interest in sustained DR incentives

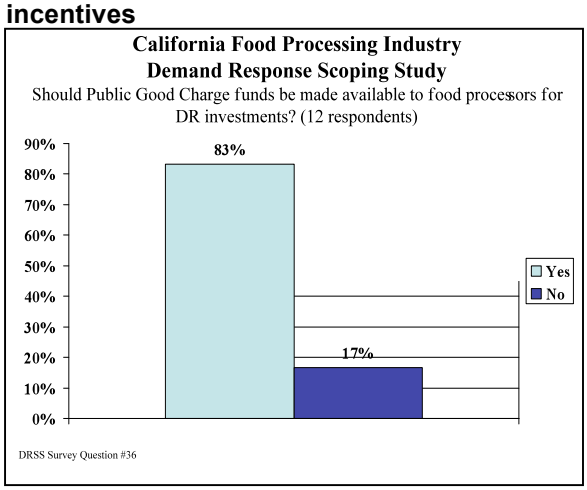
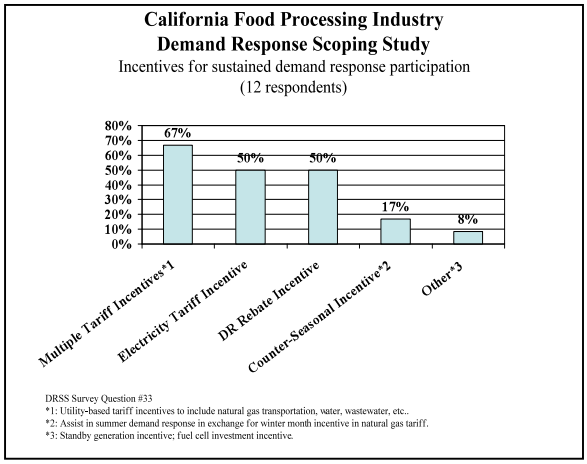


Figure A.17 Views on Public Good Charge funds for DR



A.3 Demand Response Regulatory and Administrative Results

Figure A.18 Adequacy of DR enrollment and implementation process

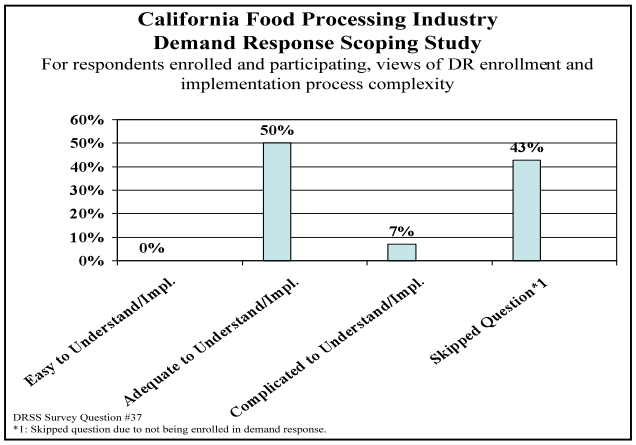


Figure A.19 Source of DR administration assistance

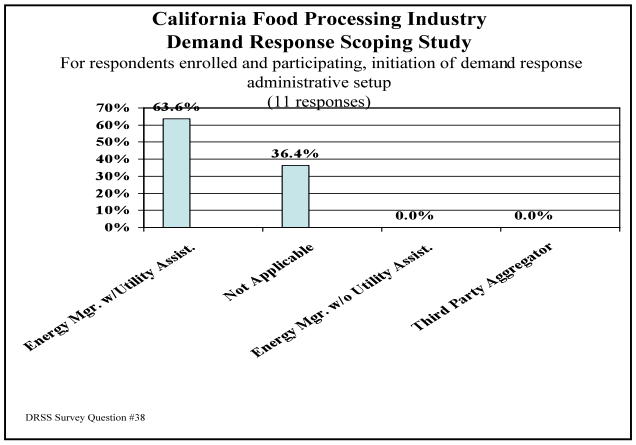


Figure A.20 Utility representative knowledge

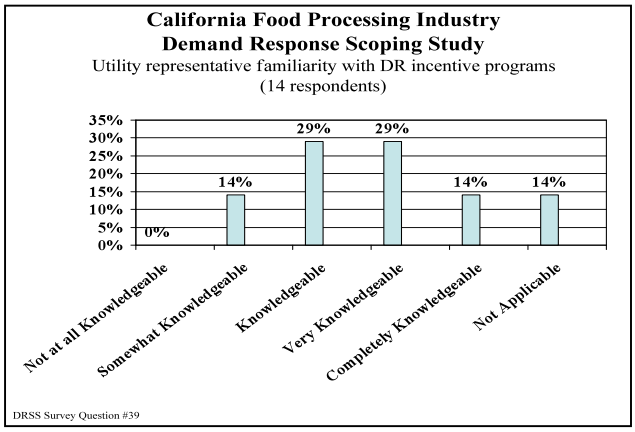
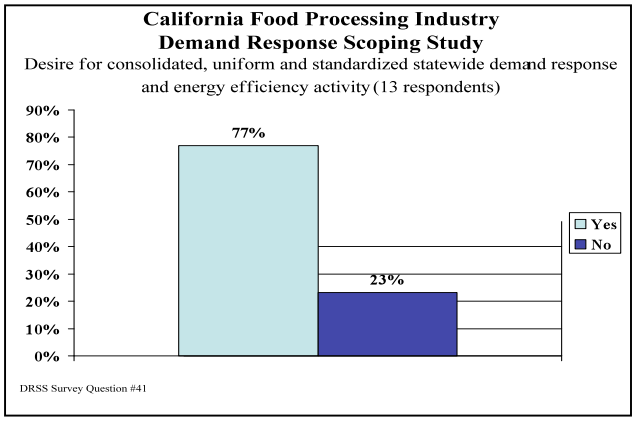


Figure A.21 Desire for standardized statewide DR and EE



A.4 Demand Response Education and Training Results

Figure A.22 Job function

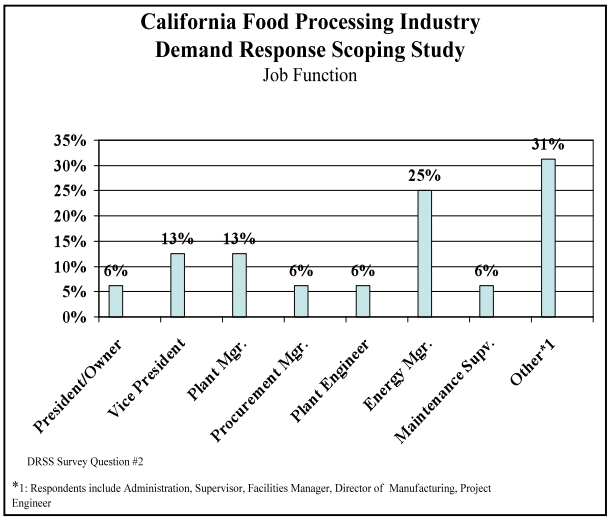


Figure A.23 Familiarity with DR incentive programs

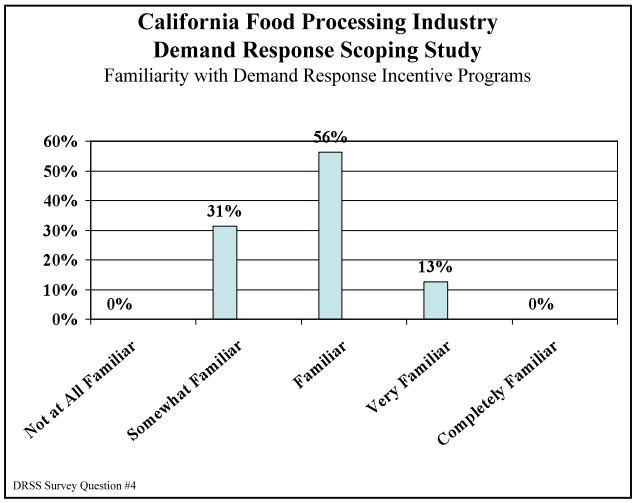


Figure A.24 Sources of DR program information

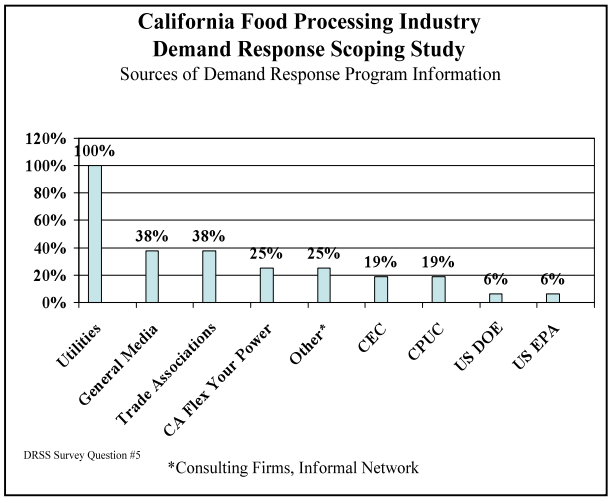


Figure A.25 Staff with DR or EE training

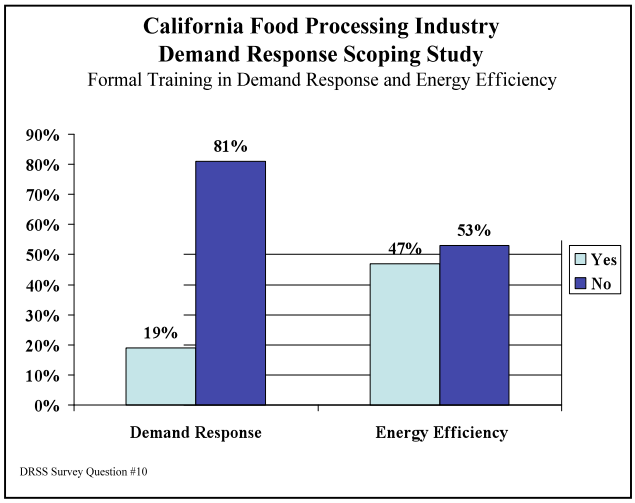


Figure A.26 OM or hourly staff with DR or EE training

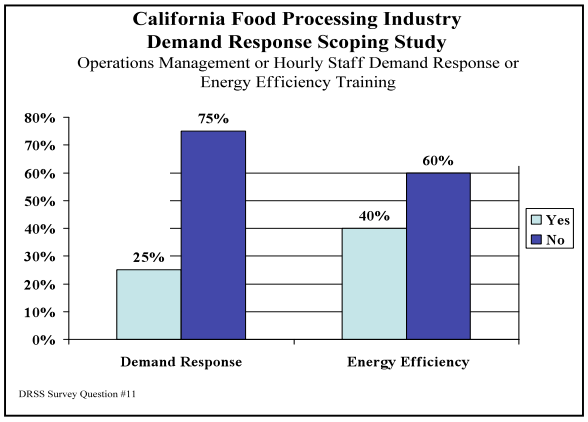


Figure A.28 Reasons for non-participation in training

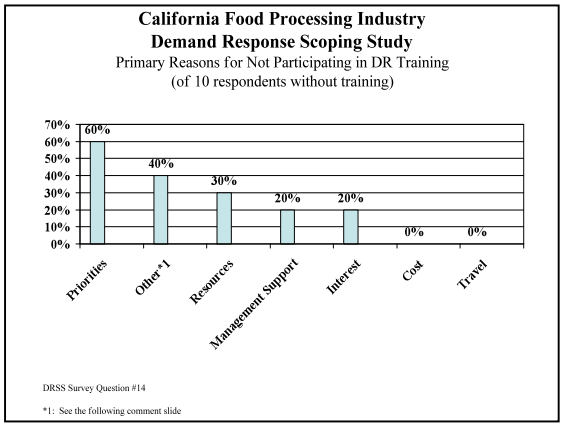


Figure A.27 Sources of DR training

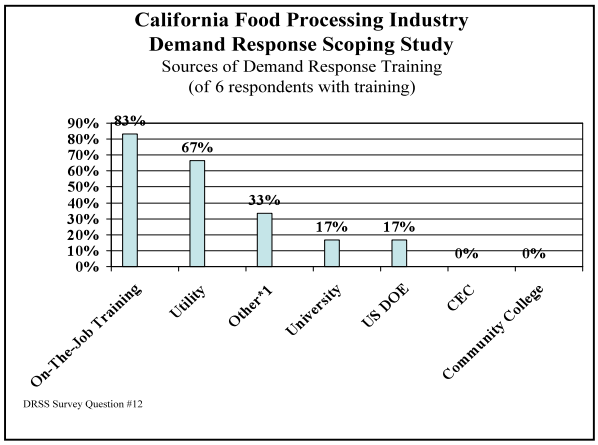


Table A.3 Comments on reasons for non-participation

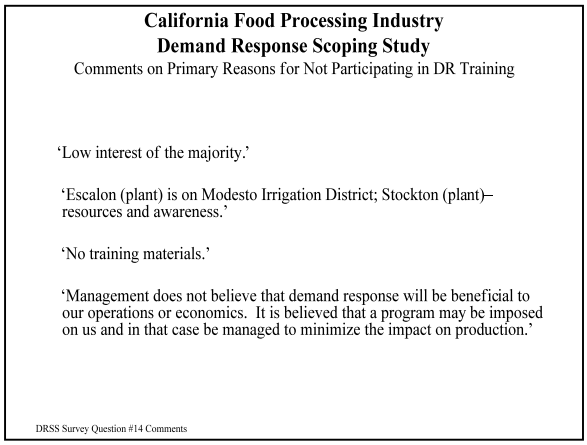


Figure A.29 Effectiveness of DR training

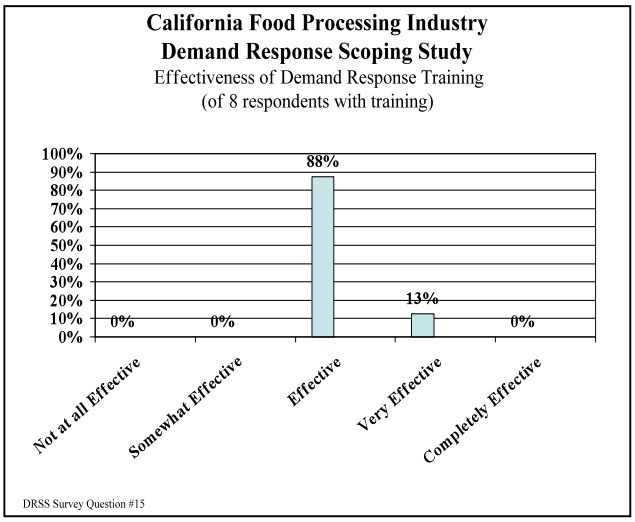


Figure A.30 Possession of DR measurement and management tools

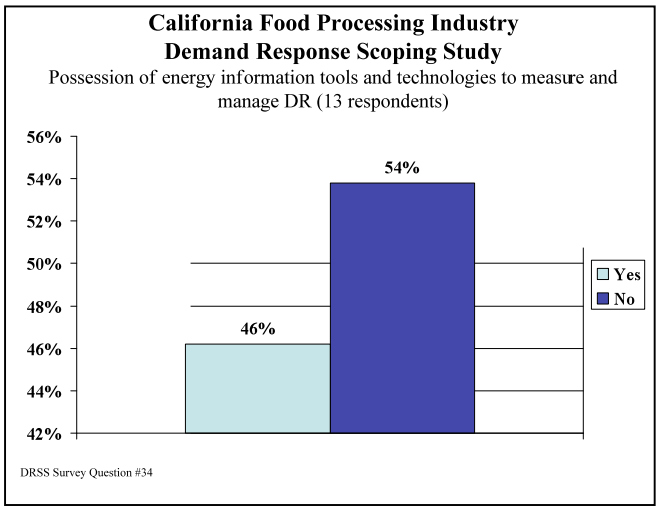


Table A.4 Suggestions for improving DR training

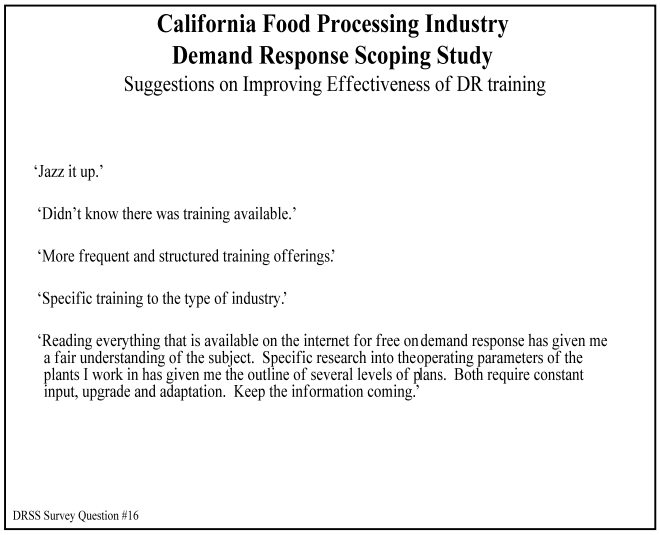


Figure A.31 DR tools and information source preferences

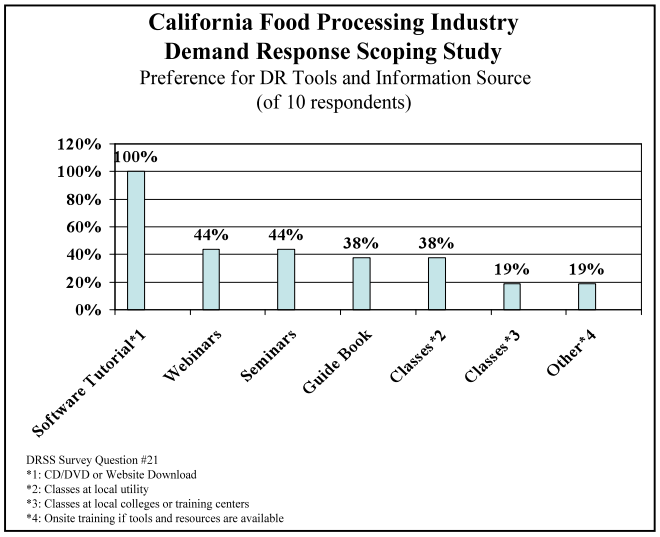


Figure A.32 Familiarity with utility energy management

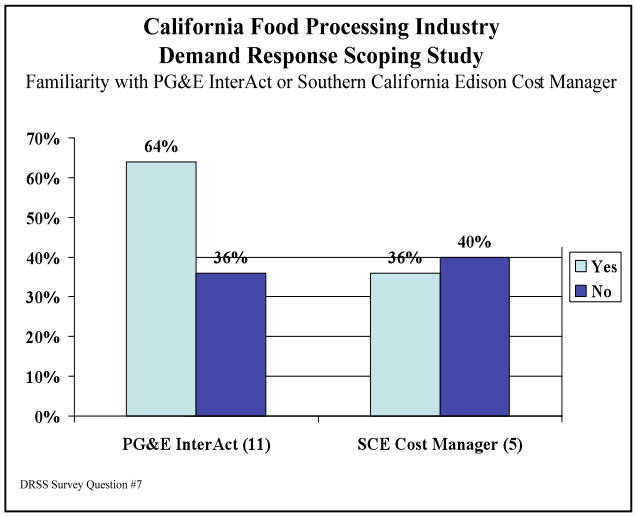


Table A.5 Suggestions to improve utility energy management tools

California Food Processing Industry
Demand Response Scoping Study

Suggestions to Improve InterAct or Cost Manager Functionality & Usage

'Provide improved data integrity. Missing data points each period or daily.' (PG&E)

'Actually we heard about InterAct through our PG&E account person but we've never utilized the web-based program.' (PG&E)

'More user-friendly.' (PG&E)

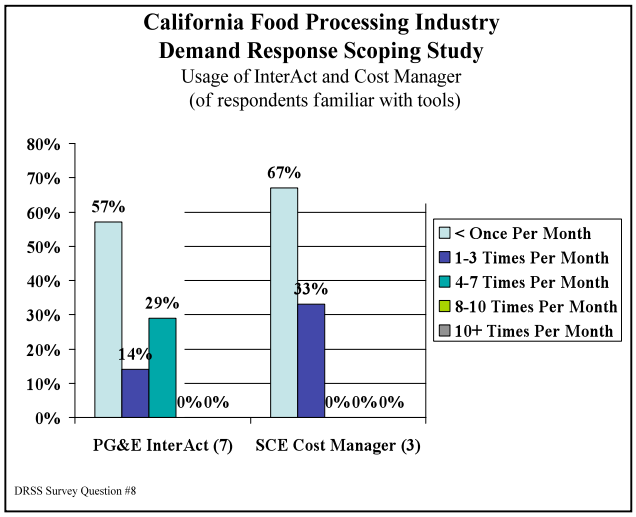
'We cannot take advantage of any InterAct program due to our processing and operations demands.' (PG&E)

'We need to have a better understanding of reactive power, circulating currents, neutral current, kW meter calibration, generator paralleling and synchronization.' (SCE)

'Needs to be more cost-effective to offset the losses due to disruption in production and employee schedules.' (PG&E)

DRSS Survey Question #9

Figure A.33 Usage of utility energy management tools



A.5 Demand Response Scoping Study Survey

1. Name (optional)

2. What is your job function?

President/Owner
Vice President
Plant Manager
Production Superintendent/Supervisor
Controller
Procurement/Purchasing Manager
Plant Engineer
Energy Manager
Maintenance Supervisor
Other (please specify)

3. Please provide your plant location. If you have multiple plants in California, please indicate each plant location in the additional fields:

Plant Location:
Plant Location:
Plant Location:
Plant Location:
Plant Location:

4. How familiar are you with both demand response and energy efficiency incentive programs offered at national, state, and local utility levels?

	Not at all familiar	Somewhat familiar	Familiar	Very familiar	Completely familiar
Demand Response					
Energy Efficiency					

5. What is/are your source(s) of demand response program information?

Utilities
California Energy Commission
California Public Utilities Commission
California Flex Your Power
US Department of Energy
US Environmental Protection Agency
Trade Associations
General Media
Other (please specify)

6. What is/are your source(s) of energy efficiency program information?

Utilities
California Energy Commission
California Public Utilities Commission
California Flex Your Power
US Department of Energy
US Environmental Protection Agency
Trade Associations
General Media
Other (please specify)

7. As a PG&E customer, are you familiar with PG&E's web-based InterAct program for electricity management? As a Southern California Edison (SCE) customer, are you familiar with SCE's web-based Cost Manager program for electricity management?

PG&E
SCE

8. If you answered "Yes" to question #7, how frequently do you utilize either PG&E InterAct or SCE Cost Manager?

	Less than once per month	1-3 times/month	4-7 times/month	8-10 times/month	10+ times/month
PG&E					
SCE					

9. If you answered "Yes" to question #7, do you have any suggestions to improve PG&E's InterAct or Southern California Edison's Cost Manager software programs in order to more effectively manage your energy requirements and costs?

10. Have you received formal training in demand response or energy efficiency?

Demand Response
Energy Efficiency

11. Has your operations management or hourly staff received demand response or energy efficiency training?

Demand Response
Energy Efficiency

12. If you answered "Yes" to DEMAND RESPONSE training in questions #10 and #11, where did you and your staff receive this training (check all that apply)?

On-the-Job Training
Community College
University
Utility
California Energy Commission

US Department of Energy
Other (please specify)

13. If you answered "Yes" to ENERGY EFFICIENCY training in questions #10 and #11, where did you and your staff receive this training (check all that apply)?

On-the-Job Training
Community College
University
Utility
California Energy Commission
US Department of Energy
Other (please specify)

14. If you answered "No" to questions #10 and #11, why hasn't training occurred (check all that apply)?

Priorities
Travel
Cost
Interest
Management Support
Resources
Other (please specify)

15. If you received demand response and energy efficiency training per questions #10 and #11, how effective was the training?

Not at all effective
Somewhat effective
Effective
Very effective
Completely effective

16. What improvements in training effectiveness would you suggest for demand response and energy efficiency?

17. Have you enrolled in any demand response program(s) (e.g. interruptible, demand bidding, OBMC, etc.)?

Yes
No
Comments:

18. If you answered "Yes" to question #17, which demand response program(s) are you enrolled in?

DR Program
DR Program

DR Program
DR Program
DR Program

19. Do you actively participate in your enrolled DR program(s)?

Yes
No
Comments:

20. If you answered "Yes" to question #17 and "No" to question #19, why haven't you participated in demand response if enrolled?

Priorities
Interest
Training
Management Support
Resources
Other (please specify)

21. What demand response and energy efficiency tools and information sources would you prefer to use?

Classes (at local colleges or training centers)
Classes (at local utility)
Case Studies
Seminars
Webinars
Guide Book
Software Tutorial (CD/DVD; Website Download)
Other (please specify)

22. What approximate percentage of your annual plant operating cost is applicable to electricity?

1-3%
3-5%
6-8%
8-10%
10-12%
12-15%
15%+

23. What is your typical operating schedule during the months of July-October?

24 Hours/Day - 7 Days/Week
24 Hours/Day - 6 Days/Week (Monday-Saturday)
24 Hours/Day - 5 Days/Week (Monday-Friday)
Other (please specify)

24. If you selected "Other" to question #23, do you operate during the following hours during the months of July-October?

11am-7pm @ 7 Days/Week
11am-7pm @ 6 Days/Week
11am-7pm @ 5 Days/Week
Other (please specify)

25. Have you voluntarily taken action to reduce electricity demand at your plant(s) on critical systemwide electricity demand days?

Yes
No
If "No", please comment:

26. Do you have the opportunity to REDUCE both essential demand (i.e. manufacturing operations demand) and non-essential demand (e.g. increasing HVAC set points, turning off certain lighting banks, etc.) during summer on-peak afternoon hours? Depending upon the specific utility, this would be approximately 11am-7pm.

Yes - Essential Demand
No - Essential Demand
Yes - Non-Essential Demand
No - Non-Essential Demand
Please comment:

27. If you answered "Yes" to question #26, which business categories do you have the opportunity to REDUCE electricity demand and by what approximate percentage?

Manufacturing Operations
Warehouse, Storage or Shipping/Receiving Operations
Research & Development
Administration
Data or Computer Center Operations

28. Does the economic impact to your operation of REDUCING electricity demand outweigh current DR incentives to reduce demand?

Yes
No
Don't Know
If "No", please comment:

29. Do you have the opportunity to SHIFT both essential demand (i.e. manufacturing operations demand) and non-essential demand (e.g. increasing HVAC set points, turning off certain lighting banks, etc.) during summer on-peak afternoon hours? Depending upon the specific utility, this would be approximately 11am-7pm.

Yes - Essential Demand

No - Essential Demand
Yes - Non-Essential Demand
No - Non-Essential Demand
Please comment:

30. If you answered "Yes" to question #29, which business categories do you have the opportunity to SHIFT electricity demand and by what approximate percentage?

Manufacturing Operations
Warehouse, Storage or Shipping/Receiving Operations
Research & Development
Administration
Data or Computer Center Operations

31. Does the economic impact to your operation of SHIFTING electricity demand outweigh current DR incentives to reduce demand?

Yes
No
Don't Know
If "No", Please Comment:

32. What demand response preparation incentives would you prefer to enable your plant to effectively participate in demand response?

Demand Response Metering & Technologies Incentives (e.g. energy management systems investment incentives, plant equipment circuit breaker re-switching/re-wiring incentives to provide DR participation, etc.)
Demand Response Education & Training Incentives
Demand Response Multi-Year Participation Incentives (i.e. progressively more favorable incentive structure for each year of participation)
Other Incentives (please specify)

33. What participation incentives would prompt you to effectively participate in DR on a sustained basis?

Electricity Tariff Incentives Only
Multiple Tariff Incentives (e.g. natural gas, water, air emissions, tax credits, etc.)
Post-Summer Rebate from Utility per DR Participation Results (e.g. Invoice Credit)
Counter-Seasonal Incentive (e.g. assist in summer DR in exchange for natural gas incentive for winter months, etc.)
Other Financial and/or Operating Incentives:

34. Do you have energy information tools and technologies in your operation to effectively measure and manage demand response and energy efficiency activity (e.g. Microsoft Excel spreadsheet macros; Enterprise Energy Management systems, etc.)?

Yes
No
If Yes, please explain:

35. Do you currently have onsite generation capacity at your location(s)? If "Yes", for what primary purpose?

Yes
No
Cogeneration for daily operations
Emergency backup generation
Peak demand charge reduction
Other (please specify)

36. Due to the California public good benefit than can be realized by your demand response and energy efficiency participation, based upon your participation results (e.g. sustained kW demand reduction from established baseline over a given period, etc.) would you like to see a line-item percentage of your monthly utility invoice made directly available to you from the public good charge (PGC) you currently pay? The PGC amount would be made available as a credit or payment for demand response and energy efficiency investment at your location(s). This PGC funding would directly assist in offsetting any company-internal capital investment needed in demand response and energy efficiency improvement.

Yes
No
Please comment:

37. If you have enrolled and participated in DR, have you found the process to be?

Easy to understand and implement?
Adequate to understand and implement?
Complicated to understand and implement?
Comments

38. If you have enrolled and participated in DR, how did you initiate the administrative setup and process for ongoing participation?

Company energy manager without utility representative assistance?
Company energy manager with utility representative assistance?
Third Party Aggregator?
Not Applicable
Comments:

39. How knowledgeable is your local utility representative on demand response regulatory, administrative and incentive activity?

Not all knowledgeable
Somewhat knowledgeable
Knowledgeable
Very knowledgeable
Completely knowledgeable

40. How knowledgeable is your local utility representative on energy efficiency regulatory, administrative and incentive activity?

Not all knowledgeable
Somewhat knowledgeable
Knowledgeable
Very knowledgeable
Completely knowledgeable

41. From a regulatory and process efficiency perspective, would you like to see statewide demand response and energy efficiency programs and activity consolidated into one uniform and standardized administrative process?

Yes
No
Please comment:

42. Please provide additional comments, thoughts or ideas pertaining to improving demand response and energy efficiency participation that you would like to see included in regulatory processes and programs.

Appendix B. Additional Food Processing Industry Data

This appendix presents data for California's entire food processing sector, expanding on the data presented in the main report above for CLFP food processors. To give further perspective on demand savings potential for the state's food industry, it also presents estimates of peak demand and electricity use savings from a recent industrial sector potentials study for California's major IOUs.

The scoping study whose results are presented in the main report focused on the CLFP subset of the food processing industry. The utility DR data team referenced in section 2.0 above supplied additional data for the whole NAICS food processor industry group. Table B.1 presents the peak demand and annual electricity usage for the entire food processor range. As the data indicate, there may be a much larger potential opportunity for DR across the entire industry group, which covers processing and retailing of food and kindred products including beverages. This broader group may be included in subsequent recommended DRSS phase(s) as budget and resources allow.

Table B.1. Demand by utility for NAICS 311 – 319 (SIC 20)

		# of Accounts	2005 Peak Demand (MW)	2005 Annual Usage (GWh)
PG&E				
> 200 kW		580	343	2,057
< 200 kW		5,506	634	465
PG&E Total		6,086	NA	2,522
SCE				
> 200 kW	CLFP	80	NA	6
	Beverages	166		19
	Other	1,136		121
	Total	1,382		146
< 200 kW	CLFP	29	15	87
	Beverages	27	15	113
	Other	235	161	1,176
	Total	291	NA	1,376
SCE total		1,673	NA	1,522

Sources: PG&E 2006, SCE 2006

A study of electricity and demand savings potential for California's manufacturing sector (NAICS 311 - 339, SIC 20 – 39) projected the cumulative electricity demand for the state's three major IOUs (PG&E, SCE, and SDG&E). The projected demand from 2005 – 2016 was 4,673 MW. For the same period, the projected peak demand for food and kindred products was 611 MW, representing 13 percent of the industrial sector total load. The report estimated a potential peak demand savings of 11 MW to 103 MW for a range of scenarios from "Naturally Occurring" to "Technical Potential." The report also projected cumulative electricity use by the food sector as 4,495 GWh, or 14 percent of the total projected industrial electricity use for the same time period. The estimated potential energy savings ranged from 100 – 779 GWh for the same savings scenarios (KEMA, 2006).

Appendix C. Non-PIER Recommendations

In order for DR to be effective in California, PIER's scope and recommendations alone cannot achieve sustained, statewide DR success. Effective, sustained DR success for California requires coordinated teamwork that includes the purview and responsibilities of other non-PIER public agencies, such as the CPUC and other agencies, as well as a clear understanding and incorporation of business competitiveness recommendations from the private sector.

The following non-PIER recommendations could be addressed in a subsequent research phase. They are primarily based on industry operations feedback and experience, as well as on interpretation of "other" category responses from this Scoping Study.

To effectively expand on the recommendations presented in the main report, PIER/CEC **leadership** could initiate and assemble a collaborative **energy supply chain** resource collaborative consisting of utilities, end-user representatives, CEC, CPUC, LBNL-DRRC, and state agencies both **directly and indirectly impacting energy resource management** (e.g. Air Resources Board, etc.). The objective of such a collaborative would be to holistically approach and improve DR participation and sustained achievement of statewide DR objectives in addition to **all** direct and indirect energy resource management issues (e.g. natural gas, air emissions, etc.). The energy supply chain resource collaborative is envisioned as a broader extension of the DR clearinghouse structure referenced in the Education and Training recommendation above.

Operations and Economics Recommendations

From an operations and economics perspective, there is limited incentive for food processors to effectively participate in DR. In most cases DR participation is currently an unsound business decision due to lack of cost-effectiveness and administrative burden.

Existing tariff incentives are unrealistic relative to food processor plant operating costs and business competitiveness issues. The lack of an effective incentive structure appears to be one of the primary barriers to expanded DR participation. Per the survey results, there is an excellent opportunity to address demand reduction opportunities with food processors if incentives were structured properly and realistically aligned with business needs. For example, over two-thirds of respondents have the opportunity to reduce non-essential demand (i.e. non-manufacturing demand such as warehouses, offices, etc.) with almost one-third able to reduce manufacturing demand ranging from 1 - 10 percent contingent upon the plant operations application. The DR opportunity for aggregated manufacturing and non-manufacturing demand could be substantial if DR processes and incentives were properly and effectively structured.

There are three key Operations and Economics incentive opportunities that could be further addressed as catalysts to increase food processor (and other industry segments) DR participation:

- Pre-Summer DR Zone Signup
- Multi-Tariff and Tax Incentives

Pre-Summer DR Zone Signup

- *Proactively plan and structure July-October DR in advance of summer months to meet both food processor business needs as well as state electricity infrastructure operations planning and capacity requirements (e.g. CAISO, etc.) for each specific day through the July-October period.*

From a program design conceptual perspective, a practical approach to increase food processor (and other industry segments) DR participation is via a pre-summer DR zone signup process. The various DR programs that have a day-ahead notification for DR events are unrealistic and impractical for the majority of food processing and industrial operations. The day-ahead intent has the objective of having the most current information on next-day weather and projected system load. However, in the context of complex plant operations and scheduling issues ranging from labor resource planning, production planning, raw materials planning, logistics, etc., a day-ahead notification approach is not a practical option, which results in limited DR participation.

A workable and practical approach for most food processors (and other industry segments) would be a pre-summer DR *zone signup* process in April-May of each year. Utilities and CAISO would benefit from this approach as well and will be further outlined.

During April-May each year, food processors would sign up for either red, yellow or green zones for the months of July-October. Red zone days would be based upon historical system demand, degree-days, and other statistical information. For example, a red zone day might indicate a 90+ percent probability on August 15 that customers would be called for a DR event. In exchange for signing up for a red zone day, a participant would be credited 8 percent on their electricity invoice (whether or not a DR event was called on that day) for electricity charges on that day; a participant would receive an 8 percent credit for every red zone day for which they signed up. A yellow zone day might represent a 50 - 89 percent probability of a DR event with a 5 percent incentive and a green zone day (e.g. mid-October) might have less than 49 percent probability with a 3 percent incentive. The zones would be on specific days, weeks or months during July-October such that once signed up, plants could plan finished goods, capital projects, labor, railroads, trucking, raw materials and other supply chain resources knowing in advance the DR days for which they are signed up.

Food Processor Benefits of DR Zone Sign Up: Food processors can plan finished goods inventories, engineering capital projects, production and logistics planning, labor, etc. in anticipation of signup days. For example, if a food processor knows that by August 15 their finished goods inventory will be sufficient for meeting customer shipments, then from August 16 on they will sign up for red, yellow or green DR days (or weeks or months) as operational needs allow in context with DR incentives. In addition, with finished goods inventories and customer service factor being critical issues for many food processors during the summer months, the pros and cons, practicality, and costs of integrating Auto-DR to enterprise resource planning (ERP) or other finished goods inventory management systems could be explored. For example, if finished goods inventories are above a particular quantity mutually agreed in advance by the food processor and utility, Auto-DR could be invoked. An Auto-DR approach such as this could have its own participation incentive structure.

Utility and CAISO (California Independent System Operator) Benefits of DR Zone Sign Up: Utilities and CAISO can benefit as they will both know well in advance of the summer how

much demand is signed up for a specific day during June-October. For example, if 200 MW is signed up for on August 4, both CAISO and utilities know months in advance how much DR signup load is available to be reduced on August 4. In the event 300 MW is needed for August 4, the 200 MW can be reduced from signups and the 100 MW balance can be from conventional DR programs, e.g. OBMC (optional binding mandatory curtailment), interruptible tariffs, etc.

Multi-Tariff and Tax Incentives

- *Develop and implement an incentive structure aligned with state DR objectives and food processor business objectives that will foster sustained DR commitment and continuous improvement.*

Contemporary tariff structures are structured in a "one-to-one" relationship (i.e. electricity tariff = electricity incentive) rather than as a holistic and multi-dimensional utility resource tariff structure. A key DR incentive barrier is the limited level of discount available from a specific electricity tariff that can approach food processor operations and cost impacts. To realistically increase food processor DR participation, incentives will need to range 10-15 percent discount from existing tariffs, which cannot be effectively achieved via a single electricity tariff. A multi-tariff option, supported by 67 percent of survey respondents, would need to be implemented.

However, a key issue in a multi-tariff incentive design is effective leadership and cooperation across state agencies where DR, most likely via a governor's Executive Order, becomes a true state priority. To achieve incentives of 10-15 percent from a holistic utility resource perspective versus from electricity alone, an incentive structure similar to the following example would need to be enacted:

For each MW reduced over the course of July – October when peak events are called, discounts would need to be offered for charges on utilities other than electric utilities, as well as state tax incentives, as shown below:

- Natural gas transportation incentive: 2%
- Air emissions incentives: 2%
- Water: 2%
- Waste Water: 2%
- Solid Waste: 2%
- State tax credit 2%

This incentive structure could be progressively positioned in a *frequent flyer* model where each successive year of DR participation and increased demand reduction could result in a higher incentive bracket, for example, 3 percent incentives for 3+ years of DR participation and achieving a certain percentage of demand reduction over the period.

One of the primary hesitations of food processors to implement DR is their need for assurance of meeting customer shipments of finished goods as inventories are typically low at the beginning of a production season. Specific production planning "time fence zones" for finished goods inventory levels can be integrated with Auto-DR. For example, "frozen zones" of finished goods inventories would not be applicable to DR as those are committed production periods needed to build finished goods inventories. Once inventory levels are achieved to

effectively service customers, production schedules are then in "slush" (semi-firm production schedule) or "liquid" (negotiable) zones where flexibility exists and Auto-DR may be applicable given an appropriate process and incentive structure. Further research is needed to integrate new DR processes with the appropriate technology enablers to meet both the needs of the industrial supply-chain and of Auto-DR. Collaboration between various agencies is necessary to accomplish all of these recommended changes.

Non-PIER Regulatory and Administrative Recommendations

- *Develop and implement a single, standardized statewide DR-EE administrative process and tariff structure aligned and flexible in meeting both state DR objectives and food processor business objectives.*

As referenced in the Education and Training recommendations in the main report, the existing structure of uncoordinated DR programs and information makes DR very confusing for food processors to understand and select the appropriate DR option for their operations. Over three-quarters of DR survey respondents desired standardized *cafeteria-style* DR and EE processes where there is one statewide administrative process that incorporates both DR and EE. From this single administrative process, food processors (and other industry segments) could select, via a cafeteria-style approach, various DR and EE options applicable to their business operations and circumstances.

It is recommended that several of the collaborative team participants referenced in the Education and Training section above address the re-engineering of DR and EE regulatory and administrative requirements. This re-engineering team would consist of utility representatives, end-user representatives, CEC, CPUC, and DRRC, and would focus on developing one statewide DR and EE regulatory and administrative process. The new process would be aligned and adaptable to current and future California DR and EE objectives. It is anticipated this effort will require senior executive leadership and support from both utilities as well as government agency leadership to move from their narrow perspectives and related "turf" issues to seamless user-friendly processes across utilities and government agencies.