STUDY OF MARKET EFFECTS ON THE SUPERMARKET INDUSTRY

FINAL

STUDY ID 3305

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P822-010

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1. EXECUTIVE SUMMARY

1.1 Study Objectives and Methods

This report presents the approach, research methods, results, and recommendations for the study of Market Effects in the Supermarket Industry. In this market characterization study, the characterization of the market—rather than encompassing the market for a specific technology—focuses on a single industry: supermarkets. The study focused on:

- determining the extent, if any, to which the actions of customers in the supermarket industry in PG&E's service territory indicate market effects
- determining the extent to which the current state of the supermarket industry in PG&E's territory reflects the effects of past market interventions by PG&E.
- Using the results of this analysis to make recommendations regarding future program design to facilitate and future evaluations of market interventions

While supermarkets use a number of technologies, the largest portion of supermarket energy usage is accounted for by refrigeration, followed by lighting. Moreover, while grocery stores of all sizes use refrigeration, supermarkets are distinguished from smaller food stores by their use of centralized refrigeration systems rather than stand-alone cases. Refrigeration and, to a lesser extent, lighting were the primary focus of the current study.

A series of focus groups held with customers revealed striking differences between the energy awareness, decision criteria, and program exposure of the supermarket and convenience store (C-store) markets. The focus of the present study, therefore, was on the supermarket segment, where supermarkets are essentially defined as food stores of sufficient size to allow them to use centralized refrigeration systems.[1]

The review of secondary sources and preliminary data collection efforts also revealed a high degree of concentration (i.e., a limited number of players) in the supermarket industry. As a result, a quantitative assessment of the extent of market effects was not considered sufficiently reliable to serve as the sole basis for determining market effects, and was supplemented by a characterization of market structures and observed market effects using more qualitative methods.

The study research plan called for a description of the market and its major players, the barriers that appear to limit the efficiency of the market, and the extent to which that market may have been transformed in PG&E's service territory by PG&E's Programs. The framework for the

[1] The definition of a supermarket used by the Food Marketing Institute, an industry trade association, is of a grocery store with more than $2 million in annual sales.

current study is inspired by the initial Scoping Study by Eto, et. al. There are three basic components to this theoretical framework as applied to this study: program interventions (i.e., programs), customer actions (i.e., specific energy efficiency measures installed), and barriers (i.e., impediments to those energy efficiency measures.).

One of the original goals of this study was to develop a structural equation model (SEM) to quantitatively link market interventions to changes in attitudes/perceived barriers and, in turn, to changes in actions and intentions. Based upon initial data collection efforts and review of data sources, however, we found that not enough data would be available to support such a multivariate analysis. We therefore relied on more qualitative indications of linkages between market interventions and the actions and attitudes of the industry.

1.2 Data Sources

Preliminary data collection and analysis activities included a review of PG&E data sources and existing literature, interviews with PG&E program staff, two focus groups within PG&E's service territory and one in the comparison territory served by Commonwealth Edison; a series of open-ended interviews with vendors at the Food Marketing Institute show in Chicago, and an interview with EPRI's supermarket specialist Mukesh Khattar.

Other primary data collection activities for this study are summarized in exhibit 1-1.

Exhibit 1-1
Data Collection Activities

	Within PG&E Service Territory	Outside PG&E Service Territory
Staff Interviews	4	
Supermarket Decision Makers	15	10
Architects, Designers & Technical Specification Managers	5	5
Vendor/Manufacturer Interviews	15	15

Since the difficulties of obtaining responses from enough respondents in this fairly limited market—as described above—made developing a "representative" sample futile, the above data points were collected by attempting to contact as many of the major players in the categories listed above as possible.

Respondents for the data collection efforts were identified using both PG&E's customer lists and secondary data sources. The PG&E list was based on the SIC (5411) corporate ID, premise number, and rate class in the CIS. In addition, program tracking data were used to identify supermarket customers who have had one or more stores participate in PG&E program. The customer sample in the non-PG&E territory was drawn using Dun & Bradstreet data, sorted by SIC, number of employees, and sales per facility to distinguish supermarkets from convenience stores. Names of other market actors (vendors, designers) were drawn from secondary sources

(e.g., D&B data, participation in the Food Marketing Institute show) as well as from interviews with PG&E program staff and with supermarket decision makers.

These primary data collection activities helped to determine how market actions and attitudes were or were not influenced by PG&E's programs. Interviews were designed to elicit both qualitative and quantitative data, and included both open-ended and structured responses.

1.3 Results

1.3.1 Market Characterization

There are an estimated 127,000 grocery stores and supermarkets in the United States, with combined annual sales of $425 billion, according to the Food Marketing Institute. The 29,900 (as of 1996) supermarkets accounted for $323.2 billion of this total. According to the Department of Energy, supermarkets use an estimated 900 trillion Btuh of energy annually for heating, cooling, refrigeration and lighting. Refrigeration equipment represents the largest share of energy usage within this segment, accounting for over 50 percent of the total.

The overall trend in supermarket energy intensity had been downward until about 1995. According to EPRI Supermarket Segment Manager Mukesh Khattar. For a variety of market and regulatory reasons, energy use has been increasing since then. Electricity usage currently averages 50-60 kWh per square foot per year. As noted above, a variety of energy using equipment contributes to this total. The market for that equipment is discussed below.

1.3.2 Key Market Players

One of the recurring themes in interviews with market actors was the ability of three or four **manufacturers** to dominate this industry. In refrigeration systems, for example Hussman, Tyler, Kysor-Warren, and Hill-Phoenix help to define the market, including the range of energy efficiencies offered. These firms are international in scope, enjoy close relationships with top supermarket chains, and maintain a steady flow of product literature and other information to buyers, designers, and others who might influence the purchase decision.

- Despite intense competition among the major players, there is also a significant amount of information sharing and participation in industry-wide groups and initiatives. Vendor representatives cited professional associations and conferences as their primary source of information on trends in energy efficiency.

- Because of their depth of in-house expertise and their experience, the major manufacturers often exert considerable influence in equipment selection decisions. This generally favors greater rather than less energy efficiency. Culturally, most key personnel at the manufacturing companies are engineers, with an engineer's interest in and appreciation for energy efficiency. Moreover, energy efficiency figures prominently in the marketing efforts of all major firms.

- Manufacturers are generally fully aware of programs offered by PG&E or other utilities, and use rebate programs to help close a sale or influence the choice of efficient equipment when possible

A number of senior R&D, product development, and even sales personnel with these firms cited their frustration at being unable to convince many supermarket decision makers of the wisdom of selecting efficient equipment, complaining that "marketing is everything" for buyers. In some instances, however, manufacturers have made essentially permanent changes to their basic designs that have rendered efficiency gains irreversible.

The market for **design** services is concentrated in a few specialized architects and designers who serve the national market; the limited number of local or regional companies may be called upon to design stores for independents. The few national firms have established relationships with major supermarket chains as well as with leading vendors. Design firms and the in-house design departments for major chains share the store design/equipment specification task, often working together to implement the store's master specification. Independents are much less likely to have either master specifications or an in-house design staff, thereby providing designers with greater input to the decision-making process. Several respondents noted that this, too, is changing as more independents are consolidating or being acquired by chains.

Major sources of information cited by supermarket designers include trade magazines, professional associations, and contractors and equipment suppliers. One designer said that his firm keeps an in-house library of the leading manufacturers' catalogs, but uses this in the context of their own years of experience in the supermarket industry.

Designers indicated that energy efficiency is a consideration in their designs, but the more important consideration is staying within a client's budget; the starting point in the design is usually the energy efficient option for refrigeration as well as lighting, but these designs are subject to change based upon available funds. PG&E or other utility programs are generally not a high priority for designers unless they are alerted to them by their clients, who may ask for rebate-qualifying equipment as part of the design.

Local **refrigeration contractors** supplement (and often supplant) in-house supermarket maintenance organizations, playing a critical role in the installation and operation of energy-using equipment. In PG&E's service territory, there are about 140 refrigeration contractors, ranging in size from one-person shops to affiliates of national vendors such as Hussman. Many of these do little supermarket work, focusing instead on refrigerated warehouses, C-stores, restaurants, or institutions. The number of stores served by those who do supermarket work ranged from 3 to 500 in PG&E territory, and from 4 to 100 in the comparison territory.

Contractors play an increasingly important role both in influencing the kind of equipment installed and in ensuring its proper operation. Sophisticated systems need better maintenance and fine tuning and, especially for relatively remote stores, this has increased reliance on local contractors. In addition, the use of racks of multiplexed compressors has led to more frequent, smaller purchase decisions as individual compressors and components are replaced.

To keep up with trends in energy efficiency, contractors rely most heavily on professional associations and conferences, although specialized magazines and manufacturer information were also cited. However, only half of those interviewed in PG&E's territory were familiar with any of the energy efficiency programs offered by the utility or by EPRI.

Contractors were also asked about their perceptions of the importance of various equipment attributes to their customer. Subject to the caveat of small sample sizes, it should be noted that

California refrigeration contractors rated initial cost as the most important criterion, followed by reliability and appearance/contribution to sales. Illinois contractors gave the highest rating to appearance/contribution to sales, followed by warranty and availability of financing. Both groups rated ease of maintenance lowest and energy efficiency in the middle.

A concern raised repeatedly by vendors and supermarket decision makers was the dependence on contractors to maintain the sophisticated systems needed to ensure energy efficiency. It was pointed out that the focus of the contractor is to "keep the system going," and a number of vendors and supermarket facility manager told of finding controls overridden, valves or inlets forced open, and system set points altered.

At the **customer** level, supermarkets are a $320 billion industry, with about a dozen chains together accounting for over 40 percent of the industry's 1996 sales. Concentration in the industry is, in fact, increasing, with several mergers having taken place in the recent past..

- For supermarket chains, decisions regarding energy using equipment are made by regional engineering departments, with senior management exercising final approval authority. Independents (defined by the Food Marketing Institute as chains with fewer than 10 stores) almost always have at least some in-house engineering capability, although top management usually plays a more direct role than in larger chains.

- Supermarket decision makers rely on input from designers (both in-house and consultant), equipment vendors, and even contractors. Input is gathered through professional associations or at conferences and trade shows, which were most often cited as the chief source of supermarket decision maker information on trends in energy efficiency.

- With utilities changing their organizational structure and the way they deal with supermarkets (from providing one point of contact for electric service to acting as vendors of all kinds of products services), utilities as a group have lost some of their status as providers of unbiased information. EPRI continues to be viewed as reliable sources of information, however, with 100 percent of respondents in PG&E's territory reporting familiarity with the EPRI supermarket initiative.

Every one of the supermarket respondents in PG&E's territory rated market and presentation concerns a 6 on a 1 to 6 scale. These decision makers gave the availability of rebates an average rating of 5.4 on the same scale. Among focus group participants and other respondents there remained a clear preference for rebate programs over audits information, demonstrations, and other potential program designs.

1.3.3 Product/Efficiency Mix

The current mix of energy efficient products and practices used by supermarkets in PG&E's territory represents a key indicator of the current status of the market's transformation toward more efficient practices. It must be borne in mind, however, that actions in PG&E's territory reflect the direct effect of past PG&E programs, including incentives as well as informational programs and demonstrations.

Supermarket decision makers were asked what percentage of their existing stores and new stores had each of a selected list measures installed, both in PG&E's territory and in other areas served by utilities that did not have active energy efficiency programs. Results reflect installations in 553 PG&E stores and 427 out-of-territory stores. For most types of equipment, installations in PG&E stores far outnumber those in out-of-territory stores. Almost all of the PG&E stores surveyed use energy efficient store lighting, including energy management systems, T-8 lamps and electronic ballasts, and HID bulbs. The PG&E chains interviewed also reported a higher percentage of stores with electronic ballasts for case lighting. high efficiency compressors, cycling of anti-sweat heaters, high efficiency motors for evaporator fans, and store humidity controls to reduce case load in all of their stores. In contrast, the no-program territory stores had almost the same penetration of floating head pressure controls and a higher share of refrigerated cases with doors.

Another indicator of energy efficiency industry wide, the number of stores with doors on freezer cases, was also addressed by a recent survey conducted by the trade magazine Frozen Food Age. This survey found that supermarket chains are installing doors on significantly more cases in new stores than are currently found in existing stores; existing stores have 62 percent doored cases, but operators are installing doors on 74 percent of cases in new stores.

That new stores incorporate more energy efficiency measures is supported by responses from respondents to our interviews and surveys. For new stores, the differences between the PG&E and out-of-territory stores are less striking than for existing supermarkets. T-8 lamps with electronic ballasts appear to be the standard for all new stores, as does the use of electronic ballasts in display cases, and the percentage of stores with most other measures is also higher.

Estimates of the percentage of stores with selected refrigeration measures were also provided by refrigeration contractors in Northern California and Illinois. These responses, weighted by the number of supermarkets served by each contractor, show that most high efficiency measures were more common in the California stores, with the exception of Adjustable Speed Drives for compressors and store dehumidification to reduce case load.

1.3.4 Practices and Barriers

Past Barriers

The most fundamental barrier to energy efficiency in the supermarket industry, both now and in the past, is the overwhelming emphasis placed on increasing sales – to the exclusion of energy efficiency and most other operational concerns. In a version of the bounded rationality barrier, incremental investment dollars are almost always allocated to store appearances that will help boost sales.

In addition, the supermarket industry is historically conservative, with an aversion to any perceived risks that could affect system reliability. This concern has been overcome for a number of the technologies considered here (notably floating head pressure controls and integrated energy management systems), but remains a barrier for new measures that could help improve energy efficiency.

Split incentives have also posed a barrier for some of the measures at issue. Because they fear that they will be unable to recoup the development costs for efficient equipment, vendors have

little incentive to invest in developing efficient new technologies that will make their products more expensive than their competition. In practice this barrier has been of limited concern, since leading equipment manufacturers feel compelled to develop high efficiency models to differentiate themselves from the competition—who in turn must develop their own efficient technology.

Overall, availability has not been a problem for big-ticket items such as EMSs or efficient refrigerator/freezer cases. It was a barrier for smaller items; specifically for permanent split capacitor (PSC) evaporator fan motors. According to several of the contractors interviewed, PG&E rebate programs were instrumental in causing them to stock PSC motors. The results are evident in the contractor-provided estimates of the number of stores with PSC motors: 73 percent for PG&E's territory, 34 percent for Illinois.

Current Barriers

In the past several years, barriers to energy efficiency in supermarkets have grown as the result of a number of external forces: marketing, business considerations, regulatory issues, and technology-related concerns. Each of these is discussed below.

The importance of **marketing** concerns to the detriment (or exclusion) of energy efficiency has already been discussed. This barrier has been increasing, however, as ever greater emphasis is placed on merchandising as supermarkets become true retailers, competing not only with each other, but with restaurants, convenience stores, and Wal-Mart (or other) superstores. In addition to the resulting overall emphasis on presentation and design, the need for supermarkets to become true retailers has brought new products and activities into the store, thereby tending to increase energy usage.

Business considerations are also acting as barriers. The current economic expansion has led to stores are being constructed as fast as possible. As a result, much greater emphasis is placed on getting a new store built than on optimizing its design to ensure maximum energy efficiency. According to several representatives of large supermarket chains, that means individual store systems are hastily installed and poorly integrated.

Regulatory issues are responsible for several of the most significant issues facing the industry today, including the ban on CFC refrigerants, greater concern about refrigerant leaks, and a tightening of the regulations affecting food safety in general and the temperature of stored, prepared foods in particular. In tandem with regulatory concerns, there is an increasing awareness of exposure to litigation on everything from food-related illness to crimes associated with inadequate parking lot lighting.

"Give me simplicity," says the Vice President in charge of new store design for a major Midwestern chain. These **technology concerns**, voiced in various forms by a number of market actors, is that store systems have become so sophisticated, with so many interactions, that the cost of managing them outweighs potential energy benefits.

Effect of PG&E Programs on Past Barriers

All of the supermarket customers in PG&E territory who were interviewed were aware of the PG&E programs, and those chains that had participated in the programs reported a higher

proportion of stores with the efficient technologies investigated. Exhibit 1-2 summarizes the main barriers to the adoption of specific measures and the effect of PG&E programs on those barriers. A number of survey respondents noted that the programs had made them more aware of energy efficiency, but few said that they had fundamentally changed the way they make energy related decisions. In addition, one of the difficulties of assessing the program's effects is that the marketplace has been changed by regulatory and market influences.

Exhibit 1-2

Past Market Barriers and Program Effects

Technology/measure	*Market Characteristic*	*EPS Barrier*	*Program/Intervention**	*Program Effect*	*Evidence of Sustainability?*
Floating Head Pressure Controls	Concerns that refrigerant might reach flash point; operation outside compressor manufacturer specifications required	Hidden cost	1, 3, 4	H	FHP controls are standard in new stores for most chains
	Uncertainty about technique's ability to deliver promised savings	Performance uncertainty	3, 4	H	
	Desire to maintain standard equipment across all stores in a chain	Organization practices	1	L	
Efficient Compressors	High efficiency compressors not designed for supermarket refrigeration systems	Performance uncertainty	1, 2	M	Manufacturers expanding range of scroll compressors and optimizing for supermarkets
	Compressors not available in all sizes needed for multiplexed rack system	Unavailability	1	M	
PSC motors	PSC motors not stocked by refrigeration contractors	Unavailability	1	H	Contractors are stocking; more stores using as standard; may be supplanted by more efficient ECMs.
Cycling anti-sweat heaters	Concern that inadequate control of condensation would hamper sales	Hidden cost	1, 3, 4	H	Cycling standard practice in large chains; triple pane doors may obviate need in the future
Energy Management Systems	Bad experiences with some EMS vendors; unreliable systems did not deliver promised savings	Asymmetric information and opportunism	1, 2, 4	M	Awareness and acceptance of EMS high, but some chains waiting for rebates to install
Doors on freezer cases	Limiting customer access to food could reduce sales	Hidden cost/performance uncertainty	1, 4	M	Upward trend in number of freezer cases with doors nationwide
T-8 Store lighting	Not worth the cost of spending money to retrofit existing lighting	Performance uncertainty/access to financing	1	H	With changes in Title 24 to cover supermarkets, T-8s effectively mandated
Efficient display lighting	Concerns about efficient display lighting's effect on sales	Bounded rationality	1, 4	M	Most supermarkets still place a premium on presentation over efficiency
Electronic ballasts in cases	For manufacturers to include electronic ballasts in cases would raise costs, reduce market share	Split incentives	1, 4	M	Case manufacturers unlikely to change standard case design back

* Program/Intervention	Program Type
1	Rebates
2	Audits
3	Information
4	Demonstrations

A number of customers and other market actors did provide information on their awareness of various programs and on what they found helpful. In contrast to the level of awareness and use in Northern California, participants in the comparison area focus group—comprising decision-makers from companies with similar size and number of stores—showed far less awareness of energy-related issues, opportunities for savings, or company efforts to achieve energy efficiency. Members of the comparison group reported little effort by their utilities to educate them, or to provide options or incentives to become energy efficient.

On balance, the PG&E programs appear to have heightened awareness of and interest in energy efficiency. To that extent they may be considered to have moved the market. On the other hand, supermarkets appear to have become conditioned to expect rebates as a precondition for undertaking energy efficiency actions.

1.4 Major Issues and Recommendations

One of the issues arising from the study is the evident reliance, or even dependence, of decision makers in PG&E territory on the availability of rebates to drive energy efficiency initiatives. As noted previously, rebates became an important part of the framework within which Northern California supermarkets made energy efficiency decisions. While this had the desired effect of raising the visibility of energy efficiency issues within the organization, the presence of rebates may have acted as a misplaced incentive.

Nevertheless, the perceived value of rebates to the supermarket industry may also provide a tool to affect the market in the future, particularly now that changing market and regulatory conditions have altered the environment in which supermarkets operate.

1.4.1 New Technologies, Market Barriers, and Levers to Overcome Them

Exhibit 1-3 presents a number of promising technologies, current barriers to those technologies, and programs or actions designed to address them. One of the strategies that may help address many of the fundamental barriers to energy efficiency in this industry is to emphasize non-energy benefits in promoting these measures or technologies. For example:

- Less refrigerant for lower leakage, savings
- "Smart" defrost helps maintain food temperatures, improves presentation quality
- Self-contained, water cooled cases provide merchandising flexibility
- Greater use of doors on freezer cases improves customer comfort
- Reducing total heat emissions will help stores achieve coming global warming limits on total heat released to the atmosphere.

Exhibit 1-3

Potential Future Market Interventions

Measure/technology	Potential Savings	Status	Barriers	Market Interventions/Levers
Commissioning	20-25 Percent for whole store	Done less than half the time	Construction deadlines; different vendors for different systems	Demonstrations, information; pre-post comparisons
Training for refrigeration contractors	Difficult to quantify	Contractors are not prepared to deal with the complex systems needed for energy efficient store management	No incentive for individual stores or vendors to provide all but very specific training	Certification program sponsored by CBEE/EPRI
More efficient compressors	10-20 percent for compressor only	Scroll compressors not originally designed for supermarkets and not optimized for them	Contractors not likely to stock; small models may be unavailable	Modest rebates for small compressors
Dual-path HVAC systems	Savings of $70,000 per year in 200,000 sq. ft store	Prototype developed and demonstrated; used in WalMart store	Performance uncertainty; hasn't been extensively demonstrated	Demonstrations, possible savings/performance guarantees
"Smart" defrosting	Annual savings of 34 percent for defrosting	EPRI had developed and is offering this as a product	Awareness	Rebates, alliance with refrigeration contractors
Store dehumidification	10 percent for whole store	GRI has promoted gas desiccants; EPRI has pushed low humidity for years	Practices; awareness	Demonstration, information

2. INTRODUCTION

This report presents the approach, research methods, results, and recommendations for the study of Market Effects in the Supermarket Industry.

2.1 Research Objectives

As the transition is made to market transformation-oriented programs, it becomes more important than ever to accurately characterize the targeted market and determine the extent to which it has been influenced by past market interventions before significant program investments are made. In this case, the characterization of the market—rather than encompassing the market for a specific technology—focuses on a single industry: supermarkets. The characterization of this market characterization is designed to serve several purposes:

- to describe the market actors, information flows, and distribution channels in the supermarket industry and their implications for energy efficiency
- to describe the barriers that impede the adoption of energy efficient technologies in the supermarket industry

- to determine current baseline values for a set of indicator variables that describe the market's movement toward higher efficiency

- to provide guidance for future program design through the identification of critical points of intervention in the market.

2.2 Description of Market

Technology/Equipment Markets. While supermarkets use a number of technologies, the largest portion of supermarket energy usage is accounted for by refrigeration, followed by lighting. Moreover, while grocery stores of all sizes use refrigeration, supermarkets are distinguished from smaller food stores by their use of centralized refrigeration systems rather than stand-alone cases. Refrigeration and, to a lesser extent, lighting were the primary focus of the current study.

Supermarkets vs. Convenience Stores. A series of focus groups held with customers revealed striking differences between the energy awareness, decision criteria, and program exposure of the supermarket and convenience store (C-store) markets. Other than large chains such as 7-11, the C-stores tended to be largely indifferent to energy concerns, with virtually no interest in installing (or even learning about) efficient refrigeration or lighting technologies. While we believe that the finding of the focus groups indicate a clear need for an energy information outreach program to this market segment, it was felt that C-stores appear to be distinct market from supermarkets, both in energy attitudes and awareness and in the type and scale of equipment utilized. The focus of the present study, therefore, was on the supermarket segment, where supermarkets are essentially defined as food stores of sufficient size to allow them to use centralized refrigeration systems.[2]

3. THEORETICAL FRAMEWORK AND RESEARCH PLAN

As shown in Exhibit 3-1, the present study focused on:

- determining the extent, if any, to which the actions of customers in the supermarket industry in PG&E's service territory indicate market effects

- determining the extent to which the current state of the supermarket industry in PG&E's territory reflects the effects of past market interventions by PG&E.

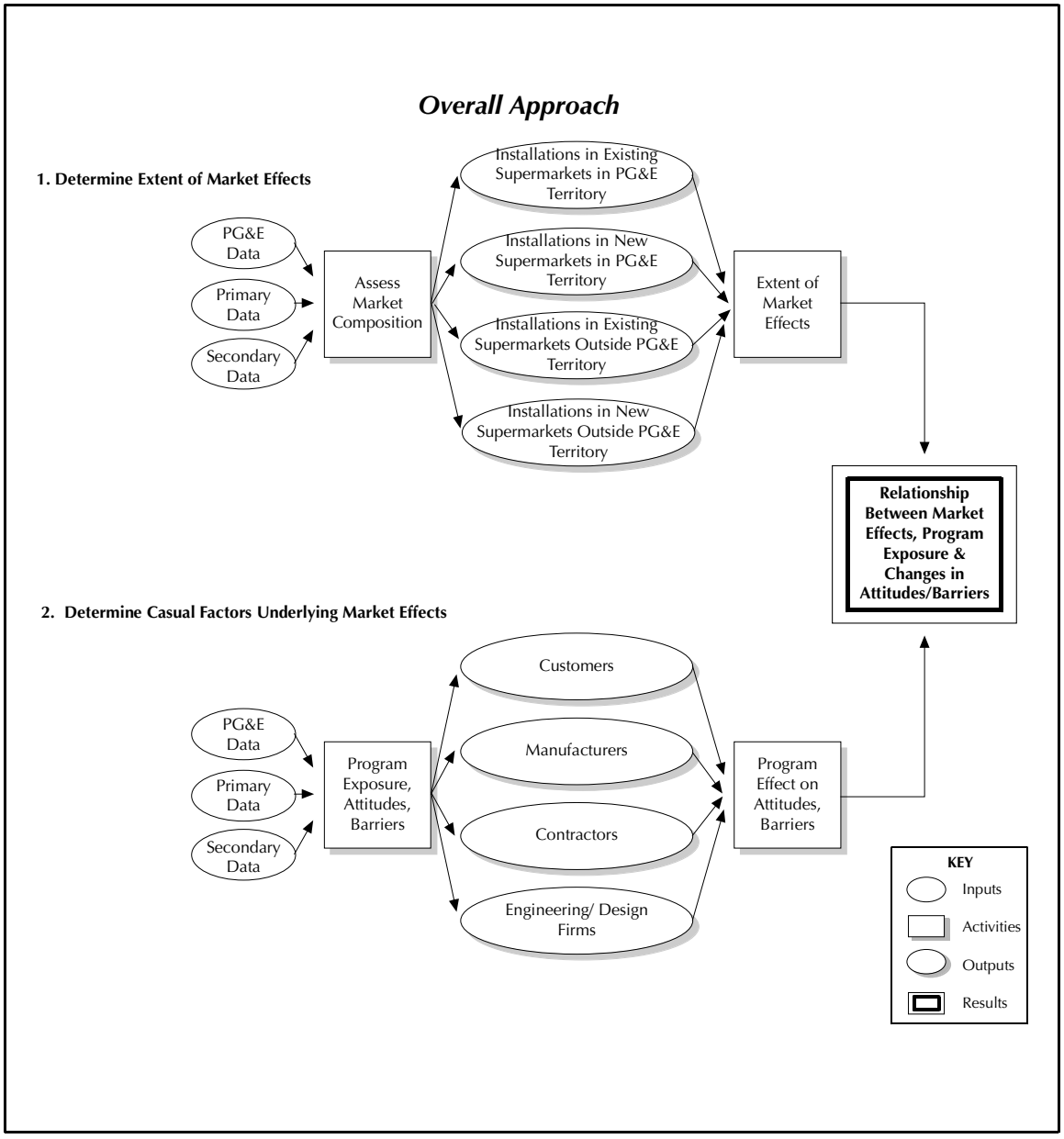
- Using the results of this analysis to make recommendations regarding future program design to facilitate and future evaluations of market interventions

The review of secondary sources and preliminary data collection efforts revealed a high degree of concentration (i.e., a limited number of players) in the supermarket industry. As a result, a quantitative assessment of the extent of market effects was not considered sufficiently reliable to serve as the sole basis for determining market effects, and was supplemented by a characterization of market structures and observed market effects using more qualitative

[2] The definition of a supermarket used by the Food Marketing Institute, an industry trade association, is of a grocery store with more than $2 million in annual sales.

methods. (It may be that many markets, when sufficiently well defined to provide a meaningful description of the interactions of various players and market forces, have too few players to support a quantitative assessment.)

Exhibit 3-1
Market Effects in the Supermarket Industry
Project Overview



3.1 Study Design

In this study, as in other market effects assessment efforts, we believe primary emphasis should be placed on the actions of customers in adopting or rejecting available energy efficient

measures. The actual measures installed, technologies used, and practices implemented in supermarkets provide the necessary first condition for determining whether market effects can be observed. In addition, we believe that customer attitudes, uses of various information channels, and perceptions of market barriers provide an indication of the likely sustainability of market effects, as well as of the mechanism by which the observed degree of market transformation has been affected. As discussed in more detail elsewhere in this report, a critical issue in this study was to determine whether the existence of rebate programs has had a positive or negative effect on purchase intentions and attitudes toward energy efficiency in the industry.

In our approach we stress the importance of laying out the logic behind observed market effects of PG&E programs targeted to supermarket energy use. Our research plan therefore called for a description of the market and its major players, the barriers that appear to limit the efficiency of the market, and the extent to which that market may have been transformed in PG&E's service territory by PG&E programs.

3.2 Study Methods

A key to our approach was to determine whether market interventions (e.g., PG&E programs) have led to changes in the types of technologies installed, attitudes and equipment selection criteria, and barriers to these and other energy efficiency measures. The framework for this approach is inspired by the initial Scoping Study by Eto, et. al., which hypothesizes that adoption of energy-efficient technologies is impeded by market barriers. Market effects are said to have taken place when one or more market barriers is eliminated or reduced.

Since the ultimate measure of the success of programs in lowering barriers to energy efficiency is the rate of technology adoption by supermarkets (customer actions), there are three basic components to this theoretical framework as applied to this study: program interventions, customer actions, and barriers. Each of these concepts is discussed in more detail below.

Program interventions. The programs PG&E has made available to the supermarket industry in the past comprise both incentives (Energy Efficiency Incentives) and information (e.g., Energy Management Systems, Safeway Test Store, Food Technology Center). Many of the major players in the industry in Northern California have participated in one or both of these types of programs, although the extent of participation varies substantially among supermarket chains, as shown in Exhibit 3-2. We therefore attempted to gather information on customer awareness of each of these programs, both through the focus groups and through interviews with as many supermarket chains in PG&E's service territory as could be contacted. Information on awareness of other types of program interventions (e.g., Motor Challenge, EPA Green Lights, the EPRI supermarket initiative) was also gathered.

Exhibit 3-2

Participation in PG&E Programs for Major Supermarkets

Store/Chain	Total Premises	No. in Rebate Program	Percent in Rebate Program	No. in Audit Program	Percent in Audit Program	Percent in Programs
1	263	55	21%	8	3%	24%
2	204	55	27%	0	0%	27%
3	91	60	66%	1	1%	66%
4	62	0	0%	4	6%	6%
5	57	25	44%	8	14%	47%
6	41	3	7%	4	10%	17%
7	36	11	31%	3	8%	33%
8	29	2	7%	0	0%	7%
9	25	1	4%	3	12%	16%
10	18	3	17%	0	0%	17%
11	11	1	9%	0	0%	9%
12	10	5	50%	0	0%	50%
13	8	6	75%	0	0%	75%
14	8	6	75%	0	0%	75%
15	7	0	0%	2	29%	29%
16	7	1	14%	3	43%	57%
Total for Top 16	877	234	27%	36	4%	30%

Customer actions. Customer actions with respect to energy-efficient technologies are seen as the ultimate measure of market effects. Barriers can occur at any point in the market, but the end result is the customer's decision (and ability) to purchase efficient or non-efficient technologies (or, in the case of a technology that is inherently efficient, such as night curtains for refrigerated cases, the decision to purchase or not to purchase). Customer actions were measured by asking supermarket decision makers which measures they have installed and in how many stores (within the specific technology areas that are the focus of this study). Thus, while the actual number of decision makers interviewed was relatively small, the number of stores represented numbered in the hundreds.

An important component of analysis of customer actions is the determination of what those actions would have been if market interventions had not taken place (i.e., if the programs had not existed). Supermarket decision makers for chains that extend beyond Northern California were asked about their equipment selection actions for stores in territories where there are and have been no utility-sponsored energy efficiency programs. We also selected a specific area to provide a more detailed view of the market in a no-program area. The area of Illinois served by Commonwealth Edison was used to recruit focus group participants and as the area for the

comparison samples of supermarkets and vendors. In part because many firms who cater to the supermarket industry (and the supermarket industry itself) have a regional or national focus, we drew our sample from outside Illinois as well. Few of the leading designers, to the industry, for example, have offices in the specific areas being studies.

Barriers and attitudes. In addition to determining whether market effects can be observed in customer behavior, we were also interested in determining *why* behavior did or did not change, since this has profound implications both for assessing the permanence of observed change and for identifying levers by which to achieve future changes in behavior. By identifying and assessing market barriers that had been overcome (and that still existed) and relating these to the equipment actually installed in stores, it may be possible to "explain" changes in customer actions with the market barrier changes. Concerns regarding the ability of local refrigeration contractors to adequately service and maintain a sophisticated floating head pressure system, for example, have prevented some supermarkets from implementing this cost-effective efficiency measure.

On a more general level, it is worthwhile to track customer decision criteria as related to energy-using equipment in general and energy-efficient refrigeration and lighting equipment in particular. Having identified a number of potential decision factors in the focus groups, we asked various market actors about their perception of the importance of those factors in the equipment selection process. While the number of respondents was generally not large enough to support statistical analysis, responses were nevertheless helpful in explaining behavior changes and assessing permanence. This is particularly important in the supermarket industry, where multiple stores controlled by a single decision maker (or group of decision makers) are the norm.

Linkages between program, barriers, and behavior. One of the original goals of our approach to the study was to quantitatively link market interventions to changes in attitudes/perceived barriers and, in turn, to changes in actions and intentions. The intent was to develop a structural equation model (SEM) to estimate the impacts of multiple variables (e.g., program exposure, perceived barriers) on intentions and actions. Based upon our initial data collection efforts and review of data sources, however, we found that not enough data would be available to support a multivariate analysis of this type. We therefore relied on more qualitative indications of linkages between market interventions and the actions and attitudes of the industry.

3.3 Data Sources

3.3.1 Literature Review and Existing Data Sources

Both a literature review and several preliminary data collection tasks were performed to help refine the focus of the study and subsequent data collection efforts. Preliminary data collection and analysis activities included:

- **A review of PG&E data sources and existing literature**. Data sources used in the review of existing data are presented in Exhibit 3-3, and results of the literature review were presented to PG&E in a memo in early March, which is included with this report as Appendix 1.

Exhibit 3-3
Data Sources Used in Literature Review

PG&E Data	Secondary Data
Program Data Billing Data Web site Marketing Materials Impact Evaluations Other Studies/Surveys	Market Data - Census Bureau - Trade publications - Food Marketing Institute Equipment Data - EPRI - ORNL - Equipment Catalogs - ARI

- **Staff interviews with PG&E program staff, as well as with program staff focusing on market effects**. Key findings from these staff interviews have been presented in a Summary Memorandum.

- **Focus groups with supermarket decision makers**. A total of three focus groups were conducted: two within PG&E's service territory (one with large customers; one with small groceries and convenience stores) and one in the comparison territory served by Commonwealth Edison. The findings of the focus groups are presented in detail in Appendix 2, and are cited as appropriate throughout this report.

- **Open-ended interviews with vendors**. Approximately a dozen vendors who supply equipment to the supermarket industry were interviewed informally at the Food Marketing Institute show in Chicago May 3-5. A list of these vendors is included in Appendix 3.

- **An interview with EPRI's supermarket specialist**. Mukesh Khattar was interviewed regarding trends in energy efficiency and the current market for energy efficient equipment.

The results of these initial data collection and analysis activities led to a focus on supermarkets rather than C-stores, with a primary emphasis on refrigeration and lighting, for the remainder of the data collection effort.

3.3.2 Primary Data Collection and Sampling Plan

The data collection plan for the study was dictated by the basic approach of assessing market effects through a comparison of markets within and outside PG&E's service territory, including installed technologies, information flows, market barriers, and decision criteria. While we recognize that no other service territory will exactly match the characteristics of PG&E's, we believe the benefits from developing a credible baseline outweigh the inability to correct for all variables that influence the California market for energy efficient equipment. The territory selected – that portion of Illinois served by Commonwealth Edison – has a number of characteristics that fairly closely match those of PG&E's territory, including cooling degree days and the overall "green" attitude of consumers as measured by Congressional voting records.

Exhibit 3-4 presents the data collection activities for this study.

Exhibit 3-4
Data Collection Plan

	Within PG&E Service Territory	Outside PG&E Service Territory
Staff Interviews	4	
Supermarket Decision Makers	15	10
Architects, Designers & Technical Specification Managers	5	5
Vendor/Manufacturer Interviews	15	15

Since the difficulties of obtaining responses from enough respondents in this fairly limited market—as described above—made developing a sample futile, the above data points were collected by attempting to contact as many of the major players in the categories listed above as possible, including:

- The major supermarket chains in PG&E's service territory and in the comparison territory, as well as several chains outside the Commonwealth Edison territory (but also in the Midwest in territories without programs). A total of 25 decision makers provided input.

- The leading vendors who supply refrigeration systems (including compressor systems), refrigerated cases, lighting, and energy management systems to supermarkets, as well as the refrigeration contractors who service these systems. For some of the most important vendors, contacts were made at various levels, including corporate marketing, R&D, and field marketing and service.

- All of the designers/A&E firms who specialize in designing and specifying equipment for the supermarket industry, as drawn from an American Institute of Architects (AIA) database and from lists of exhibitors at the FMI show in Chicago.

As discussed earlier, focus groups were conducted with supermarket and C-store decision makers both within and outside PG&E's service territory to obtain an understanding of the current and future status of energy efficiency in the market.

Sample design. Both PG&E's CI customer lists and secondary data sources were used to generate lists of customers with the SIC 5411 within and outside PG&E's service territory. The PG&E list was based on the corporate ID, premise number, and rate class in the CIS. In addition, program tracking data were used to identify supermarket customers who have had one or more stores participate in PG&E program. The sample in the non-PG&E territory was drawn using Dun & Bradstreet data, sorted by SIC, number of employees, and sales per facility to distinguish supermarkets from convenience stores.

Names of other market actors (vendors, designers) were drawn from secondary sources (e.g., D&B data, participation in the Food Marketing Institute show) as well as from interviews with PG&E program staff and with supermarket decision makers.

This data collection plan was designed to meet the following research objectives:

- Collection of customer data focused on actions taken by supermarket customers, awareness of program, information sources and decision influences, and decision criteria, both within and outside PG&E's service territory.
- The in- and out-of-territory interviews with vendors addressed issues of equipment design, product availability, pricing, performance, and customer acceptance, as well as vendor attitudes toward energy efficient equipment. Interviews were also conducted with the refrigeration contractors who play a key role in maintaining and servicing equipment after it has been installed in supermarkets.
- Interviews with design firms were used to determine the extent to which energy efficient technologies have been accepted or requested by supermarkets, specified as "standard practice," or incorporated into the "master" specifications for supermarket chains.

These primary data collection activities helped to determine how market actions and attitudes were or were not influenced by PG&E's programs. Interviews were designed to elicit both qualitative and quantitative data, and included both open-ended and structured responses. Interview guides/survey instruments for the customer, vendor, and designer surveys/interviews are presented in Appendix 4.

Staff interviews. QC completed the staff interviews in February 1998. The interviews with PG&E's program staff provided insights into the current market conditions, indications of market effects from previous programs, and PG&E's future plans.

Focus Groups. As described previously, focus groups were conducted both with PG&E's service territory and in the comparison territory. The results are presented in Appendix 2.

Customer surveys. Customer data were collected on attitudes toward energy efficiency and perceived barriers to energy efficient technologies among supermarket decision makers for facilities within PG&E's service territory for comparison to those of similar customers outside PG&E's service territory. (It should be noted that many of the decision makers for national and regional chains are actually located outside PG&E's territory.) Customers were asked to respond to a series of questions relating to specific energy efficiency actions they have taken at stores within and outside PG&E's territory.

Vendor surveys. Both manufacturers and refrigeration contractors were interviewed. Questions asked of vendors focused on the extent to which specific technologies and practices (e.g., floating head pressure controls; cycling of anti-sweat heaters; night covers for cases) are being adopted by existing and new stores in California and in no-program territories. In addition, data were collected on vendor perceptions of market barriers, information channels regarding new technologies, and customer attitudes and decision criteria related to energy efficiency. One of the concerns noted by several equipment manufacturers has been the extent to which supermarkets in program territories such as PG&E's have become dependent on

rebates; companies that might otherwise consider a four- or five-year payback acceptable have become conditioned to see anything over two years as too long.

Designer Interviews. Interviews with architect and engineering firms who serve the supermarket industry sought to determine to what extent standard design practices now incorporate energy efficient technologies and the role that PG&E (and other utility) programs have had in influencing these practices. In addition, the interviews sought to gain insight into designer attitudes and perceptions of market barriers to energy efficient practices

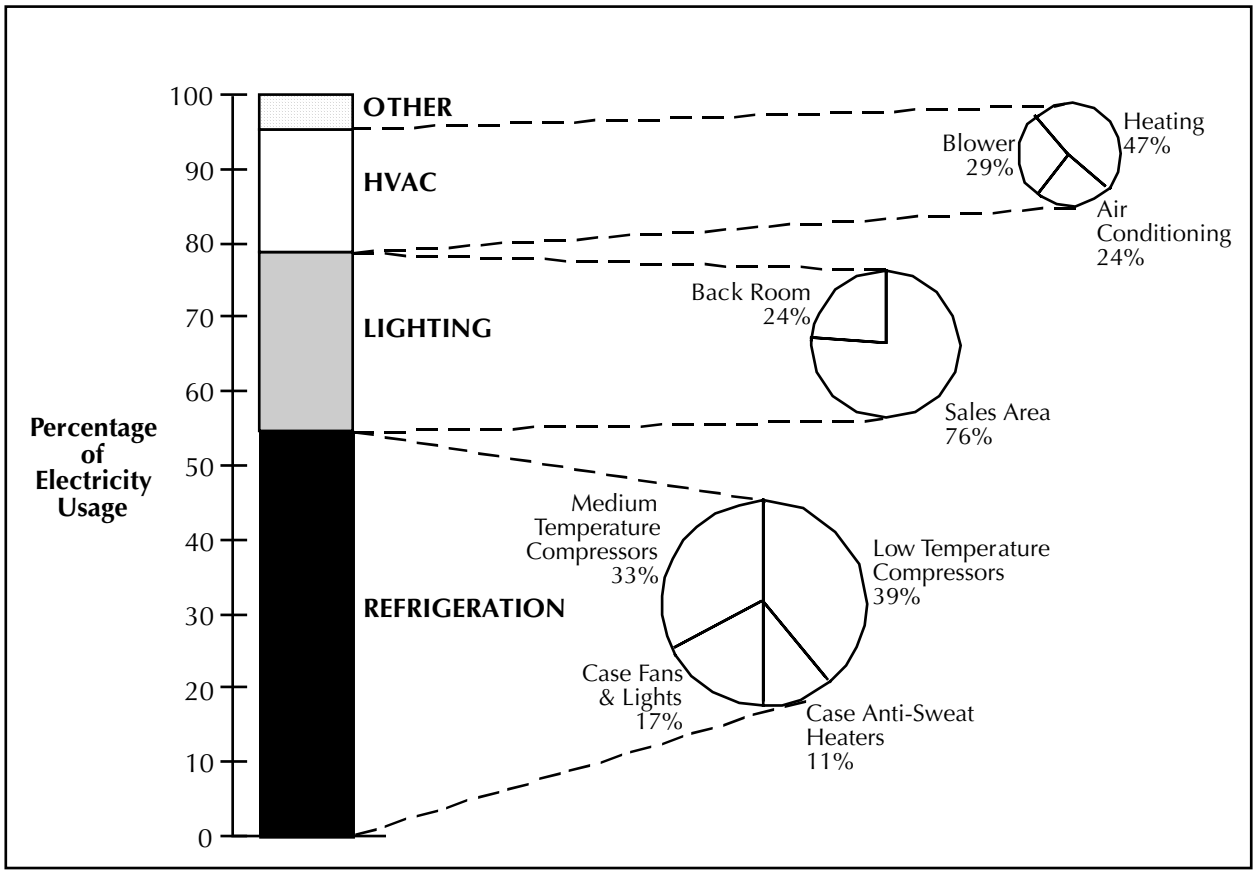
4. RESULTS

4.1 Market Characterization

There are an estimated 127,000 grocery stores and supermarkets in the United States, with combined annual sales of $425 billion, according to the Food Marketing Institute. The 29,900 (as of 1996) supermarkets accounted for $323.2 billion of this total, with supermarkets defined as grocery stores with more than $2 million in annual sales. According to the Department of Energy, supermarkets use an estimated 900 trillion Btuh of energy annually for heating, cooling, refrigeration and lighting.

Refrigeration equipment represents the largest share of energy usage within this segment, accounting for nearly 50 percent of the total. Exhibit 4-1 provides a breakdown of a typical supermarket's energy usage. While it highlights the importance of the refrigeration end use, the exhibit does not provide a complete picture of the complexity of supermarket energy usage, particularly the interaction of refrigeration with store space conditioning and store lighting.

Exhibit 4-1
Supermarket Electricity Usage



The overall trend in supermarket energy intensity had been downward until about 1995. According to EPRI Supermarket Segment Manager Mukesh Khattar. For a variety of market and regulatory reasons discussed below, energy use has been increasing since then. Electricity usage currently averages 50-60 kWh per square foot per year. As noted above, a variety of energy using equipment contributes to this total. The market for that equipment is discussed below.

4.2 Key Market Players

The roles, interaction, and exchange of information and influence of major players in the market for energy using equipment are discussed below, from the manufacturers of energy using equipment to its final users – the individual stores. For each group of market actors we discuss the industry structure, the size and market scope of leading companies, the information sources they use, the role they play in the selection of energy using equipment, and their knowledge of PG&E and other market interventions. Finally, we discuss barriers that inhibit their ability to supply or obtain energy efficient equipment.

4.2.1 Equipment Manufacturers

One of the recurring themes in interviews with market actors was the ability of three or four manufacturers to dominate this industry. For refrigeration system in particular, the "rule of three" applies, with three major firms (Hussman, Tyler, and Hill-Phoenix) helping to define the market, including the range of energy efficiencies offered. These leading firms all employ thousands of people and are international in scope, with sales, distribution, and service outlets in all major markets. They enjoy close relationships with the top supermarket chains, and maintain a steady flow of product literature and other information to buyers as well as designers and others who might influence the purchase decision.

Despite intense competition among the major players, there is also a significant amount of information sharing and participation in industry-wide groups and initiatives. Representatives of the manufacturing companies cited professional associations and conferences as their primary source of information on trends in energy efficiency. In addition, all the industry leaders support significant individual R&D programs in an effort to obtain a competitive advantage. For example:

- Hill-Phoenix is promoting the use of secondary coolants in thermal energy storage systems for refrigerated cases

- Hussman has developed a modular distributed system of compressors tailored to CFC-free refrigerants (and named it the Protocol system in honor of the Montreal Protocols.)

- Tyler continue to lower the temperature at which its systems can operate in order to achieve additional energy savings through the use of floating head pressure controls.

Moreover, energy efficiency figures prominently in the marketing efforts of all major firms; at a recent FMI Conference, all three firms emphasized the energy saving features of their equipment, and Hussman explicitly cited savings of "3 % over competitor 1 and 14 % over competitor 2.[3]"

Because of their depth of in-house expertise and their experience, the major manufacturers often exert considerable influence in equipment selection decisions. This generally favors greater rather than less energy efficiency. Culturally, most key personnel at the manufacturing companies are engineers, with an engineer's interest in and appreciation for energy efficiency. A number of senior R&D, product development, and even sales personnel with these firms cited their frustration at being unable to convince many supermarket decision makers of the wisdom of selecting efficient equipment, complaining that "marketing is everything" for buyers.

Manufactures noted that in-house energy or facilities managers typically initiate equipment replacement projects, while the in-house store design department or (in the case of smaller chains and independents) top management are responsible for new stores or major renovations. Either way, top management always has the final say on major projects, although

[3] Hussman ad reprint.

this is more apt to be a go/no-go decision than a revision of the type of equipment selected. Finally, it should be noted that other market actors (designers, contractors, and end users) attribute a significant role in influencing equipment selection to manufacturers.

Manufacturers are generally fully aware of programs offered by PG&E or other utilities. A number of them participate in "test stores" and other demonstration projects with EPRI and individual utilities. They will also use rebate programs to help close a sale or influence the choice of efficient equipment when possible.

One of the most significant barriers cited by vendors is the pervasive emphasis on appearance and marketing in equipment selection, often to the detriment of energy efficiency. Since buyers are unwilling to pay extra for efficient equipment, vendors are reluctant to make a full-scale commitment to energy efficient technologies, preferring instead to have their standard and high efficiency models coexist. In some instances, however, manufacturers have made essentially permanent changes to their basic designs that have rendered efficiency gains irreversible. For example:

- Copeland has been continuing to apply its efficient scroll compressor technology to smaller units to make their benefits available to a wider range of applications, and relatively few of its "standard" reciprocating models are sold any more.

- Hussman and Tyler have both incorporated electronic ballasts and anti-sweat heater cycling controls as standard features for their most popular models of cases.

4.2.2 Designers

The market for design services is concentrated in a few specialized architects and designers who serve the national market; the limited number of local or regional companies may be called upon to design stores for independents. Within all of California, there are 40 member firms of the American Institute of Architects who list supermarkets as one of their "specialties," although these listings often includes schools, retail outlets, and a wealth of other business types as well[4]. A number of these architects, when contacted for interviews, said they really have not done any supermarket designs in the past year.

It is the national firms who have established relationships with major supermarket chains as well as with leading vendors. The design firms and the in-house design departments for major chains share the store design/equipment specification task, often working together to implement the store's master specification. Independents are much less likely to have either master specifications or an in-house design staff, thereby providing designers with greater input to the decision-making process. Several respondents noted that this, too, is changing as more independents are consolidating or being acquired by chains.

The supermarket designers cited several major sources of information, including trade magazines, professional associations, and contractors and equipment suppliers. One designer said that his firm keeps an in-house library of the leading manufacturers' catalogs as a way to

[4] In all of Illinois there were just 10 such firms.

keep up with new trends and technologies. However, the most important source of information was these designers' own years of experience in the supermarket industry. This is a highly specialized niche market, and requires a knowledge of a variety of engineering and marketing issues ranging from lighting, to merchandising, to traffic flow.

These designers indicated that energy efficiency is a consideration in their designs, but the more important consideration is staying within a client's budget; the starting point in the design is usually the energy efficient option for refrigeration as well as lighting, but these designs are subject to change based upon available funds.

Designers described their role in the equipment selection process as a consultant. They are often called upon to provide technical advice or offer a different perspective from the in-house staff. One designer said that corporate-owned supermarkets often hire outside design firms to see if they can suggest a new or fresh approach.

One designer pointed specifically to the trend toward prefabricated or distributed refrigeration systems, such as those developed by Hussman. The designers will also specify equipment from certain manufacturers, if that manufacturer is well-known and has an excellent reputation. But the supermarkets are also able to use their own vendors, if they so choose.

PG&E or other utility programs are generally not a high priority for designers. Most are unaware of specific programs until alerted to them by their clients, who may ask for rebate-qualifying equipment as part of the design. One design engineer interviewed at the EPRI Supermarket Initiative Meeting in Houston complained that prescriptive HVAC rebates have had deleterious effects on overall store efficiency in the past; when stores installed high efficiency packaged AC systems to obtain a rebate, they increased the humidity in their store (since efficient units do not dehumidify as effectively), thereby placing a substantial extra load on the case cooling system and leading to a net increase in energy usage.

Misplaced incentives are evident in the almost exclusive emphasis placed on the store designer's ability to generate increased revenues and keep first cost to a minimum. Since designers know they are being graded on cost and marketing rather than energy, they have very little incentive to specify any energy efficient alternative that could hamper sales or cost more up-front. Access to financing is generally not a problem for supermarkets, but, several respondents noted, incremental cost increases attributable to energy efficient design may be the first to go in the face of budget constraints.

Refrigeration Contractors

It is clearly very difficult for a supermarket to maintain an internal service organization capable of providing full-time coverage for all its stores. As a result, local refrigeration contractors supplement (and often supplant) in-house supermarket maintenance organizations, playing a critical role in the installation and operation of energy-using equipment.

In PG&E's service territory, there are about 140 refrigeration contractors, identified by SIC codes 1711-9901 (refrigeration contractor) and 7623-9902 (refrigeration repair). They range in size from one-person shops to affiliates of national vendors such as Hussman. Many of these do little supermarket work, focusing instead on refrigerated warehouses, C-stores, restaurants, institutions. As many as half of targeted interview respondents did not pass the screener:

"does your firm provide services to supermarkets?" The number of stores served by those who do work for supermarkets ranged from 3 to 500 in PG&E territory, and from 4 to 100 in the comparison territory.

- Of those who service supermarket, all do maintenance work, about half provide installation services, and about a third also sell equipment. A few of the largest contractors also provide design services.

- Seven of the 16 contractors interviewed do at least part of their work with supermarkets through established service contracts; the remainder provide services only on an as-needed basis.

Contractors play an increasingly important role both in influencing the kind of equipment installed and in ensuring its proper operation. Reasons for their expanded role include:

- The advent of sophisticated systems has meant better maintenance and fine tuning and, especially for relatively remote stores, this has increased reliance on local contractors.

- In addition, the use of racks of multiplexed compressors has led to more frequent, smaller purchase decisions as individual compressors and components are replaced. As noted in *Refrigeration Service and Contracting* magazine, contractors increasingly "have a strong voice in what ends up on the racks.[5]"

To keep up with trends in energy efficiency and energy using equipment, contractors rely most heavily on professional associations and conferences, although specialized magazines and manufacturer information were also cited. One of the aspects of the market that these firms do not keep up with is the availability of programs from PG&E: only half of those interviewed in PG&E's territory were familiar with any of the energy efficiency programs offered by the utility or by EPRI.

Contractors were also asked about their perceptions of the importance of various equipment attributes to their customer. Results are presented in Exhibit 4-2, but must be viewed in light of the small sample of respondents who both agreed to be interviewed and who met the screening criterion of providing services to supermarkets.

[5] Refrigeration Service & Contracting, May 1998, p.7

Exhibit 4-2

Refrigeration Contractor Perceptions of Customer Selection Criteria

Attribute	Northern California (n=8)	Illinois (n=8)
Appearance/contribution to sales	5.20	5.40
Energy efficiency	4.50	4.60
Initial cost	5.80	4.75
Life cycle cost	4.00	5.00
Ease of maintenance	3.00	3.50
Availability of financing	4.30	5.13
Eligibility for utility rebates	4.80	4.50
Warranty	4.20	5.25
Manufacturer's reputation/ relationship with vendor	4.70	4.25
Reliability	5.20	4.60
Compatibility with other equipment in other stores	4.50	3.60
Immediate availability	4.30	4.60

*Importance on a 1 to 6 scale. The question asked was, "Please rate on a six point scale, where 1 means 'Not at All Important' and 6 means 'Extremely Important' how your supermarket customers rate each of the following equipment attributes."

Subject to the previous caveat, note that:

- CA refrigeration contractors rated initial cost highest, followed by reliability and appearance/contribution to sales
- IL contractors rated appearance/contribution to sales highest, followed by warranty and availability of financing
- Both ranked ease of maintenance lowest
- Energy efficiency rated in the middle for both groups.

All the respondents in both territories said that supermarket demand for energy efficiency equipment has increased (rather than decreased or stayed the same) over the past three to five years. Moreover, all contractors except one in Illinois expect this demand to continue increasing over the next three to five years.

One of the concerns raised repeatedly by vendors and supermarket decision makers in the course of the data collection effort was the dependence on (or vulnerability to) contractors to maintain the more sophisticated systems needed to ensure energy efficiency – whether floating head pressure refrigeration systems, heat recovery systems, or energy management oriented lighting controls. It was pointed out that the focus of the contractor is to "keep the system going." Four of the six California contractors said that store managers typically initiate the service call, and pleasing the store manager clearly leads to a "quick-fix" orientation. A number of vendors and regional/corporate store facility manager told of finding controls overridden, valves or inlets forced open, and system set points altered.

The level of expertise and of training to deal with complex systems varies widely by contractor. Other market actors were quick to note the skill of the largest contractors, but also noted that they might have to rely on a local HVAC contractor who handles refrigeration as a sideline in many smaller markets. Moreover, training is rarely provided, and contractors have had to "learn by doing" many of the different practices required for the new generation of refrigerants.

Paradoxically, the supermarket chains themselves are least interested in providing training for the biggest market changes (e.g., new refrigerants, temperature requirements); "If it's that important, we expect them to learn it. (split incentive barrier). As discussed further in the recommendations section of this report, this aspect of the market may present opportunities for affecting fundamental changes.

Separate interviews were not conducted with lighting contractors. Other market actors contacted noted that lighting installations in supermarket typically do not involve a complex role for the contractor, since the types of lighting to be installed are usually specified by the designer. One focus group participant did describe a recent relamping project in which 34 W fluorescent lamps were used as replacements for 40 W lamps and touted for their energy efficiency. (At the participant's insistence, the job was redone, using T8 lamps and electronic ballasts.)

Customers

At the national level, as noted earlier, supermarkets are a $320 billion industry. The following table characterizes the industry based upon a number of criteria, including sales volume, operating margin, and number of stores.

Table 4-3

Top Supermarket Chains in the United States

*Based upon 1996 Sales**

Store	1996 Sales ($ Billions)	Number of Stores	Sales/Store ($Millions)
Albertson's Inc.	$11.9	720	$16.5
American Stores Co.	$18.4	816	$16.9
Food Lion Inc.	$7.9	1,039	$7.6
Giant Food Inc.	$3.7	159	$23.2
Great Atlantic & Pacific Tea Co.	$10.3	1,108	$9.3
Hannaford Bros. Co.	$2.3	118	$19.4
Kroger Co.	$23.0	1,301	$17.6
Safeway Inc.	$15.6	1,062	$14.7
Stop & Shop Cos.	$3.8	128	$29.6
Vons Cos. Inc.	$5.0	334	$15.0
Winn Dixie Stores Inc.	$11.1	1,159	$9.6
Totals/Averages			
1994 Actual	$113.0	7,944	$13.5
1995 Actual & Estimated	$116.9	8,028	$13.9
1996 Estimated	$124.9	8,235	$14.5

**Source: Donaldson, Lufkin & Jenrette*

Note that the 11 chains shown here together accounted for almost 40 percent of the industry's 1996 sales. Concentration in the industry is, in fact, increasing, with several mergers having taken place since the above data were compiled. Both Giant and Stop and Shop, for example, have been acquired by a foreign firm looking for inroads into the North American market; and Safeway has acquired Vons, increasing its total stores from 1,060 to 1,400 and the number of stores it operates in PG&E's territory from 260 to more than 300.

Within California, the same trends observed nationally are taking place. A number of acquisition over the past several years has reduced the number of players in the market, and firms who are part of national (or at least multi-regional) chains dominate. According to D&B data, there are approximately 2,300 grocery stores (SIC 5411) with 25 or more employees (a reasonable cutoff for a full-sized supermarket) in California, including about 800 in the territory served by PG&E.

An examination of the D&B data reveals the importance of stores with a national and multi-regional scope in the California market. Most of the prominent firms in California do business well beyond the state's boundaries. Safeway (including Vons) and Albertson's both have more stores in other states that they do in California, and both do business in more than 20 states. While Lucky Stores are found only in California and Nevada, they are part of American Stores, which operates a total of 813 stores in more than a dozen states in the West, Midwest, and East.

In addition to these national/multi-regional chains, California has several statewide chains. Within California, Ralphs is strongly focused on the southern part of the state, while Raleys has

most of its 50 stores in the North. Examples of other Northern California regional operations include the 40-store Nob Hill chain, recently acquired by Andronico's, Andronico's itself (with 9 stores of its own), Cala Foods (34 stores), Holiday Market (8 stores), and Lunardi's (5 stores).[6]

The market in the Midwest has a structure that is not dissimilar to California, with a mix of large chains with national reach -- including Jewel (like California-based Lucky, part of American Stores) and Kroger (1,392 stores in 24 states) – and local/regional chains, notably Dominick's, with all but a handful of its 80 stores in Illinois. Chains with a broader midwestern focus also play an active role, including Minneapolis-based Cub Foods, which has 23 of its 117 stores in Illinois. Piggly Wiggly, a franchise operation owned by food wholesaler Fleming Companies, has 8 of its more than 700 stores in Illinois.[7]

For supermarket chains, decisions regarding energy using equipment are made by regional engineering departments, with senior management exercising final approval authority. Independents (defined by the Food Marketing Institute as chains with fewer than 10 stores) almost always have at least some in-house engineering capability, although the company's top management may play a more direct role than in larger chains.

As noted previously, supermarket energy managers and executives rely on input from designers (both in-house departments and consultant), equipment vendors, and even contractors. Much of this input is gathered continually through professional associations or at conferences and trade shows, which were most often cited as the chief source of supermarket decision maker information on trends in energy efficiency. The Food Marketing Institute's annual show and exposition provides users with insight into the current line of product offerings and industry trends – which explains why several of the leading vendors are said to spend in excess of $3 million on the show.

With utilities changing their organizational structure and the way they deal with supermarkets (from providing one point of contact for electric service to acting as vendors of all kinds of products services), utilities have lost some of their status as providers of unbiased information. EPRI continues to be viewed as reliable sources of information, however, with 100 percent of respondents in PG&E's territory reporting familiarity with the EPRI supermarket initiative.

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[6] All these data on store numbers came from publicly available D&B data.

[7] While we believe the structure of the industry tends to be determined by national rather than regional forces, we recognize that there are differences in the samples of respondents to our questions. More of the no-program territory responses were obtained from chains with national affiliations and stores located across states – in part because these chains were able to provide information on installations in the absence of utility programs, in part because the smaller chains in Illinois were unwilling or unable to participate in the data collection effort. Results that are weighted by the number of stores therefore reflect the greater influence of these national/trans-regional chains in determining the number of efficient measures installed, while unweighted results regarding decision influences reflect the greater proportion of smaller chains in the Northern California sample. The data on installations of efficient equipment are therefore more of a like-to-like comparison than are the data on decision influences. Even so, these results must be interpreted cautiously.

One of the frustrations encountered by the individuals who have responsibility for facility management for a number of stores is the low priority assigned to energy efficiency. As described by many of the focus group participants, their role as facilities managers or energy managers puts them in the role of stepchildren in their companies. One discussant noted that there are nine people in the company who address marketing for every one who addresses energy operations. Another described how marketing staff hide the costs from him until after the equipment has been purchased and installed. Still another agreed, saying that the company "doesn't even look at energy use" initially. To illustrate the point further, a decision-maker from one large chain described the placement of a bagel case on top of a refrigeration unit, leading to a profusion of crumbs and the consequent need for additional maintenance. But customers liked it, he was told, and his job was to deal with the placement rather than to improve the overall operation. Even when equipment is sent to PG&E's test kitchens for testing of safety and efficiency, the results do not make or break the buying decision.

Even the engineers who typically hold responsibility for facility and equipment management at supermarkets have learned the importance of marketing; every one of the supermarket respondents in PG&E's territory rated market and presentation concerns a 6 on a 1 to 6 scale. These decision makers gave the availability of rebates an average rating of 5.4 on the same scale. In the past, supermarket engineering departments used PG&E and other utility rebate programs to add luster and visibility to energy efficiency projects. Rebates were a major influence in company plans, with energy managers often being rewarded on the basis of utility rebates they were able to bring in. Among focus group participants and other respondents there remained a clear preference for rebate programs over audits information, demonstrations, and other potential program designs.

4.3 Product/Efficiency Mix

As noted previously, the current mix of energy efficient products and practices used by supermarkets in PG&E's territory represents a key indicator of the current status of the market's transformation toward more efficient practices. It must be borne in mind, however, that actions in PG&E's territory reflect the direct effect of past PG&E programs, including incentives as well as informational programs and demonstrations.

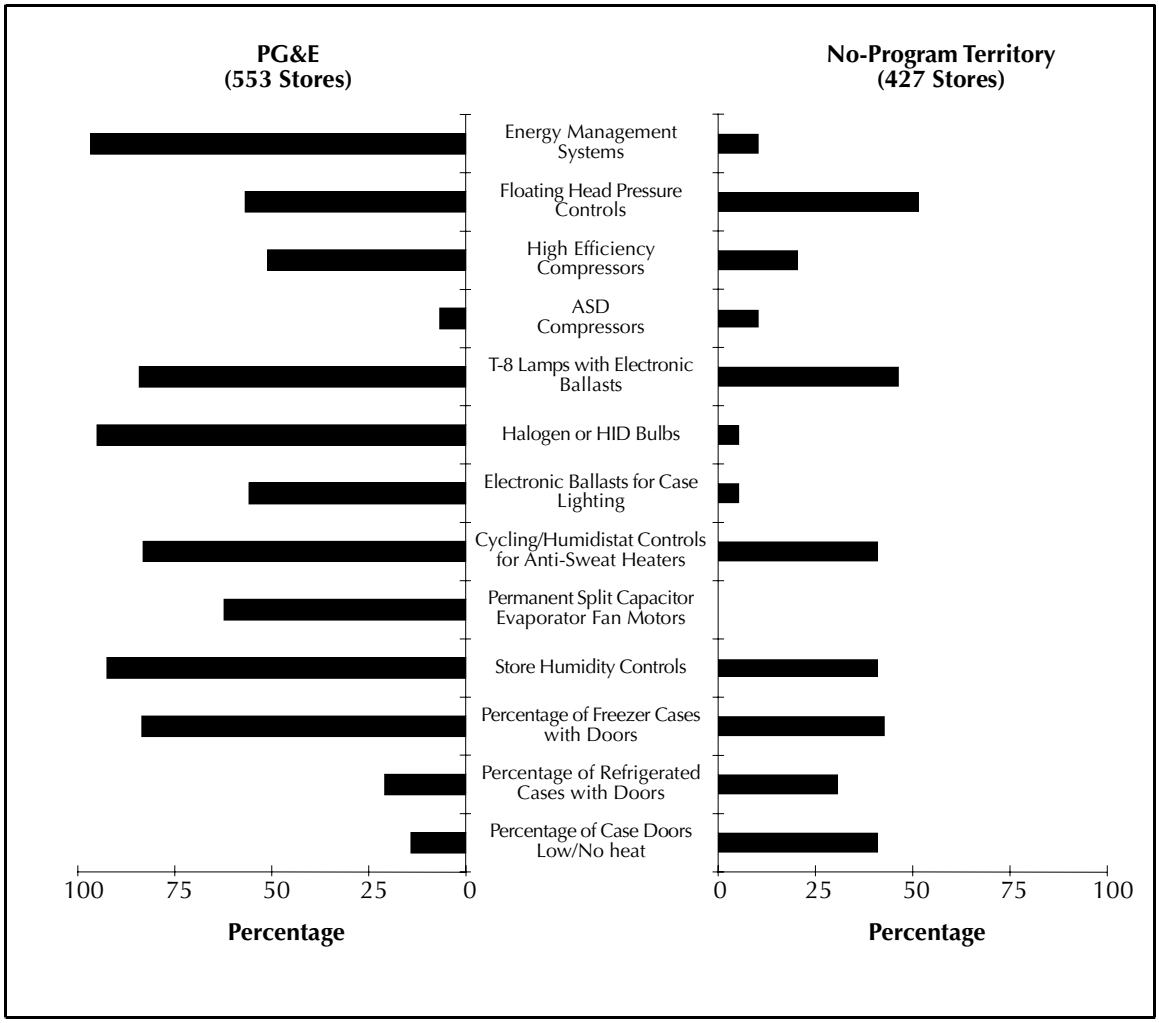
A representative listing of energy efficient measures and practices was developed from the *Evaluation of Pacific Gas & Electric Company's 1995 Nonresidential Energy Efficiency Incentives Program for Commercial Sector Refrigeration Technologies*, supplemented by findings of the literature review and interviews with market actors. While the resulting list is by no means all inclusive, the measures on it offer significant potential for energy savings and, we believe, serve as an accurate indicator of the pervasiveness of energy efficiency and an indication of where to look for remaining barriers that continue to hamper their adoption. In addition, there are several new technologies "in the pipeline", and understanding the extent to which barriers still operate in the market today may help us provide guidance to designers of future programs for this industry.

Supermarket decision makers were subsequently asked what percentage of their existing stores and new stores had each of the selected measures installed, both in PG&E's territory and in other areas served by utilities that did not have active energy efficiency programs. Results for existing stores were weighted by the number of stores to determine the overall percentage of

stores with each measure. This provides information for a much larger number of stores, but is, of course, still subject to the limitations of having only a few individuals providing responses.

Results are provided for existing stores in Exhibit 4-4. In all, the results reflect installations in 553 PG&E stores and 427 out-of-territory stores. Note that for most types of equipment, installations in PG&E stores far outnumber those in out-of-territory stores. Almost all of the PG&E stores surveyed use energy efficient store lighting, including energy management systems, T-8 lamps and electronic ballasts, and HID bulbs. The PG&E chains interviewed also reported a higher percentage of stores with electronic ballasts for case lighting. high efficiency compressors, cycling of anti-sweat heaters, high efficiency motors for evaporator fans, and store humidity controls to reduce case load in all of their stores. In contrast, the no-program territory stores had almost the same penetration of floating head pressure controls and a higher share of refrigerated cases with doors. An additional estimate of the penetration of energy management systems in California comes from Hussman's Director of Marketing for energy management systems, who puts the number of stores with such systems at about 80-85 percent for chains and 60-70 percent for independents.

Exhibit 4-4
Percentage of Existing Stores with Equipment

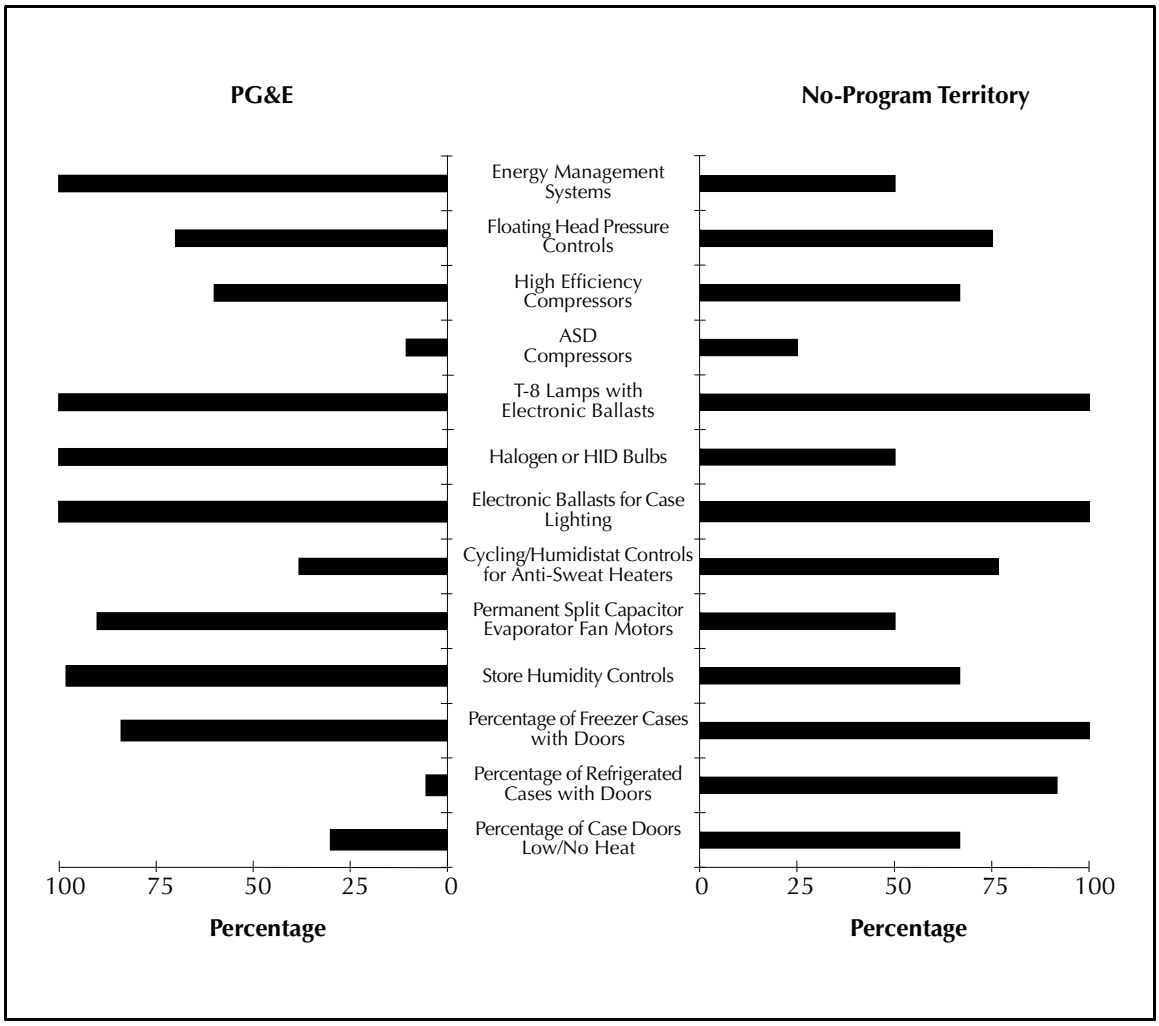


Another indicator of energy efficiency industry wide, the number of stores with doors on freezer cases, was also addressed by a recent survey conducted by the trade magazine Frozen Food Age. This survey found that supermarket chains are installing doors on significantly more cases in new stores than are currently found in existing stores; existing stores have 62 percent doored cases, but operators are installing doors on 74 percent of cases in new stores. The magazine reported that respondents believe doors will continue to grow in popularity "for several reasons: cost of operation, prevention of "cold aisle" syndrome, energy savings, and better packout." This trend continues despite the belief (backed, according to the magazine, by anecdotal evidence) that open-top coffin cases "move more cases on display than do doored uprights.[8]"

That new stores incorporate more energy efficiency measures is supported by responses from respondents to our interviews and surveys. For new stores, the differences between the PG&E and out-of-territory stores, shown in Exhibit 4-5, are less striking than for existing supermarkets. T-8 lamps with electronic ballasts appear to be the standard for all new stores, as does the use of electronic ballasts in display cases, and the percentage of stores with most other measures is also higher. On the one hand, this suggests that much of the difference between PG&E and other existing stores may be attributable to the direct effects of PG&E rebate programs; on the other hand, the percentage penetration of the targeted technologies is higher than the participation in PG&E programs reported in Exhibit 3-2 above. Moreover, several display case vendors noted that utility programs have been at least partly responsible for changes in their product offerings to include, for example, electronic ballasts and low/no-heat doors or cycling controls for anti-sweat heaters. Again, the limited number of respondents means these results should be interpreted with caution, but they do suggest market effects beyond the direct effects of PG&E programs.

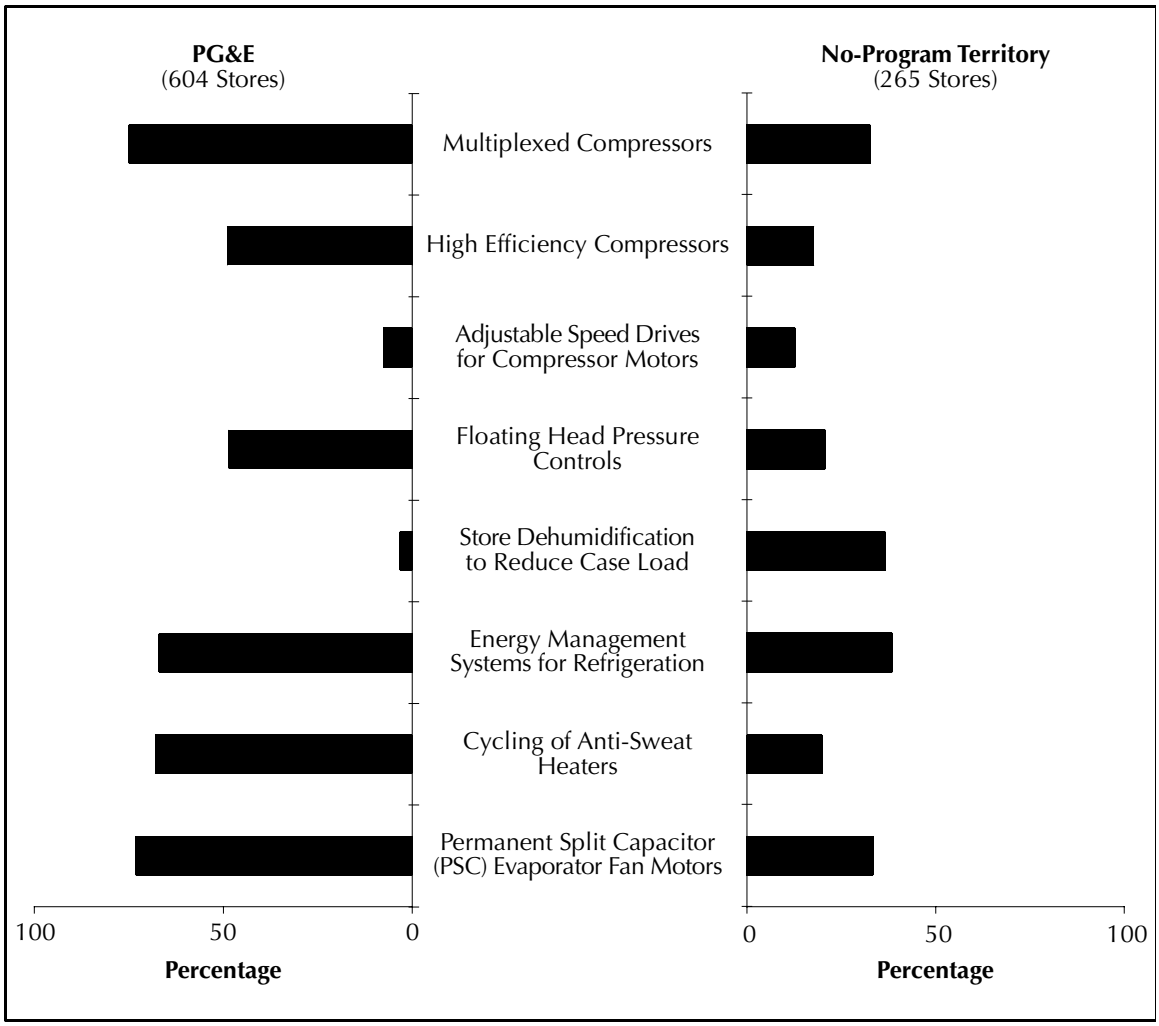
[8] Frozen Food Age, May 1998, p. 26

Exhibit 4-5
Percentage of New Stores with Equipment



Estimates of the percentage of stores with selected refrigeration measures were also provided by refrigeration contractors in Northern California and Illinois. Since responses were weighted by the number of supermarkets served by each contractor, the total number of stores for which installations are estimated is 604 in Northern California, 265 in Illinois. The results are shown in Exhibit 4-6. Note that most high efficiency measures were more common in the California stores, with the exception of Adjustable Speed Drives for compressors and store dehumidification to reduce case load.

Exhibit 4-6
Contractor-Reported Percentage of Stores with Equipment



4.4 Practices and Barriers

4.4.1 Past Barriers

The most fundamental barrier to energy efficiency in the supermarket industry, both now and in the past, is the overwhelming emphasis placed on increasing sales – to the exclusion of energy efficiency and most other operational concerns. As noted earlier, both focus group participants and other supermarket decision makers with an interest in energy issues find themselves playing a consistent second fiddle to the marketing department. In a version of the bounded rationality barrier, incremental investment dollars are almost always allocated to store appearances that will help boost sales.

The approach cited by several energy managers and used with some success by PG&E in convincing supermarkets to undertake energy saving actions—that is, to emphasize that a

bottom line contribution of $10,000 made by reduced energy costs is equivalent to the profits generated by sales of nearly $1 million, given a 1 percent supermarket profit margin—is somewhat beside the point. Much of what concerns supermarket top management is market share, and generating incremental sales has value beyond the bottom line contribution to profits.

In addition, the supermarket industry is historically conservative, with an aversion to any perceived risks that could affect system reliability. This barrier has, however, been overcome for a number of the technologies considered here.

- For floating head pressure control, there were initially concerns of refrigerant flash as well as the need to operate outside the specifications of the compressor manufacturers. Demonstrations and detailed information overcame most of these concerns, and compressor manufacturers have worked closely with case suppliers like Tyler and Hussman to provide warranty coverage and assurances that compressors can handle the floating head pressure parameters.

- The complexity of some of the more sophisticated energy management systems led buyers to wonder whether the systems could actually deliver the promised results in actual field conditions. Early experiences with some EMS systems for supermarkets that were poorly installed and managed reinforced rather than overcame some of these concerns, and it has only been recently that the capabilities of these systems have become widely accepted.

Split incentives have also posed a barrier for some of the measures at issue. Equipment vendors and designers alike report that they place a premium on energy efficiency, but that supermarket buyers are often unwilling to pay the incremental first cost of efficient models. Because they fear that they will be unable to recoup the development costs for efficient equipment, vendors have little incentive to invest in developing efficient new technologies that will make their products more expensive than their competition. In practice this barrier has been of limited concern. In part because of the oligopolistic nature of the market, leading equipment manufacturers feel compelled to develop high efficiency models to differentiate themselves for the competition—who in turn must develop their own efficient technology.

Overall, availability has not been a problem for big-ticket items such as EMSs or efficient refrigerator/freezer cases. It was a barrier for smaller items; specifically for permanent split capacitor (PSC) evaporator fan motors. Since refrigeration contractors traditionally stocked only the standard shaded-pole motors, those were the motors that were installed when a service call required a motor replacement. According to several of the contractors interviewed, PG&E rebate programs were instrumental in causing them to stock PSC motors. The results are evident in the contractor-provided estimates of the number of stores with PSC motors: 73 percent for PG&E's territory, 34 percent for Illinois.

4.4.2 Current Barriers

In the past several years, barriers to energy efficiency in supermarkets have grown as the result of a number of external forces. As noted previously, the combination of these forces is said to have effectively halted the steady decline in energy usage per square foot in the supermarket industry. The resulting barriers can be grouped under the headings marketing, business

considerations, regulatory issues, and technology-related concerns. Each of these is discussed below.

Marketing Barriers

The importance of marketing concerns to the detriment (or exclusion) of energy efficiency has already been discussed. This barrier has been increasing, however, as ever greater emphasis is placed on merchandising as supermarkets become true retailers, competing not only with each other, but with restaurants, convenience stores, and Wal-Mart (or other) superstores.

In addition to the resulting overall emphasis on presentation and design, the need for supermarkets to become true retailers has brought new products and activities into the store. Customer demand for home meal replacements has given supermarkets a new weapon to counter the growth in away-from-home food purchases driven by the need for convenience, but it has also created a need for added energy use to prepare and store this popular class of product.

Growing consumer sophistication and interest in non-traditional foods also adds to the need to stock a wider range of foods. This has led to, among other things, a premium placed on flexibility. Supermarkets are, for example, demanding mobile display cases that can be deployed anywhere in the store. Because they must be self-contained to be mobile, these cases are independent of the central refrigeration system – which means that all the heat generated by the case compressor is pumped back into the store. "Stores just don't care about (such) inefficiency," says the Vice President of a leading supplier, "they simply demand the flexibility these cases offer, and will pay whatever efficiency penalty goes with it." He noted that they have even been asked to design a free-standing, mobile, self-contained, multi-deck open freezer case.

Finally, more supermarkets are including non-food products and services in their merchandising mix. One of the designers we contacted is working with chains nationwide to incorporate local bank branches into new stores, and expanded pharmacies are common in many chains. Again, these added lines of business are expected to increase the importance of merchandising to capture impulse purchases by shoppers who may be in the store for an entirely different reason, thereby reducing the relative importance of energy efficiency.

Business Considerations

The current long-running economic expansion has created boom times for a number of supermarket chains, and individual firms are striving to meet the demand in areas of rapid economic and population growth. A direct effect of this growth has been that stores are being constructed as fast as possible. Once a chain commits to a new location, they want the store built immediately. As a result, much greater emphasis is placed on getting a new store built than on optimizing its design to ensure maximum energy efficiency. According to several representatives of large supermarket chains, that means individual store systems are hastily installed and poorly integrated.

A less obvious business-related barrier is the wave of mergers and acquisitions in the supermarket industry. Pending deals (and the negotiations leading up to them) tend to make

top management unwilling to commit to substantial store remodeling – especially for non-core activities such as those related to energy efficiency.

Regulatory Issues

Several of the most significant issues facing the industry today have been brought on by recent regulatory changes, including the ban on CFC refrigerants, greater concern about refrigerant leaks, and a tightening of the regulations affecting food safety in general and the temperature of stored, prepared foods in particular. In tandem with regulatory concerns, there is an increasing awareness of exposure to litigation on everything from food-related illness to crimes associated with inadequate parking lot lighting.

New Refrigerants.--The ban on CFC refrigerants has forced supermarkets to review their entire refrigeration management approach. There are a number of new non-CFC refrigerants now available on the market, but they are more expensive and generally more difficult to manage, especially since existing and currently available equipment was not designed around the new refrigerants. Obtaining cost-effective, reliable performance from the new refrigerants has outweighed efficiency issues. Barriers resulting from the new refrigerants include:

- Performance uncertainty, as supermarkets strive to ensure reliable performance and are reluctant to fine-tune systems for efficiency
- Availability, since new refrigerants with properties that enhance efficiency may simply not be available
- Hidden costs, as supermarkets worry about whether they will be able to obtain adequate service at reasonable cost.

Refrigerant leaks.—Tighter regulations are being placed on leaks of refrigerants from the central refrigeration system, including the possibility of substantial fines if the leaks are deemed to be "deliberate," that is, if the store management knows about them but does not correct them. With more than a mile of piping in the typical store, this can pose a significant and costly challenge. In combination with the higher costs of refrigerants, regulatory aspects of leakage have made refrigerant leakage concerns a high priority. One approach that is being used to address this issue—reducing the refrigerant charge in the system—has reduced energy efficiency.

A variety of EPRI and other R&D efforts are now under way to develop new strategies to minimize leaks and optimize system performance with reduced refrigerant charges, including the use of secondary refrigerants or even water loops to carry out heat exchange throughout the store, while the primary refrigeration loop is located in a separate area where leaks can be closely monitored.

Food safety.—A set of new FDA standards in the past several years has changed the ground rules for the maintenance of food products from meeting requirement for case temperatures to meeting requirements for the food itself. Prepared food products must now be maintained at a maximum temperature of 41 degrees Fahrenheit. This leads to an understandable emphasis on reliability and performance. Where it was once acceptable to monitor temperature through a simple thermometer in a typical case, it is now necessary to have electronic temperature probes

placed throughout the equipment, to ensure that the requirements are met at all points, including the corners of the case, etc. On the one hand, these requirements are consistent with movement toward energy management systems—more monitoring and more control points can increase efficiency of such systems. On the other hand, they increase equipment costs and require additional sophistication.

Some participants in the focus groups said they believe that equipment that is more efficient may be more likely to achieve some of its savings by hewing more closely to a thermostatic set point. They are concerned that the margin of error is therefore reduced and that product could rise above the mandated temperature. Accordingly, they suggest, the store's strategy may be to avoid such equipment or, if it is used, to run it at a lower set point than it is nominally designed for. In their opinion, it is far preferable to incur greater energy costs than to take the risk that product will have to be discarded or that customers will purchase and consume spoiled food.

With tighter FDA regulations expected to take force in 1999, food temperature regulations will continue to influence the market in the coming years, generally creating added barriers to energy efficiency.

Technology Issues

"Give me simplicity," says the Vice President in charge of new store design for a major Midwestern chain. The concern, voiced in various forms by a number of market actors, is that store systems have become so sophisticated, with so many interactions, that the cost of managing them outweighs potential energy benefits. The concern regarding complexity takes several forms.

- First, as the technology needed to deliver energy efficiency gains become more sophisticated, supermarkets are increasingly worried about the ability of maintenance organizations (internal, but especially external) to provide the level of expertise needed to operate, maintain, and repair the new systems. Every supermarket energy manager has a story about a botched repair job, a bypass of critical controls to keep a system running, or a system that's performing sub-par because it can't be properly maintained.

- Second, complex systems are usually installed in new stores under tight deadlines by parties who do not communicate with each other. As a result, the systems – for example, the HVAC, lighting, and refrigeration system -- are never optimized, either for overall performance or for energy efficiency.

- Finally, management at some chains places a premium on having a consistent, uncomplicated approach to the design and management of systems at all its stores – which clearly leads to energy saving opportunities being missed. One large Western chain known for its insistence on a simple, consistent approach across all its stores adopted rack systems of compressors only a few years ago, and was never swayed into having any of its 60+ stores in PG&E territory participate in rebate programs.

4.4.3 Effect of PG&E Programs on Past Barriers

As noted previously, PG&E has had a variety of programs targeted to the supermarket industry. All of the supermarket customers in PG&E territory who were interviewed were

aware of the programs, and many had participated in them. Not surprisingly, those chains that had participated in the programs reported a higher proportion of stores with the efficient technologies investigated. The question was whether the overall percentage of stores with the efficient technologies was higher in PG&E territory because of market effects attributable to the program.

Exhibit 4-7 summarizes what we perceive to be the main barriers to the adoption of specific measures and the effect of PG&E programs on those barriers. Since direct actions through one of the programs can not be taken as evidence that the market has been transformed, it was necessary to rely on more qualitative results to determine whether there have been permanent changes in the structure of the market. The answer is that it is hard to tell—in part because it is so difficult to distinguish actions taken through the program from those taken in a market transformed by the program. In addition, a fundamental reason for the difficulty of assessing the program's effects is that the marketplace has been changed by external factors; notably the regulatory and market influences described above.

Exhibit 4-7
Past Market Barriers and Program Effects

Technology/measure	*Market Characteristic*	*EPS Barrier*	*Program/Intervention**	*Program Effect*	*Evidence of Sustainability?*
Floating Head Pressure Controls	Concerns that refrigerant might reach flash point; operation outside compressor manufacturer specifications required	Hidden cost	1, 3, 4	H	FHP controls are standard in new stores for most chains
	Uncertainty about technique's ability to deliver promised savings	Performance uncertainty	3, 4	H	
	Desire to maintain standard equipment across all stores in a chain	Organization practices	1	L	
Efficient Compressors	High efficiency compressors not designed for supermarket refrigeration systems	Performance uncertainty	1, 2	M	Manufacturers expanding range of scroll compressors and optimizing for supermarkets
	Compressors not available in all sizes needed for multiplexed rack system	Unavailability	1	M	
PSC motors	PSC motors not stocked by refrigeration contractors	Unavailability	1	H	Contractors are stocking; more stores using as standard; may be supplanted by more efficient ECMs.
Cycling anti-sweat heaters	Concern that inadequate control of condensation would hamper sales	Hidden cost	1, 3, 4	H	Cycling standard practice in large chains; triple pane doors may obviate need in the future
Energy Management Systems	Bad experiences with some EMS vendors; unreliable systems did not deliver promised savings	Asymmetric information and opportunism	1, 2, 4	M	Awareness and acceptance of EMS high, but some chains waiting for rebates to install
Doors on freezer cases	Limiting customer access to food could reduce sales	Hidden cost/performance uncertainty	1, 4	M	Upward trend in number of freezer cases with doors nationwide
T-8 Store lighting	Not worth the cost of spending money to retrofit existing lighting	Performance uncertainty/access to financing	1	H	With changes in Title 24 to cover supermarkets, T-8s effectively mandated
Efficient display lighting	Concerns about efficient display lighting's effect on sales	Bounded rationality	1, 4	M	Most supermarkets still place a premium on presentation over efficiency
Electronic ballasts in cases	For manufacturers to include electronic ballasts in cases would raise costs, reduce market share	Split incentives	1, 4	M	Case manufacturers unlikely to change standard case design back

A number of customers and other market actors did provide information on their awareness of various programs and on what specific programs they found helpful. Virtually all supermarket

decision makers and most refrigeration contractors in PG&E territory were aware of the utility's programs. Large customers in the PG&E service territory are highly aware of energy-efficiency programs conducted by the utility and report having participated in a number of those programs, with considerable benefit to themselves. Among the programs mentioned were those that have addressed lighting efficiency, fan-motor speed, energy management systems, window tint and blinds, and refrigerator gaskets and case design. In addition, some companies have served as test beds for equipment designs developed through PG&E collaboration with manufacturers and with EPRI. Finally, some supermarket chains have taken advantage of PG&E's assistance in testing the energy efficiency of new refrigerator case designs.

The level of awareness and use of utility programs among large PG&E customers can be attributed, in considerable part, to the efforts of the company and its account representatives. In contrast to the level of awareness and use in Northern California, participants in the comparison area focus group—comprising decision-makers from companies with similar size and number of stores—showed far less awareness of energy-related issues, opportunities for savings, or company efforts to achieve energy efficiency. Needless to say, perhaps, members of the comparison group reported little effort by their utilities to educate them, or to provide options or incentives to become energy efficient.[9]

Of note, the PG&E customers spontaneously recounted their satisfaction with almost all the programs in which they had participated. Even in the one instance of failure reported—an effort to reduce fan-motor usage that severely underestimated load requirements and resulted in equipment failure and loss—the Company was praised for its interest, efforts, and cooperative attitude. In addition, the customers are quite comfortable with the verification requirements attached to the various rebate programs.

In essence, the focus group participants indicated that the utility programs had helped create awareness of energy efficiency and a constituency for improving facilities and operations with respect to energy consumption. However, given competing demands for capital and staff resources, supermarkets have not been converted by the programs into a segment that is committed to investing in these activities on its own. Focus group participants do see considerable opportunities for additional energy savings in their equipment choice and operations, but the large end-users in PG&E's service territory are not optimistic that their companies will invest in those opportunities.[10]

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[9] As noted at the outset, the comparison group was conducted in the service territory of Commonwealth Edison. One of the decision-makers, however, carried responsibilities for (convenience) stores in the Boston metropolitan area. He, too, reported little effort to help his company increase energy efficiency in that area. The only report of active efforts by utilities in this group came from a decision-maker with responsibilities for stores in Wisconsin. Overall, the evidence strongly supports the conclusion that supermarket decision-makers are unlikely to have made efforts to increase energy efficiency in their facilities in the absence of major utility programs.

[10] Participants in the comparison territory group appeared somewhat more willing to invest their own resources in energy efficiency—if they recognized the need. For them, of course, no change in the availability of rebates is occurring.

Not surprisingly, these decision-makers express disappointment with the possibility that rebate programs will not be available in the future. Several noted projects that they had been planning, but now believe unlikely to be accepted by senior management.

- Decision-makers with smaller chains indicated that lack of access to financing would directly impinge on their ability to undertake new projects. They raised the possibility that they might be able to do so if loans were available to take the place of rebates.

- Those with larger chains suggested that they did not need the financing per se, but that the availability of the rebates helped to "sell" projects internally, for other reasons. In particular, they noted that rebates reduced the payback period for projects and enabled good, but marginal projects to pass company policy.

- For all supermarkets, rebates appear to function as a "seal of approval" or as evidence of the utility being in a partnership with the supermarket—again, helping to persuade senior management of the worth of the proposed project.

On balance, the programs appear to have heightened awareness of and interest in energy efficiency. To that extent they may be considered to have moved the market. On the other hand, supermarkets appear to have become conditioned to expect rebates as a precondition for undertaking energy efficiency actions. Customers clearly consider rebates the best part of any utility program. When asked to rate on a one-to-six scale how useful various kinds of utility programs were, customers gave rebates a mean rating of 5.8 – well above the value assigned to information (4.3), audit (4.2), and demonstration (3.8) programs. Similarly, when focus group participants were asked what kinds of programs they found most useful, all of them lobbied enthusiastically for the return of incentive programs.

5 RECOMMENDATIONS

5.1 Major Issues

One of the issues arising from the study is the evident reliance, or even dependence, of decision makers in PG&E territory on the availability of rebates to drive energy efficiency initiatives. As noted previously, rebates became an important part of the framework within which Northern California supermarkets made energy efficiency decisions. While this had the desired effect of raising the visibility of energy efficiency issues within the organization, the presence of rebates may have acted as a misplaced incentive. A design engineer and a representative of a major refrigeration vendor agreed that supermarket facility managers were sometimes judged on the basis of rebate dollars they brought in rather than the overall merits of their projects.

Nevertheless, the perceived value of rebates to the supermarket industry may also provide a tool by which to affect the market in the future, particularly now that changing market and regulatory conditions have altered the environment in which supermarkets operate, as discussed below.

5.2 New Technologies, Market Barriers, and Levers to Overcome Them

The issues discussed above give an indication of the issues that currently face the supermarket industry and that pose barriers to increased energy efficiency. In this section we offer examples

of high-potential measures and practices and suggest ways in which barriers to those measures and practices might be overcome.

Exhibit 5-1 presents a number of the current barriers described above, along with programs or actions designed to address them and suggestions for designs of those market interventions that might have meaningful long-term effects.

Exhibit 5-1
Potential Future Market Interventions

Measure/technology	Potential Savings	Status	Barriers	Market Interventions/Levers
Commissioning	20-25 Percent for whole store	Done less than half the time	Construction deadlines; different vendors for different systems	Demonstrations, information; pre-post comparisons
Training for refrigeration contractors	Difficult to quantify	Contractors are not prepared to deal with the complex systems needed for energy efficient store management	No incentive for individual stores or vendors to provide all but very specific training	Certification program sponsored by CBEE/EPRI
More efficient compressors	10-20 percent for compressor only	Scroll compressors not originally designed for supermarkets and not optimized for them	Contractors not likely to stock; small models may be unavailable	Modest rebates for small compressors
Dual-path HVAC systems	Savings of $70,000 per year in 200,000 sq. ft store	Prototype developed and demonstrated; used in WalMart store	Performance uncertainty; hasn't been extensively demonstrated	Demonstrations, possible savings/performance guarantees
"Smart" defrosting	Annual savings of 34 percent for defrosting	EPRI had developed and is offering this as a product	Awareness	Rebates, alliance with refrigeration contractors
Store dehumidification	10 percent for whole store	GRI has promoted gas desiccants; EPRI has pushed low humidity for years	Practices; awareness	Demonstration, information

One of the strategies that we recommend to address many of the fundamental barriers to energy efficiency in this industry is to emphasize non-energy benefits in promoting these measures or technologies. For example:

- Less refrigerant for lower leakage, savings
- "Smart" defrost helps maintain food temperatures, improves presentation quality
- Self-contained, water cooled cases provide merchandising flexibility
- Greater use of doors on freezer cases improves customer comfort
- Reducing total heat emissions will help stores achieve coming global warming limits on total heat released to the atmosphere.

5.3 Measuring Market Effects in the Future

Because of the rapid and extensive changes taking place in this industry, we believe that the best method of tracking potential market effects may be through a panel of supermarket decision makers and other market actors. Talking to the same players over time and obtaining their perception on specific changes that have occurred in the market and how their firms have responded to those changes would provide a consistent, albeit qualitative, look at the extent of market effects of future market interventions.

APPENDIX 1
SUPERMARKET INDUSTRY LITERATURE REVIEW

March 2, 1998

A critical component of the Final Research Plan for the Study of Market Effects in the Supermarket Industry is a review of the current research and data available pertinent to the supermarket industry. This literature review covered a variety of sources, including professional journals, industry trade publications, published evaluation reports, and industry and government data on equipment shipments. The findings from this review will help to frame the issues for further exploration and analysis in both the focus groups and the final research plan.

The findings presented in this review focus on the following key areas:
1) The size and scope of the supermarket industry
2) The roles of key market players, including convenience stores (c-stores) and superstores operated by non-food retailers
3) Energy usage and efficiency trends in this segment
4) Trends and competitive changes that will affect the long-term viability of this industry.

Lastly, the literature review presents conclusions and recommendations based upon these findings for inclusion in the Final Research Study.

CHARACTERISTICS OF THE SUPERMARKET INDUSTRY

The supermarket industry is one of the largest and most important market segments in the energy services marketplace. According to a recently completed study for the Department of Energy, this industry uses an estimated 900 trillion Btuh annually for heating, cooling, refrigeration and lighting. Refrigeration equipment represents the largest share of energy usage within this segment, accounting for nearly 50 percent of a typical store's operating costs and 25 percent of a store's maintenance costs.

Estimates regarding the number of supermarkets operating in the United States vary, depending on how supermarkets and grocery stores are classified. According to one study underway by E Source, there are an estimated 127,000 grocery stores and supermarkets in the United States, with combined annual sales of $425 billion.[11] This

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11 *"Multi-Client Study: Delivering Energy Services to Supermarkets and Grocery Stores,"* Komor et al, E Source. January, 1998.

study defines the supermarket and grocery sector as selling only or predominately food for off-site consumption and does not include convenience stores (c-stores), which are said to number approximately 102,000, according to a study conducted by the Department of Energy.[12]

Key Market Players

The following tables characterize the supermarket industry based upon a number of criteria, including sales volume, operating margin, and number of stores.[13]

Table 1
Top Supermarket Chains in the United States
Based upon Annual Sales*

Store	Sales ($ Billions)	Sales/Sq. Ft (selling)	Sales/Store ($Millions)
Albertson's Inc.	$11.9	$440.2	$16.5
American Stores Co.	$18.4	$588.7	$16.9
Food Lion Inc.	$7.9	$340.1	$7.6
Giant Food Inc.	$3.7	$710.7	$23.2
Great Atlantic & Pacific Tea Co.	$10.3	$416.9	$9.3
Hannaford Bros. Co.	$2.3	$646.1	$19.4
Kroger Co.	$23.0	$542.7	$17.6
Safeway Inc.	$15.6	$546.4	$14.7
Stop & Shop Cos.	$3.8	$765.5	$29.6
Vons Cos. Inc.	$5.0	$589.4	$15.0
Winn Dixie Stores Inc.	$11.1	$363.2	$9.6
Totals/Averages			
1994 Actual	$113.0	$491.3	$13.5
1995 Actual& Estimated	$116.9	$482.9	$13.9
1996 Estimated	$124.9	$490.7	$14.5

**Source: Donaldson, Lufkin & Jenrette*

As shown in Table 1, supermarket chains with the largest sales volume include Kroger, Safeway, and American Stores Co.

The most profitable chains in terms of operating margins, on the other hand, include Albertson's Hannaford Brothers, and Stop&Shop. As shown in Table 2, all of these stores report operating margins that exceed the industry average of 4.1 percent.

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12 "Commercial Refrigeration Sector Portrayed in DOE Analysis," Thomas A. Mahoney, *Air Conditioning, Heating & Refrigeration News,* Nov. 11, 1996 v 199, n 11 p.13.

13 "Power Chains," *Progressive Grocer*, May 1996, v75, n5. pg. 38-45.

Finally, as shown in Table 3, both the number of stores and the average size of stores increased for these leading supermarket chains. Supermarket chain stores are generally larger than independent stores, with an average square footage of 29,015 compared to the industry average of 27,000 sq. ft. On average, supermarket chains have more than 700 stores (722 average), and the inventory turns over 10 times annually.

Table 2
Operational Characteristics of the
Largest U.S. Supermarket Chains*

Store	**EBITDA Margin**	**EBITA/sq. ft.**	**Operating Margin**	**Year-End Selling Sq. Ft. (millions)**
Albertson's Inc.	8.15%	$35.9	6.17%	27.0
American Stores Co.	5.81%	$34.2	3.54%	31.2
Food Lion Inc.	6.25%	$21.2	4.28%	23.3
Giant Food Inc.	7.16%	$50.8	4.52%	5.2
Great Atlantic & Pacific Tea Co.	3.36%	$14.0	1.08%	24.8
Hannaford Bros. Co.	8.23%	$53.1	5.49%	3.5
Kroger Co.	4.54%	$24.6	3.26%	42.3
Safeway Inc.	6.02%	$32.9	3.92%	28.6
Stop & Shop Cos.	8.35%	$63.9	5.98%	5.0
Vons Cos. Inc.	5.59%	$32.9	3.18%	8.5
Winn Dixie Stores Inc.	4.67%	$16.9	3.27%	30.5
Totals/Averages				
1994 Actual	5.69%	$27.9	3.75%	229.9
1995 Actual & Estimated	5.99%	$28.9	3.99%	242.2
1996 Estimated	6.19%	$30.4	4.11%	254.6

**Source: Donaldson, Lufkin & Jenrette*

Table 3
Sales and Inventory Ratios of the
Largest U.S. Supermarkets*

Store	Average Selling Sq. Ft/ Store	Average Inventory Turnover	Number of stores
Albertson's Inc.	37,531	9.8	720
American Stores Co.	24,225	8.8	816
Food Lion Inc.	22,449	7.1	1,039
Giant Food Inc.	32,704	11.4	159
Great Atlantic & Pacific Tea Co.	22,365	8.9	1,108
Hannaford Bros. Co.	30,056	13.2	118
Kroger Co.	32,520	10.9	1,301
Safeway Inc.	26,929	10	1,062
Stop & Shop Cos.	38,672	12.5	128
Vons Cos. Inc.	25,380	10.1	334
Winn Dixie Stores Inc.	26,328	8.1	1,159
Totals/Averages			
1994 Actual	27,504	9.5	7,944
1995 Actual & Estimated	28,643	9.6	8,028
1996 Estimated	29,364	9.8	8,235

**Source: Donaldson, Lufkin & Jenrette*

While supermarket chains are generally profitable, independent grocery stores are struggling for market share. They cannot enjoy the same economies of scale employed by the larger stores, in terms of inventory ordering. Therefore, independent stores must compete through either improved merchandising, enhanced store location, or lower costs.

California Market Characteristics

Supermarkets currently operating in California include American Stores, Acme, Lucky Northern and Safeway. The most prominent supermarket chains in Northern California include Safeway, Lucky Stores, Albertson's, Raley's and Save-More. In recent years, this market has undergone some consolidation with the acquisition of Vons Co. by Oakland-based Safeway. This deal is valued at $1.7 billion.

Another change in this market has been the decision of Smith's Food & Drug to leave the Southern California market and instead focus on Arizona.[14]

[14] "New Territory," David Merrefield, *"Supermarket News*, Dec. 9, 1996 v.46 n50 pg. 2-3.

CHARACTERISTICS OF THE CONVENIENCE STORE MARKET

While convenience stores do have different market and operating characteristics than traditional supermarkets, convenience stores have become a major player in this market. According to the National Association of Convenience Stores' (NACS) 1997 State of the Industry Report, sales in this segment have increased to a record high of $151.9 billion. This growth rate, of 5.4 percent, continues to outpace grocery sales, which increased only 3.2 percent comparatively.

The literature review uncovered a great deal of industry rivalry between these two segments as they fight for market share. One of the biggest forces driving these two markets closer together has been demographics: as more dual-income households are pressed for time, convenience has become a premium. Americans are more interested in "one-stop shopping," and in buying prepared meals. These changes have dramatically affected both the way this industry sells products, and ultimately, the way this industry uses energy.

The favorable outlook for the c-stores is due to changing lifestyles, the decline in the number of supermarkets, drug stores, and discount stores. The projected growth rate for the c-store industry is estimated to be 0.4 percent in store count and 1.7 percent real annual increase in sales through the year 2000.[15]

Like the supermarket industry, the c-store industry also continues to consolidate. The recent trend has been to develop fewer stores with larger square footage. The c-store industry projects the number of new stores will increase by only 1,400 during the next five years (from 93,044 in 1995 to 94,414 in 2000) with growth in new stores expected to be partly offset by the closing of an estimated 8,000 stores in the same time period.[16] Table 4 summarizes the overall trend in convenience store margins during the past decade.

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15 "NACS Study Plots Future," *U.S. Distribution Journal*, July 15, 1995 v222 n7 pg. 30-31.

16 "Convenience: New Strategies in a Changing Market," *National Petroleum News, May 1995* v87 n5 pg. 24-29.

Table 4
Convenience Store Gross Margins
(As a % of Sales)

Year	Gasoline Margin	Nongasoline Margin	Average Margin
1996	10.70%	31.20%	20.30%
1995	0.11%	30.40%	20.80%
1994	11.10%	31.00%	20.80%
1993	11.90%	31.00%	21.10%
1992	9.90%	32.20%	20.10%
1991	9.20%	33.10%	20.80%
1990	10.40%	32.40%	20.70%
1989	11.70%	32.10%	21.80%
1988	11.50%	36.40%	26.20%
1987	10.60%	35.90%	24.40%
1986	11.20%	35.50%	25.10%
1985	7.30%	32.20%	22.80%

*National Association of Convenience Stores, 1997 State of the Industry, June 1997

While C-stores report higher operating margins than supermarkets, they must also contend with higher operating costs. C-stores often have higher direct operating expenses and labor costs compared to supermarkets. These factors depressed overall profits. But as this industry grows, larger chains are starting to report increased profitability compared to the smaller, independent stores.[17]

REFRIGERATION EQUIPMENT IN THE SUPERMARKET/C-STORE SEGMENT

Refrigeration accounts for the largest portion of grocery store energy usage. In an effort to estimate overall market potential, the Department of Energy recently completed a study estimating the amount of refrigeration equipment currently installed in the supermarket industry. These data were also used to estimate the market share for each equipment type.

The following tables summarize the findings from this report based upon an equipment inventory taken from 143,500 buildings. This information also helps to differentiate between the types of refrigeration equipment currently in use, and serves to narrow the scope of this overall study.

[17] "C-Stores sales up, Profits Down," *National Petroleum News*, July 15, 1997 v89, n8, pg. 134-135.

Table 5
Commercial Refrigeration Equipment Inventory*

Equipment Type	Number of Units Installed
Centralized Systems, Display Cases	900,000
Ice makers	1,200,000
Vending Machines	4,100,000
Beverage Merchandisers	1,000,000
Reach-in Freezers	800,000
Reach-in Refrigerators	1,300,000
Walk-in Coolers, Freezers	880,000

* *Source: Energy Savings Potential for Commercial Refrigeration Equipment, Department of Energy Report*

Table 6
Estimated Annual Sales of
Selected Commercial Refrigeration Equipment*

Equipment Type	Estimated Number of Units Sold Annually
Ice makers	190,000
Compressors for Refrigeration	55,000
Beverage Merchandisers	60,000
Reach-in Freezers	80,000
Reach-in Refrigerators	120,000
Walk-in Coolers, Freezers	30,000

* *Source: Energy Savings Potential for Commercial Refrigeration Equipment, Department of Energy Report*

A typical supermarket has a variety of refrigeration equipment installed. However, the most important component of the refrigeration system is the compressor. Therefore, supermarket energy managers search for ways to arrange or configure these compressors to achieve maximum results while lowering energy costs.

The DOE report found that supermarkets usually configure their compressors in a rack, consisting of parallel-connected compressors. Racks have between three and five compressors, serving nearly identical loads. On average, a typical supermarket has between 10 and 20 compressors, ranging from 3 hp to 15 hp located in a machine room in the back. Most racks are "uneven parallel" with different capacities for different compressors.

The most commonly installed compressors are semi-hermetic reciprocating models (92% market share), but screw compressors (currently about 2%) and scroll compressors (6%) are gaining market share.[18]

The total cost of a 100-ton supermarket refrigeration system is between $1 and $1.1 million, with display cases accounting for nearly half of this cost. The average expected lifespan of compressors and air-cooled condensers is 10 years, but display cases are usually replaced before then for "cosmetic" reasons.

Refrigeration maintenance costs are approximately 25 percent of the supermarket's revenues. Maintenance costs for a parallel system are $75 per 100 sq. ft. of store sales area, translating into an annual outlay of approximately $20,000 for an average 27,000 sq. ft. supermarket.[19]

Unlike supermarkets, convenience stores typically use stand-alone cases rather than central systems for refrigeration and freezing. Since energy efficiency gains achievable in supermarkets often result from improved management and operation of the central system (e.g., multiplexed compressors, floating head pressure controls), the C-store segment has generally had fewer options for achieving such gains.

The following shipment data for commercial refrigeration equipment, compiled from Commercial Refrigerator Manufacturers Association (CRMA) sales data and Census Bureau estimates, helps to further describe the range of available equipment.

Table 7

1994 Shipments of Commercial Refrigeration Equipment*

Equipment Type	Number of Installed Units	Estimated Value
Sectional Coolers	Not Available	$304.2 million
Reach-in Refrigerators (normal temperature)	165,800	$237.2 million
Reach-in Refrigerators (low-temperature)	59,500	$220.6 million
Closed Display Cases	NA	$43.6 million
Open-self service (one level)	NA	$141.2 million
Open self-service (multi level)	42,600	$151.8 million
Frozen food display cases (open)	28,300	61.8 million
Frozen food cabinets (closed)	14,600	$38.2 million
Other	9,600	$39.6 million

* *Source: Commercial Refrigerator Manufacturers Association and U.S. Census Bureau*

[18] "Commercial Refrigeration Sector Portrayed in DOE Analysis," *Air Conditioning, Heating, and Refrigeration News,* Nov. 11, 1996.

[19] Ibid

Refrigerated display cases are the largest product category of commercial refrigeration equipment. Sales of display cases increased nearly 20 percent in 1995. The following table summarizes types and estimated percentage increase in sales of this equipment type.

Table 8
Sales of Display Cases in 1995*

Equipment Type	Percentage Increase	Comments
Self-Service Meat Cases	9.8%	Top-display, double-duty and island configurations
Produce Cases	8.8%	Multi-shelf, extended-front, single-deck and island-type
Self-Service Dairy, Deli Cases	11.3%	for remote frozen food, ice cream cases
Normal-temp Reach-ins	22.5%	for milk, beer, soft drinks, wine and refrigerated dough products
Service Cases	13.1%	for deli, seafood, live tanks, bakery service
Specialty Cases	165%	flowers, pizza, cheese, salad bar and deli
Wedge Cases	6.1%	designed to fit around a corner
Mechanical Systems	9.9%	back room condensing compressors and mechanical equipment

**Source: Commercial Refrigerator Manufacturers Association Statistics*

Decision Criteria Regarding Refrigeration Equipment Selection

As the preceding tables indicated, the commercial refrigeration market offers supermarkets and convenience stores a wealth of options. However, the selection of refrigeration equipment is driven by a number of factors regarding both operating performance and the overall merchandising strategy. Supermarket managers make equipment selections based upon the following types of criteria:

- Marketing and merchandising needs
- Prepared-food handling regulations
- Federal ozone protection mandates
- Energy efficiency requirements and concerns

Perhaps the single greatest concern regarding the use of refrigeration in both the supermarket and C-store segments is the changing American consumer. With the rise of dual-income households, and the increasing demand for prepared foods, there has also been an increased demand for additional and attractive refrigerated space on store floors. As one retailer explained, "Refrigeration isn't something that can be taken for

granted. It's not just a matter of a shelf keeping something cold. It's a merchandising vehicle that can help enhance everything we're doing."[20]

Safe food handling is also an increasingly important factor for retailers. With heightened public concerns regarding food safety, the Food and Drug Administration has tightened the requirements for the refrigeration levels for prepared foods. This new safety code mandates that all potentially hazardous foods, including sandwiches, salads, etc., must be chilled at a temperature below 41 degrees F.

Retailers are also grappling with the federally-mandated switch from CFC to HFC refrigerants and are trying to minimize the costs associated with compliance. For example, the cost of compliance is estimated to be nearly $50,000 per store, creating a tremendous burden on independent stores. So, retailers have begun to either standardize their refrigerants used in their stores, or have used this as an opportunity to purchase more energy efficient equipment.

Finally, since refrigeration and its associated maintenance costs comprise such a large portion of grocery store operating expenses, more and more retailers are searching for ways to enhance the energy efficiency of refrigeration compressors. Some stores have developed "prototypical" energy efficient models that rely on innovative refrigeration and lighting configurations. Other stores have developed computerized networks to monitor all refrigeration equipment as a way to avoid or minimize costly repairs.

These issues and their effect on the supermarket and convenience store industries are explored more fully in the next section.

INDUSTRY TRENDS

Supermarkets are battling for market share from two very different types of competitors: large, superstores like Wal-Mart, and smaller, convenience stores.

- The newest entrant in the food industry has been the "supercenter," a combination grocery, drug, and discount store. Many industry experts predict that supercenters will continue to erode market share of marginal performers. The rise of these large chains will have the most damaging effect on the smaller, independently owned and operated grocery stores.

- The aggressive convenience store operator is another fierce competitor. Already, convenience stores have made inroads by stocking traditional "grocery" items and by developing relationships with food distributors.

[20] "A new climate in refrigeration systems," Marc Millstein, *Supermarket News*, Sept. 11, 1995 v45 n37 pg. 14-16.

Both of these market segments are capitalizing on the fastest-growing product category in the food service industry: home-meal replacements. Many supermarket executives believe that supermarkets will offer in-store food service as a strategy to increase sales and retain market share.

What does this mean for refrigeration in the supermarket segment? First of all, as operating margins continue to tighten, supermarkets will look to squeeze every possible savings out of their current refrigeration equipment. They will also look to improve energy efficiency throughout their stores, ranging from installing energy efficient lighting to improving the ventilation system.

Second, the increased demand for ready-to-eat foods creates an increased demand for refrigeration space in both supermarkets and convenience stores, since a key purchase decision attribute of the "ready-to-eat meal" category is "Is it fresh or frozen?" As this category grows, so will the demand for cooled space.[21] Convenience stores have already dramatically increased the amount of refrigerated space in their stores as a way to capture sales in this new product category.[22]

Rise of "Superstores"

As supermarkets try to differentiate themselves from Wal-Mart, they have increased both the average square footage in their stores as well as the types of products and services offered. For example, supermarkets are getting larger. Supermarkets are expected to increase to 42,000 to 60,000 square feet in the next few years, compared to the current average of 27,000 square feet. Supermarkets have also expanded their product lines beyond the traditional grocery items to include in-store pharmacies and full-service banking.

With the competition from the new supercenters, grocers have begun placing an increased emphasis on freshly prepared foods, either on display or available through in-store bakeries and delicatessens. This means that supermarkets are increasing the square footage allotted to perishable goods, such as salad bars and fresh produce. Store bakeries are also being revamped to include new ovens, and display cases.[23]

Decline of Independent Grocers

The small, independent grocers, often based in rural communities, will be facing intense competition in the next five to seven years from two types of competitors: the

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[21] "Driving Sales," Steve Weinstein, *Progressive Grocer*, April 1997, v76 n4 pg. S20.

[22] "The c-factor," Larry Schaeffer, *Progressive Grocer,* Nov 1995 v74 n 11 pg 7.

[23] "Retooled Jewels," *Supermarket Business*, Bob Ingram, Sept. 1996, v51 n9 pg. 78-84.

supercenters like Wal-Mart, and the new "pantry" departments in discount stores.

- Wal-Mart plans to open as many as 175 supercenters nationwide. Furthermore, Wal-Mart is developing plans to expand its smaller supercenter stores, which only have 109,000 square feet and are specifically designed for small, rural communities.

- Both Kmart and Target are also starting to develop so called "pantry departments." These are typically departments ranging from 9,000 to 12,000 square feet that stock traditional household staples. These new departments could erode sales at independent stores.[24]

Remodeling and Expansion Strategies

In the face of competition from non-food retailers, supermarkets and independent grocers have decided to either build or maintain market share, both by extensive remodeling of current stores and by building or acquiring new stores. Several supermarkets have made large-scale commitments to capital improvement projects designed to enhance store attractiveness while reducing operating cost. Examples of these renovation plans among the large supermarket chains are illustrated below:

- Albertson's will invest $3.4 billion in capital improvement projects through 1999.

- Safeway set aside approximately $475 million to build 30 new stores and complete more than 100 remodels by the end of 1997.

- American Stores Co. spent $750 million for major renovations to 87 stores and minor renovations for another 102 stores in 1995. It allocated another $900 million for capital expenditures in 1996.

- Cincinnati-based Kroger Co. spent an estimated $1.96 billion in store renovations from 1995 through 1997.

- Fred Meyer, based in Portland, Oregon, has committed $225 million in capital expenditures as part of a five-year expansion plan. The company expects to remodel between 35 and 40 stores during the next five years.[25]

Besides store remodeling, several chains have expanded into new territories. Changes that affect the California market include the entry of Supervalu, a Minnesota wholesaler, into the Southern California market. Furthermore, Smart & Final of

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[24] "Challenge of Supercenters Seen Increasing," Don Yaeger, *Supermarket News*, Sept. 29, 1997 v47 pg. 12-13.

[25] "Big Spenders: Capital Expenditures Rose Dramatically as Chains Focused on Store Growth and Remodels," *Supermarket News,* December 25, 1995 v45 n52 pg. 14-16.

Southern California has opened stores in Mexico, Florida, and Puerto Rico. There has also been the merger of Quality Food Centers, a Northwest chain, with Hughes Family Markets of Southern California.[26]

Convenience stores, again following the supermarket's lead, have also committed large sums to capital improvements. According to a survey conducted by the National Association of Convenience Store Operators (NACS), a total of 366 companies scheduled capital investments totaling more than $365 million for remodeling or building 3,172 c-stores in 1997. Another $200 million in additional improvements are projected, bringing the total to the highest level of capital improvements ever reported in this industry, $565 million.[27]

Energy Efficiency Strategies

Progressive retailers, both supermarkets and c-stores, have developed a variety of strategies to reduce energy consumption. Instead of focusing solely on the "energy hog," the refrigeration component, most stores have taken a more holistic approach. These managers look for energy savings in HVAC and lighting as well as refrigeration.

This section describes some of the more innovative energy efficiency strategies that supermarket retailers and convenience store operators have developed. It also includes several short "case studies" illustrating this approach used by specific stores or chains throughout the United States.

By focusing on the specific ways supermarkets and convenience stores think about energy usage, this information will provide insights into future strategies that PG&E can use in marketing to its supermarket customers. Some of the most common approaches used with success by supermarket retailers include:

- Upgrading heating, ventilation and air conditioning (HVAC) equipment
- Retrofitting lighting systems to include natural daylight
- Using energy efficient refrigerants

HVAC Strategies

A supermarket's HVAC system typically represents less than 20 percent of a store's total power consumption. However, the combination of utility rebate programs and increased competitive pressures has made these upgrades appealing to retailers. A common approach has been to install variable speed drives on HVAC systems, which can lead to savings of up to 66%.

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[26] "New Territory," David Merrefield, *Supermarket News,* Dec. 9, 1999 v46 n50 pg. 2-3.

[27] "C Stores Sales Up, Profits Down," *National Petroleum News*, July 15, 1997. v89 n8, pg. 134-135.

Case in Point: Abco Foods developed a new prototype energy efficient grocery store. This 42,000 square foot facility, built in 1995, incorporated a variety of energy savings features by focusing on air distribution techniques. Abco used a tactic called "neutralization," which is achieved by designing an airtight environment. At the store's entrance is a "curtain" of recycled air. This acts as a barrier to prevent outside air from entering or store air from escaping. All refrigeration piping and electrical conduits are also sealed airtight.

The air conditioning system is a dual path approach that draws in fresh air, dehumidifies and filters it more efficiently. The store also has return air ducts under the floor and in the frozen food aisles. This design promotes a more efficient airflow.

By designing a completely airtight facility with proper distribution and ventilation, the load on the HVAC system is reduced. Since the air does not have to be conditioned as frequently, the end result is lower heating and cooling bills.[28]

Lighting Strategies

Lighting is also of increased interest to food retailers. Many groceries are rethinking their lighting choices as they begin to focus on both marketing as well as the operational concerns. For example:

- Many prototype energy efficient stores built by chains now include energy efficient lighting throughout the store such as T-8 lights, reflectors and electronic ballasts.

- Another popular energy-saving solution has been the use of skylighting. As stores are remodeled, skylights are being added to increase the amount of light coming into the store. This not only lowers energy costs but also improves the overall appearance.[29]

- Some supermarkets have begun using lighting as part of their merchandising strategy, moving away from bright fluorescent lights to higher-contrast lighting. Nowadays, it is becoming more common for a medium-activity supermarket to have displays that include darker ambient lighting, and brighter accent lights as a way to move shoppers from one section to another.

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[28] "Abco's Case for Energy Strategy: 'Airtight;" Denise Zimmerman, *Supermarket News*, July 17, 1995 v45 n29 pg. 17-18.

[29] "New Illumination Techniques Help Retailers See the Light," *National Petroleum News*, Oct. 1995 v87 n 11 pg. 96-98.

- To maintain interest in the store, track lighting has been installed in the supermarket deli section to highlight different product offerings. Retailers are also installing more energy efficient lighting at an angle to reduce glare while improving the overall appearance.[30]

Convenience stores have also begun putting more emphasis into store lighting. Many stores are incorporating energy efficient lighting into their overall store configurations. One c-store chain switched exclusively to electronic ballast lighting.

Refrigeration Strategies

Another challenge facing grocers is the cost of converting to non-chlorofluorocarbon (CFC) gases in refrigerated store cases. The declining prices of non-CFC gases and the cutoff date for CFC production have forced retailers to search for alternatives.[31]

While supermarkets may use a variety of refrigerants to meet their various in-store needs, this trend may be declining, in part because the use of many types of refrigerants adds to the store's overall service and maintenance costs.

Case in Point: To meet the CFC compliance requirements, Albertson's Engineering Department looked for a solution that would simplify operations and keep costs down, while keeping performance up. They found the answer in a new refrigerant --Allied Signal's "Genetron AZ-50." The chain went on to consolidate all of the refrigerants used in one of its Idaho stores. By creating a store that uses only one refrigerant, this strategy has allowed Albertson's to "employ a HCFC and CFC -free facility that can serve as a blueprint for future stores. The one-refrigerant system also gives Albertson's greater quality control. . ."

Switching to the new refrigerant also yielded some unexpected energy savings. This new refrigerant increases the load capacity by 15 percent, thus requiring lower horsepower compressors to perform the same job. These changes have led to lower costs and higher energy savings.[32]

Case in Point: Energy conservation activities have also helped Kroger Co. save more than $500,000 in electricity costs at approximately 80 stores in 1997. Kroger Co., reduced energy consumption by:

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[30] "Expert: Proper Lighting Use Makes Fresh Products Shine, Roseanne Harper, *Supermarket News*, April 17, 1995 v45 n16 pg. 24.

[31] "Supermarket News, June 12, 19995 v45 n24.

[32] "Store chain finds benefits from retrofitting with single refrigerant," *Air Conditioning, Heating, and Refrigeration News*, June 3, 1996 v198 n5 pg. 3-5.

- Lowering head pressure on refrigeration compressors
- Stepped-up routine maintenance efforts and
- Conducting an Engineering Management audit.[33]

Case in Point: Super Food Services, based in Miamisburg, Ohio, instituted a variety of energy efficiency improvements including installing bi-level lighting and refrigeration systems. The wholesaler also completely replaced its refrigeration system. It also replaced all outdated fluorescent lighting with high pressure sodium bi-level lighting. Using bi-level lighting in cooler sections created energy savings by generating less heat. Now, the refrigeration system does not have to work as hard to maintain the temperature.

***Case in Point*:** Within six months after investing more than $250,000 in new lighting, refrigeration racking, and freezer systems, an independent grocery store lowered its gas and electric bill by more than $1,400 per month and its water bill by more than $200 a month. The grocer estimates that these energy improvements will ultimately lower utility bills by $20,000 to $25,000 annually.[34]

Other Energy Efficiency Strategies

The literature review also uncovered a variety of other strategies that retailers have used to lower energy costs. These include monitoring energy usage, tracking utility bill, and installing sophisticated energy management systems. Other stores have taken to compiling historic load profiles as an effort to track performance and identify areas for improvement.[35]

One retailer avoids "on peak" charges by over-freezing refrigerators during off-peak hours and shutting the refrigeration units off during the peak hour.

Some convenience store operators, in an effort to reduce both operating costs and noise levels associated with compressor operation, have implemented a proactive maintenance strategy. One convenience store chain has developed a network of all of its stores' refrigerator compressors with one computer. This system automatically tracks each store's refrigeration compressor and sends out alerts when needed.[36]

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[33] "Tighter Refrigeration Controls cut Kroger's Energy Bills," Adam Blair, *Supermarket News,* Sept. 15, 1997 v47 n37 pg. 101-102.

[34] "Refrigeration, Lighting Upgrade Slashes Utility Bills at Herrema's," Linda Purpura, *Supermarket News*, July 21, 1997 v47 n29 pg. 45-47.

[35] "Efficiency's in the air," Pat Lenius, *Supermarket News,* Feb. 6, 1995 v45 n6 pg. 9-11.

[36] "What's cool in c-stores," Kimberly Lowe, *National Petroleum News*, Nov. 1996 v88 n12 pg. 38-40.

CONCLUSIONS AND RECOMMENDATIONS

The literature review has helped to describe and characterize the driving factors in the supermarket industry. The key findings from this literature search are summarized below:

- The supermarket industry is an attractive market for utilities to target, based upon both the size and the importance of energy usage to this industry.

- Energy usage will continue to increase in this segment, as supermarkets increase their square footage and diversify their product lines.

- Supermarkets are facing new challenges from a variety of competitors, including large supercenters and smaller, convenience stores. Both of these competitors have already adopted aggressive, cost-savings measures.

- The supermarket industry of the future will be controlled by fewer, larger chains. The independent grocery store market share will decline as customers opt to purchase grocery items from either larger supercenters or convenience stores.

- The long-term survivors in the supermarket industry will be those retailers that combine effective cost-savings measures with enhanced merchandising. Retailers will continue to look for ways to standardize and simplify their store operations.

These findings have the following implications for PG&E's current marketing strategies as well as ways to construct the Final Research Plan.

The supermarket industry is far too large and profitable to be ignored by either utilities or energy service companies (ESCo's). As the staff interviews indicated, PG&E has been pursuing a variety of strategies to help supermarkets compete more effectively in this industry. In fact, PG&E has developed a number of different programs designed to target all aspects of energy usage within the supermarket industry.

These strategies, combined with the government compliance issues and the ongoing need to reduce operating costs have already led to increased awareness of and interest in energy efficiency. Supermarket chains, especially the largest ones, appear to be leading the way toward developing and adopting energy efficiency initiatives. Moreover, as these chains buy up smaller chains and independents, this trend is likely to continue or accelerate.

As the brief case histories illustrate, supermarket chains also have the internal staffing and financial resources to design, purchase, and install the types of equipment that will lead to energy efficiency improvements.

As the supermarket industry becomes even more competitive, equipment selection decisions take on even more importance. As the review illustrated, selecting HVAC, lighting, or refrigeration equipment is as much a marketing strategy as an operational one. The demand for more attractive supermarkets with a greater variety of products has led to a change in the basic configuration of a typical supermarket. In fact, merchants are starting to use the store's lighting, display cases, and even building design, as a way to increase revenues. These issues are now no longer on the "back burner," as retailers recognize that proper refrigeration can generate sales, just as effectively as in-store bakeries or banks.

The small, independent grocery segment is not likely to survive the current shift in the market. Rising operating costs, such as the cost of new product lines, combined with the cost of compliance, will continue to limit independent stores' profits. Even increased energy-savings will not provide these stores with a sufficient margin to withstand the competition. Some stores, such as those in ideal locations or with a unique product niche, will survive. However, these are not going to be the industry leaders in the future, and their approaches will have limited impact in the overall market.

Rather, the segment of the future is the convenience store. And while this market has not yet achieved the energy efficiency gains attained by the most progressive supermarket, c-stores are aggressive marketers with higher operating margins and the flexibility to make rapid changes. They may be ready to take off.

Convenience stores, unlike supermarkets, lack both the experience and the square footage to fully capitalize on all of the energy saving strategies that are available to their supermarket rivals. While they have been able to model some changes after the supermarket industry, effective energy strategies for the convenience stores will require a different approach.

Their smaller square footage will require some more innovative energy management techniques in order to achieve energy savings. Convenience store operators are in need of specialized assistance, especially regarding the selection and installation of refrigeration equipment. They are also looking for ways to reduce energy costs, while competing in this market. While some inroads have been made in energy efficient lighting, as this market grows, so will the opportunities for other energy efficiency measures.

APPENDIX 2. FOCUS GROUP REPORT

Energy Efficiency Activities in Supermarkets:

A Report of Findings from Three Focus Groups

BACKGROUND

PG&E has conducted a number of programs throughout the decade to help supermarkets in its service territory improve their energy efficiency. These programs were designed and implemented prior to the recent emergence of the "market transformation" orientation and they tended to rely on rebate mechanisms and information dissemination.

As the utility industry moves toward a restructuring of relationships and responsibilities for enhanced energy efficiency, it is reasonable to ask whether the earlier programs have affected the underlying market. Moreover, as guidance for future program design, it is useful to ask whether any of those effects are likely to be sustained.

The pursuit of these issues with respect to PG&E's work with supermarkets is of particular interest. Other retrospective studies of the market transformational effects of DSM activities have tended to focus on the results of specific programs—often in particular years. For example, earlier studies in the current series approved by CADMAC have addressed programs designed to increase the use of premium-efficiency motors throughout the commercial and industrial sectors. In contrast, this study addresses a particular segment of the commercial market—supermarkets. Moreover, this research seeks to determine the current state of energy-efficiency activities in that segment, following a variety of DSM programs sponsored by PG&E over a number of years.

The focus group sessions on which this present report is based were designed and conducted for several purposes. First, they were designed to help understand the market effects of PG&E's earlier programs for supermarkets as described by participants. Second, the groups were intended to assess the operations of the market in which supermarket decision-makers purchase energy-consuming equipment, as well as the apparent barriers to the selection and use of energy-efficient units. Third, the research was expected to suggest which decision-makers to include in the interview samples develop the discussion guide for a later portion of this study. That study will include systematic interviews with selected decision-makers for supermarket facilities in PG&E's service territory as well as decision-makers for facilities in a comparison territory.

METHOD

The sessions were designed for "mini-groups"—focus groups of 4-8 members. Such groups are quite useful when the members are likely to have considerable knowledge about the topic of interest as well as a willingness to discuss the relevant issues. The smaller number of participants permits the group to go into greater depth regarding the experience and beliefs of each member and can provide a richer understanding of the topic than the usual model of larger (10-12 member) focus groups.

In all, three mini-groups were conducted. The first of these, which provides the bulk of the information in this brief report, included five supermarket decision-makers from chains and specialty stores operating in PG&E's territory. The second group, intended to explore contrasts related to store/chain size, included seven grocery or convenience store owners or managers operating no more than two smaller stores in the territory. The third group, intended to explore differences traceable to PG&E's efforts (or other factors differing between service territories), included seven supermarket decision-makers (mixed in size of the chains or stores represented) in the Chicago area, which had been selected as the comparison territory for the present study.

Participants in the first two groups were recruited from the entire San Francisco Bay region by Quantum Consulting's professional focus group staff from PG&E's customer lists. Representatives of the larger chains were offered an incentive of $100 for participation; those from the small independent stores received $75. The third group was also recruited by QC staff, using a list from iMarket, Inc., selected based upon SIC code, location, and number of employees. All participants had considerable experience in the industry and were responsible for decisions regarding energy use and the purchase of energy-consuming equipment in their facilities.

A draft discussion guide was prepared and provided to PG&E's Project Manager. A copy of the discussion guide is included foloowing this report.

FINDINGS

This report focuses on the group of decision-makers from larger supermarket chains in California because the results provide the clearest direction for additional research, as discussed in the following subsection. Following this, the remainder of the report reviews the drivers of supermarket design and operations, the role of energy efficiency, awareness and uses of utility programs, and prospects for future energy-efficiency efforts in a restructured environment.

REPORT FOCUS

The focus group discussions indicated that additional end-user interviews should be restricted to decision-makers for larger stores that meet generally accepted definitions of supermarkets (i.e., stores of 25,000 square feet or more and at least $2 million in sales). Specifically, decision-makers for convenience stores should be omitted, as should those for smaller "mom-and-pop" stores. The representatives of convenience stores who were included in the focus groups confirmed the background research for this project,[37] indicating that the equipment decisions they face are quite different from those faced by decision-makers who deal with supermarkets. Of most importance, they do not deal with the large banks of refrigerated cases (multiplex systems) that utilize the huge amounts of energy consumed in supermarkets. Moreover, the differences in size, competition, corporate ownership and objectives, customer selection criteria and other factors create a far different market situation for convenience stores than that faced by supermarket decision-makers.

Smaller stores should also be omitted because of the physical characteristics of their facilities. That is, they are not large enough to require or support the type of centralized refrigeration equipment for which many supermarket programs are designed. As with the convenience stores, they do not use the banks of refrigerated cases that are central to the energy consumption of a modern supermarket, and they lack many of the other devices and units whose selection and use are the target of energy-efficiency programs.

In addition, many members of this subsegment appear unable to benefit from the programs that have been designed and implemented to date. Indeed, the completed focus groups suggest the possibility that many, if not most, "mom-and-pop" stores may be unable to benefit from any program that requires their attention and commitment of time or other resources.[38]

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[37] Literature Review Memorandum, February 1998.

[38] The tenor and comments of participants in the group comprising smaller customers in PG&E's service territory were highly consistent with the descriptions of commercial segments labeled "Besieged" in EPRI's CLASSIFY™ system: "Because of their weak cash flow position and the lack of long-range management objectives, these companies have few, if any, clearly expressed energy needs/requirements. Their business focus seems to be dominated by the need to improve the company's financial condition." Moreover, many members of this group manifested both a lack of understanding of energy-related costs and considerable anger and resentment at their situation, indicating strong distrust of others, including utility companies. They report little contact with utility representatives and little willingness to take the time to meet with them.

The emotional components of these attitudes were less striking in the contributions of the smaller customers in the comparison territory focus group, perhaps because the group was less homogeneous. Nonetheless, the substantive results—the lack of interest or ability to focus on energy issues—were consistent with those found in the Bay area group.

These factors lie behind the recommendation that the remainder of the end-user portion of the current research be more focused on the larger supermarkets and chains. They also lead us to narrow the remainder of this report to the discussions with members of that group.

DRIVERS OF SUPERMARKET DESIGN AND OPERATIONS

The focus groups suggested that the major drivers of management decisions in the supermarket industry at this time are marketing needs and concerns about maintaining product integrity. Efforts to meet these needs limit management interest in improving energy efficiency, given the perceived capabilities of current equipment and design.

As discussed in the literature review summary, the supermarket industry operates on very thin profit margins. This may suggest an industry eager for the opportunity to cut operating costs—since economies should flow immediately to the bottom line. However, management tends to be more concerned with maintaining and increasing customer comfort, interest, and willingness to purchase—the income side of the ledger—than with decreasing expenditures. As described by participants, management is quite willing to spend considerable amounts of capital to obtain equipment that is attractive and may display product in such a way as to increase customer interest and purchases. Similarly, stores often use incandescent floods and spots to highlight foods or enhance their appearance, although they recognize fully the energy-saving potential of other lighting choices. Finally, stores are being driven to increase their use of refrigeration to meet customer demand for an increased variety of drinks, convenience foods, and "home meal replacements"—complete prepared meals that are ready-to-serve.

Recent events[39] have created a major concern with product integrity among industries that include food handling and distribution, such as supermarkets. The industry is anxious to respond to such concerns, to maintain consumer confidence, reduce potential liability, and meet more stringent health codes and enforcement.[40] If anything, this concern has been exacerbated by the increase in demand for convenience foods and "home meal replacements." The critical issue for supermarkets is that product temperatures must be kept within a fairly narrow temperature range while in the display cases. Where it was once acceptable to monitor this through a simple thermometer in a typical case, it is now necessary to have electronic temperature probes placed throughout the equipment, to ensure that the requirements are met at all points, including the corners of the case, etc. On the one hand, these requirements are consistent with movement toward energy management systems—more monitoring and more control points can increase efficiency of such systems. On the other hand, they increase equipment costs and require additional sophistication.

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[39] E.g., the food poisoning incidents associated with the Jack-in-the-Box chain.

[40] Based on the comparison group, these concerns are not restricted to California, but are industry-wide in their reach.

Some participants in the focus group believe that equipment that is more efficient may be more likely to achieve some of its savings by hewing more closely to a thermostatic set point. They are concerned that the margin of error is therefore reduced and that product temperature could rise above the appropriate level. Accordingly, they suggest, the store's strategy may be to avoid such equipment or, if it is used, to run it at a lower set point than that for which it is designed. In their opinion, it is preferable to incur greater energy costs than to risk that product will have to be discarded or that customers will purchase and consume spoiled food.

Other regulatory issues have been important drivers of equipment decisions in the past. For example, stores have changed all their refrigerants to comply with CFC requirements. Similarly, compliance with Title 24 building requirements are incorporated into current design practices.

THE ROLE OF ENERGY EFFICIENCY

As described by many of the focus group participants, their role as facilities managers or energy managers puts them in the role of stepchildren in their companies. One discussant noted that there are nine people in the company who address marketing for every one who addresses energy operations. Another described how marketing staff members hide the costs from him until after the equipment has been purchased and installed. Still another agreed, saying that the company "doesn't even look at energy use" initially. To illustrate the point further, a decision-maker from one large chain described the placement of a bagel case on top of a refrigeration unit, leading to a profusion of crumbs and the consequent need for additional maintenance. But customers liked it, he was told, and his job was to deal with the placement rather than to improve the overall operation. Even when equipment is sent to PG&E's test kitchens for testing of safety and efficiency, the results do not make or break the buying decision.

In part, these attitudes may reflect a failure to educate senior management, both by their internal staff and by outside representatives. As depicted by one of the participants, his management simply does not believe they can control energy costs and therefore they must live with them. To a great extent, this attitude may reflect the practices barrier described by Eto, Prahl, and Schlegel in the scoping study: When a regulation requires certain types of upgrades (e.g., with respect to CFCs or Title 24), management says, "Just do it"; until then, they suggest, avoid potential risks by doing nothing.

Some stores do use designers dedicated to the industry and master specifications. In some cases, moreover, those specifications are so detailed as to define what color lamps are to be used for particular cases for certain products. However, it does not appear that knowledge of energy use or a concern with efficiency are major criteria in either the staffing choices or the design requirements. The situation may be even less positive

from the perspective of achieving energy efficiency when other contractors are hired. For example, one participant described a recent relamping project in which 34 W fluorescent lamps were used as replacements for 40 W lamps and touted their energy efficiency. (At the participant's insistence, the job was redone, using T8 lamps and electronic ballasts.)

AWARENESS AND USE OF UTILITY PROGRAMS

Large customers in the PG&E service territory are highly aware of energy-efficiency programs conducted by the Company and report having participated in a number of those programs, with considerable benefit to themselves. Among the programs mentioned were those that have addressed lighting efficiency, fan-motor speed, energy management systems, window tint and blinds, and refrigerator gaskets and case design. In addition, some companies have served as test beds for equipment designs developed through PG&E collaboration with manufacturers and with EPRI. Finally, some supermarket chains have taken advantage of PG&E's assistance in testing the energy efficiency of new refrigerator case designs.

The level of awareness and use of utility programs among large PG&E customers can be attributed, in considerable part, to the efforts of the Company and its account representatives. In contrast to the level of awareness and use in the Bay area, participants in the comparison area focus group—comprising decision-makers from companies with similar size and number of stores—showed far less awareness of energy-related issues, opportunities for savings, or company efforts to achieve energy efficiency. Needless to say, perhaps, members of the comparison group reported little effort by their utilities to educate them, or to provide options or incentives to become energy efficient.[41]

Of note, the PG&E customers spontaneously recounted their satisfaction with almost all the programs in which they had participated. Even in the one instance of failure reported—an effort to reduce fan-motor usage that severely underestimated load requirements and resulted in equipment failure and loss—the Company was praised for its interest, efforts, and cooperative attitude. In addition, the customers are quite comfortable with the verification requirements attached to the various rebate programs.

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[41] As noted at the outset, the comparison group was conducted in the service territory of Commonwealth Edison. One of the decision-makers, however, carried responsibilities for (convenience) stores in the Boston metropolitan area. He, too, reported little effort to help his company increase energy efficiency in that area. The only report of active efforts by utilities in this group came from a decision-maker with responsibilities for stores in Wisconsin. Overall, the evidence strongly supports the conclusion that supermarket decision-makers are unlikely to have made efforts to increase energy efficiency in their facilities in the absence of major utility programs.

PROSPECTS FOR FUTURE ENERGY-EFFICIENCY EFFORTS IN A RESTRUCTURED ENVIRONMENT

In essence, the focus group participants indicated that the utility programs had helped create awareness of energy efficiency and a constituency for improving facilities and operations with respect to energy consumption. However, given competing demands for capital and staff resources, the supermarket segment has not been converted by the programs into one that is committed to investing in these activities on its own.

As discussed more fully in the last section of this report, focus group participants do see considerable opportunities for additional energy savings in their equipment choice and operations. However, the large end-users in PG&E's service territory are not optimistic that their companies will invest in those opportunities.[42]

Not surprisingly, these decision-makers express disappointment with the possibility that rebate programs will not be available in the future. Several noted projects that they had been planning, but now believe unlikely to be accepted by senior management. Decision-makers with smaller chains indicated that the lack of financing would pose a direct burden on their ability to undertake new projects. They raised the possibility that they might be able to do so if loans were available to take the place of rebates. Those with larger chains suggested that they did not need the financing per se, but that the availability of the rebates helped to "sell" projects internally, for other reasons. In particular, they noted that rebates reduced the payback period for projects and enabled projects that were good, but marginal, to pass company policy requirements. For the same reason, rebates allowed projects to be accepted for stores that were scheduled for elimination or reconstruction in the foreseeable future. Finally, rebates seem at times to function as a "seal of approval" or as evidence of the utility engaging in a partnership with the supermarket—again, helping to persuade senior management of the worth of the proposed project.

Few participants were knowledgeable about the nature of energy service companies (ESCOs) and the strengths they may be able to bring to achieving future efficiencies. One participant noted that another division in his company had contracted with an efficiency-oriented ESCO and reported that his division had considered doing so as well. His division had elected to reject that opportunity in favor of making his operational unit responsible for achieving the savings available. He indicated that the expected benefits would include maintaining knowledgeable internal staff and not having to share increased profits with an external contractor.

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[42] Participants in the comparison territory group appeared somewhat more willing to invest their own resources in energy efficiency—if they recognized the need. For them, of course, no change in the availability of rebates is occurring.

IMPLICATIONS

This section offers our recommendations regarding the sample design for the depth interviews to be conducted during the remainder of this research and for issues to be included in the discussion guide. It concludes with some suggestions for consideration in the design of future programs, assuming they are supported by the findings of the depth interviews.

SAMPLE DESIGN

As already indicated, we believe that the end-user sample for the remainder of this research project should be restricted to large supermarkets and chains. It should not include decision-makers for convenience stores or owners or managers of "mom-and-pop" stores.

The results of the focus groups also indicate the importance of working with facility managers or energy managers who are familiar with the selection and use of energy-consuming equipment in their stores. It should be understood that these restrictions severely limit the universe of potential respondents and largely preclude the use of a survey method (but not necessarily the collection of all quantitative data). We recognize these limitations to the proposed design. However, we are confident that the benefits in the ability to probe the information sources, concerns, and intentions of highly knowledgeable decision-makers in the largest and most active companies far outweigh other research considerations.

The focus group discussions also underline the importance of interviewing those who supply energy-consuming equipment to the large supermarket end-users and those who help design the facilities involved. As indicated above, long-run gains in energy efficiency in this segment are likely to depend upon improvements in equipment and design that are consistent with the other needs of the supermarket industry. A fuller understanding of the needs and constraints of those higher in the value chain is required to inform the design of programs targeted to affect those market actors.

DISCUSSION GUIDES

We suggest that the discussion guides for depth interviews with additional end-users focus on the decision-making processes associated with the construction of new supermarket facilities and the renovation of older facilities. We believe that the background research and the focus groups provide adequate information regarding the structure of the industry, evolving customer demand, and general practices, such that these topics can be omitted from future discussions. Their removal will allow more time to review the construction/renovation process and to identify leverage points for inclusion of energy-efficiency considerations as well as barriers thereto. Among the relevant issues are the following:

- Use of standard templates for store design; inclusion/omission of energy-efficiency considerations
- Procedures for selecting equipment
- Efforts to balance marketing effectiveness with energy efficiency

- Key factors in securing management approval for energy-efficiency projects (e.g., payback)

- Other perceived barriers to the selection and use of energy-efficient equipment (e.g., current designs, reliability, access to financing)

- Mechanisms for ensuring attention to energy efficiency in operations and maintenance (e.g., monitoring activities)

Other related topics that should be considered more fully include the following:

- Sources of information on energy efficiency and energy-efficient equipment

- Potential for use of energy service companies or developing internal ESCO analogues

PROGRAM DIRECTIONS

Several considerations for future program design were more or less explicit in the focus group discussion. These are listed below, with limited elaboration, pending confirmation of their potential value during the depth interview phase of this research.

- ***Continued technological development is a necessity.***
  Refrigeration systems remain the technology most in need of design improvement. If energy-efficient designs are not attractive—or if attractive designs are not made energy-efficient—there is little hope of converting most equipment in the stores.[43]

  A second, related area of opportunity lies in improving the interaction of refrigeration systems and the circulation of conditioned air.[44]

  A third area of opportunity may lie in parking lot lighting. Participants sense that increased usage may be required to ensure customer perceptions of safety and limit liability concerns. However, they appear unsure of designs and equipment that can meet those needs without significant inefficiencies.

- ***Rebates may be critical to helping move the market for newer technologies.***

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[43] The market for refrigeration equipment appears to be dominated by a duopoly, Hussman and Tyler. Although these companies and others do make some efficient units, they do not appear to promote that feature heavily. Moreover, the plethora of styles and sizes of display cases may ensure the primacy of style as a decision criterion. Some earlier cooperative efforts among manufacturers, PG&E, and EPRI do not seem to have been pursued.

[44] Participants recount considerable frustration in this area; e.g., having to heat a store to 82° F during the summer to ensure customer comfort because of the air conditioning effects of the air being refrigerated by a line of coffin cases. Although some of the manufacturers claim to have experts in both refrigeration and HVAC, participants are skeptical of their ability to work together.

Improvements in energy management systems offer considerable opportunities for energy savings in many stores; however, the capital costs involved are likely to limit their purchase and installation.

- ***Members of the industry might share information on energy efficiency more effectively.***

  Currently, knowledgeable end-users receive their information from trade journals and visits by PG&E account representatives. Although some trade organizations exist, they do not appear to include a majority of important market participants. Efforts to develop opportunities to share issues and successes in energy management have been successful elsewhere in both supplementing utility efforts and relieving such external agencies from sole responsibility in this area.

- ***Some possibilities may exist for leveraging public concern about energy efficiency, at least in some parts of the state.***

  The larger stores appear to be concerned with conveying an image of being "green," because of both management commitments and public acceptance. Several participants related stories of customer response to visible energy-saving activities or apparent waste. It is not clear that current programs have capitalized on this facet of consumer demand.

APPENDIX 3. DATA COLLECTION

Draft Discussion Guide
Supermarkets

I. Introduction (10 Minutes)

1. Welcome; purpose of the session. (Help us better understand the structure of the supermarket industry; current trends and drivers of business decisions; role of energy-using equipment, design, and practices; interest in reducing energy costs. Ultimately can support design of a new generation of energy efficiency programs that will help supermarkets reduce costs.)

2. Process: Openness; voicing opinions; anonymity in the report; speaking one at a time; being recorded.

3. Who I am. My role.

4. Participant introductions: Name; company; position, and responsibilities. (Owner, franchisee, employee?)

II. Background— Industry Description (10 Minutes)

1. How do insiders describe the components of the industry? Large chains, smaller (regional) chains, independents, convenience stores? Other?

2. What are the differentiators? Ownership and size?

3. How do these differences play out in the design and operations of the stores—particularly with regard to need for and use of energy and related services? What trends are evident?

4. Have there been any significant changes in the availability of capital for store design, renovation, or related purposes? How easy is it to get funding for cosmetic and other "marketing-related" investments as compared to funding for operational issues, such as energy-related investments?

III. CUSTOMER NICHES (15 MINUTES)

1. Do the different types of stores appeal to different customer niches? If so, how are these differentiated?

2. How is the industry evolving to meet changes in customer demographics and needs?

3. What are the implications of these changes for energy use, both overall and in the percentage accounted for by different end uses? (E.g., more kitchen/cooking/baking facilities in stores)

4. Which segments are experiencing or making an effort to increase store size?

IV. Implications for Energy Usage (15 Minutes)

1. Is there any rule-of-thumb regarding the energy consumption per square foot? Has this changed over recent years? If so, how? Why?

2. What changes are occurring in marketing and in-store promotional display?

3. What are the implications of these changes for energy use? (E.g., more lighting, more use of retail-type lighting as opposed to overall illumination, higher/lower levels of illumination, reduced glare; more/less use of coffin-type cases; more/less use of reach-in cases; other changes in style, quantity or size of display cases)

4. (Mention the Montreal Protocols/CFC/refrigerant issue, which appears to have pretty significant implications for how they manage refrigeration.)Are there any changes in regulatory requirements that might affect energy use (e.g., related to the sale of prepared foods; as a result of tightening up on sale of meat products, eggs, etc.; relating to indoor air pollution and ventilation requirements)?

5. What changes are driven or limited by corporate policies? For example, a specific payback target or a level of efficiency required? Positioning as a "green company"? What about oversizing?

6. Has there been any change over the past 5-6 years in the number of companies with a policy or the type of policy regarding energy use?

V. Energy Monitoring and Control; Information Sources (10 Minutes)

1. Who is responsible for dealing with energy bills?

2. Is energy monitoring and control a headquarters function or is it handled at each individual store? Does headquarters impose policies, offer engineering or accounting guidance, leave it up to each manager?

3. Is it tracked and reported on a regular basis? How does this differ by the type or size of the company involved?

4. Who is responsible for changes in equipment and for the selection of what is installed? For chains, what is the role of the "master spec" in new construction? In retrofits?

5. What is the role of various outside vendors; specifically, equipment suppliers, refrigeration contractors, lighting contractors, etc. in determining what kind of equipment is installed.

6. How about ESCOs—energy service companies? Any experience with them? If so, is there value in their bundling of services? Their financing packages? Do you/would you use them for purchasing gas or power? Other services?

7. Where do you/they get information regarding trends in energy-using equipment and energy-related services? How important are different sources of information? (e.g., PG&E and other utilities, trade journals, corporate or staff engineers, outside engineers, trade associations, competitors, universities or business schools, demonstration programs, EPRI and GRI, state energy offices)

VI. Efforts to Manage or Reduce Energy Use (20 Minutes)

1. Approximately what percentage of your operating cost goes to energy?

2. Over the past 2-3 years, what efforts have been made to control, manage, or reduce energy demand or use in your facilities? (For larger stores, emphasis is on the systems addressed—lighting, HVAC, refrigeration—not on specific individual stores and measures.) What were the drivers of those efforts?

3. Have you participated in any utility programs designed to help you manage or reduce energy costs? If not, why did you choose not to? If so, what were the good points of those programs? What were the bad points?

4. To what degree have these programs had any *long-term effects* on the way you or others use energy, select equipment, etc.? If any, what were these long-term effects? (Focus on effects both at customer level and elsewhere in the value chain.) What were the factors that promoted or limited success?

5. Who was most influential in making this happen? (Corporate, outside consultants, utility, energy service companies, etc.)

6. Have you monitored the results of the change(s) you made? How much impact on energy costs have you observed?

7. How important has participation in these programs been to your bottom line?

8. Which changes, if any, have been noticeable to your customers? How have they reacted?

9. Where would you find new or additional programs helpful—in what areas of operations, what technologies, what maintenance processes?

10. How would you want to see those programs delivered as we move into the era of deregulation and competition? What's the best type of program to help your company meet its objectives?

11. Do you expect the marketplace to provide these opportunities more or less automatically? (Awareness of/Experience with/Expectations of ESCOs?)

12. How important is it to you that the people you work with on this issue understand the supermarket industry? (As opposed to "Just help us with the financing"?)

VII. Market Barriers (20 Minutes)

1. Thinking back 5-6 years, what were the major reasons why you/your company might not purchase high efficiency lighting, refrigeration, or HVAC equipment or implement other energy-saving practices? (e.g., use of strip curtains, cycling of anti-sweat heaters, and reduction in compressor pressure) For example, was there any difficulty in getting delivery on efficient equipment? Was there a high level of concern that efficient lighting products would decrease the attractiveness of in-store displays or that strip curtains would inhibit customers from reaching into display cases? Was there greater difficulty in financing improvements? Obtaining trustworthy technical advice or product specifications?

2. Which of those reasons—and what new reasons—explain why you/your company might not purchase high efficiency equipment today? Have there been any changes—any barriers that seem to have been eliminated or reduced? (Awareness; availability; reliability; access to financing; etc.)

3. Looking at what has changed—what factors would you say have been most important in stimulating or supporting those changes? (the overall economy, EPAct; NEMA; PG&E; etc.)

VIII. Future Trends in Energy Efficiency (10 Minutes)

1. Do you see a shift toward increased purchases of high efficiency equipment continuing or growing over the next 3-5 years? Why or why not?

2. What about operating and maintenance practices—do you see any changes that are likely to affect energy use? What are those? What is driving them?

3. What would be necessary to cause you/your company to move toward total reliance on high efficiency equipment?

4. How likely are those conditions/activities/programs? How do you see this being affected by changes in the utility industry in California? (Renew discussion of ESCOs, if appropriate.)

IX. Close (5 Minutes)

Thank you, etc. Are there any other key issues I should have asked about? Other things I need to know to understand the important things that drive your market and cause changes?

Thank you again.

Interview Guide -- Supermarkets

PG&E SUPERMARKET DECISION MAKER SURVEY

Vendor Name: _____

Contact Name: _____

Phone Number: _____

Service Territory: _____

Date: _____

Interviewer _____

Energy Efficiency Awareness

Q102. Is energy monitoring and control handled at
1. Corporate Headquarters
2. Regional Offices
3. Each individual store

Q103. What percentage of your company's stores are located in:
_____ (%) PG&E's service territory
_____ (%) Other areas served by utilities with energy efficiency programs
_____ (%) Areas served by utilities with no significant energy efficiency programs

Q104. What are your company's primary sources of information for keeping up with trends in energy efficient technologies? *(Enter 1 for all that apply – do not read)*
a. _____ Trade magazines focused on supermarket industry
b. _____ Trade magazines focused on equipment/facilities management
c. _____ PG&E (Your utility, if out-of-area)
d. _____ The Internet
e. _____ Professional associations
f. _____ Conferences/trade shows
g. _____ Colleagues and friends
h. _____ Contractors/equipment suppliers
g. _____ Advertising from manufacturers
i. _____ Sales calls
j. _____ EPRI/Gas Research Institute
k. Other _____

Q 104. Of the sources you just mentioned, which one is the most important? _____Letter from response above

Q104a. (PG&E customers only) Which of the following energy efficiency programs offered by PG&E to supermarket customers over the past several years are familiar to you?

1. Incentive/Rebate Programs
2. Store Audit Programs
3. Information/Presentations
4. PG&E/EPRI Test store in Menlo Park
5. PG&E Food Center Technology Center

Q104b. (all) Which of the following national energy efficiency programs are familiar to you?

1. EPA Green Lights
2. Motor Challenge
3. EPRI Supermarket Initiative
4. Gas Research Institute/DOE Desiccant Cooling Program

Energy Decision-Making *Now, I would like to ask you a few questions about how energy-related decisions are made.*

Q105. Regarding the selection and installation of energy efficient equipment in **existing stores,** which of the following are involved in this process? (Mark all that apply)

a) Equipment Suppliers
b) Refrigeration Contractors
c) Consulting Engineers/Designers
d) In-house design department
e) In-house engineering/facilities management staff
f) Store managers
g) Corporate management
h) Other _____

Q106. Of the above, who makes the final decision regarding equipment purchases?

Q107. For **New Stores,** is this process the same or different?

1. Same
2. Different
9. Don't Know

Q107a. If different, which of the following are involved in this process? (Mark all that apply)

a) Equipment Suppliers
b) Refrigeration Contractors
c) Consulting Engineers/Designers
d) In-house design department
e) In-house engineering/facilities management staff
f) Store managers
g) Corporate management
h) Other _____

Q108. Of the above, who makes the final decision regarding equipment selection?

Q115. Over the past five years, has the level of energy efficiency specified for ***new*** stores:

____ Increased ____ Decreased ____ Stayed the same

Q113.Does your organization have a master specification?
1. Yes 2. No

Q114. (IF HAVE MASTER SPEC) Is energy efficiency included in that specification?

Q114a. Have utility-sponsored energy efficiency programs affected the level of energy efficiency incorporated into the master spec?

Next I'd like to ask you about specific energy efficiency measures installed in new stores, existing stores served by PG&E (or utilities with EE programs), and existing stores served by utilities that have not had such programs. What percentage of stores have each of the following for:

Q115. New stores
Q 116. Existing stores served by PG&E
Q117. Existing stores served by no-program utlities

Equipment Type	**% of New Stores with Equipment**	**% of Existing Stores in PG&E territory with Equipment**	**% of Existing Stores in no-program territory with Equipment**
Energy Management Systems			
Floating head pressure controls			
High efficiency compressors			
ASD compressors			
Night covers for refrigerated cases			
(For in-store fluorescent lighting) T-8s with electronic ballasts			
(For in-store incandescent lighting) Halogen or HID bulbs			
Electronic ballasts for case lighting			
Cycling of anti-sweat heaters/humidistat controls for anti-sweat heaters			
Permanent Split Capacitor (PSC) evaporator fan motors			
Store humidity controls			
What percent of freezer (low temperature) cases have doors?			
What percent of (medium			

temperature) refrigerated cases have doors?			
What percent of case doors are low/no heat?			
Any other aspects of store design to minimize/manage energy use?			

IMPORTANCE OF ENERGY USAGE

Q302A. Approximately what percentage of your overall (non-merchandise) operating cost is accounted for by electricity?

_____%

Q302B. During the past 5 years, has this percentage:

1. Increased
2. Decreased
3. Stayed the Same

Q303. Next, please rate for me on a six point scale, where 1 means "Not at all Important" and "6" means "Extremely Important", the importance of each of the following factors in your company's overall approach to decisions regarding energy efficiency and selection of energy using equipment.

a. _____ Marketing/presentation concerns
b. _____ Refrigerant Issues (e.g., Montreal Protocols/CFC ban)
c. _____ Regulatory Requirements
d. _____ Availability of Rebates
e. _____ Declining cost of electricity
f. _____ Uncertainty about future electric market
g. _____ Uncertainty about the future of the supermarket industry
h. _____ Availability of financing
i. _____ Other

Q304. Next, please rate for me on the same six point scale, where 1 means "Not at all Important" and "6" means "Extremely Important", the importance of each of the following equipment attributes when you select specific items of new equipment. (Rotate)

a. Appearance/contribution to sales 1 2 3 4 5 6
b. Energy efficiency 1 2 3 4 5 6
c. Initial cost 1 2 3 4 5 6
d. Life cycle cost 1 2 3 4 5 6
e. Ease of maintenance 1 2 3 4 5 6
f. Availability of financing 1 2 3 4 5 6
g. Eligibility for utility rebates 1 2 3 4 5 6
h. Warranty 1 2 3 4 5 6

i. Manufacturer's reputation/ relationship with vendor 1 2 3 4 5 6
j. Reliability 1 2 3 4 5 6
k. Compatibility with other equipment or other stores 1 2 3 4 5 6
l. Immediate availability 1 2 3 4 5 6

Q304. What is the payback your company requires for an energy efficiency investment?

_____years

Q308. To what degree have utility rebate programs had any *long-term effects* on the way you select energy-using equipment?

MARKET BARRIERS

Q311. What are some of the major reasons why your company did not select high efficiency equipment in the past? Circle all that are mentioned:

a. Difficult to find reliable, unbiased information about energy efficient alternatives
b. Difficulty in getting delivery on efficient equipment
c. Energy efficient equipment might not be as reliable
d. Energy efficient equipment costs too much/doesn't meet payback requirements
e. Decisions made at headquarters; energy efficiency not a major concern to them
f. Concern that efficient lighting would decrease the attractiveness of in-store displays
g. Doors would inhibit customers from reaching into cases
h. Difficulty in financing improvements
i. Difficulty obtaining trustworthy technical advice or product specifications

Q312. What are the major reasons that your company does not install high efficiency equipment today? (Probe)

Same as above plus:

a. Rebates are no longer available
b. Uncertainty about electricity supply
c. Uncertainty about whether our stores will be sold or merged

Q313. Do you believe the percentage of high efficiency equipment installed in your stores in the next 3 to 5 years will increase, decrease, or stay the about the same?

1. Increase
2. Decrease
3. Stay the same
99. Don't Know

Q314. Why do you say that?

Q315. On a scale of 1 to 6, where 1 is not at all helpful and 6 is very helpful, how helpful would you find each of the following kinds of programs in promoting the use of energy efficient equipment at your stores:

Rebates/incentives	1	2	3	4	5	6
Audits	1	2	3	4	5	6
Information programs	1	2	3	4	5	6
Demonstration programs	1	2	3	4	5	6

Q316. What kind of information would you find most useful in promoting the use of energy efficient equipment in your stores. Information on how energy efficiency technologies:

Reduce operating costs
Improve the shopping environment
Fill a market niche
Reduce the need for renovation
Meet payback requirements
Compare to standard technologies

Finally, I would like to ask you a couple of questions regarding your company.

Q401. _____ What is the average size of your company's stores?

Q403. _____ Approximately how many stores did your company operate in 1997?
(record actual number if available)
1 = 1-10 2 = 10-50 3 = 51-100
4 = 100-500 5 = 501-1,000 6 = 1,000 +

Q404. _____ What is your position with the company?

PG&E SUPERMARKET VENDORS SURVEY

Vendor Name: _____
Contact Name: _____
Phone Number: _____
Service Territory: _____
Date: _____
Interviewer _____

Q101. What type of equipment does your company manufacture/sell?
_____

Q102. What percentage of your company's sales are accounted for by supermarkets?
_____ (%)

With regard to existing stores:

Q103. Who initiates the replacement and upgrade of equipment?

i) Equipment Suppliers
j) Refrigeration/lighting Contractors
k) Consulting Engineers/Designers
l) In-house design department
m) In-house engineering/facilities management staff
n) Store managers
o) Corporate management
p) Energy Service Company
q) Other _____

Q104. Who has the greatest influence on the type of equipment selected? (Do not read, check all that apply)

a) Equipment Suppliers
b) Refrigeration/lighting Contractors
c) Consulting Engineers/Designers
d) In-house design department
e) In-house engineering/facilities management staff
f) Store managers
g) Corporate management
h) Energy Service Company
i) Other _____

Q105. Who makes the final decision on equipment purchases?

a) Equipment Suppliers
b) Refrigeration/lighting Contractors
c) Consulting Engineers/Designers
d) In-house design department
e) In-house engineering/facilities management staff
f) Store managers
g) Corporate management

h) Energy Service Company
i) Other _____

With regard to New stores:

Q106. Who has the greatest influence on the type of equipment selected? (Do not read, check all that apply)
a) Equipment Suppliers
b) Refrigeration/lighting Contractors
c) Consulting Engineers/Designers
d) In-house design department
e) In-house engineering/facilities management staff
f) Store managers
g) Corporate management
h) Energy Service Company
i) Other _____

Q107. Who makes the final decision on equipment selection?
a) Equipment Suppliers
b) Refrigeration/lighting Contractors
c) Consulting Engineers/Designers
d) In-house design department
e) In-house engineering/facilities management staff
f) Store managers
g) Corporate management
h) Energy Service Company
i) Other _____

Energy Efficiency Awareness

Q108. What is your company's primary source of information for keeping up with trends in energy efficient technologies? *(Enter 1 for all that apply – do not read)*

a. _____ Trade magazines focused on supermarket industry
b. _____ Trade magazines focused on equipment/facilities management
c. _____ PG&E (Your utility, if out-of-area)
d. _____ The Internet
e. _____ Professional associations
f. _____ Conferences/trade shows
g. _____ Colleagues and friends
h. _____ Contractors/equipment suppliers
g. _____ Advertising from manufacturers
i. _____ Sales calls
j. _____ EPRI/Gas Research Institute
k. _____ Colleges and universities
l. _____ Other _____

Q109. Of the sources you just mentioned, which one is the most important? _____Letter from response above

Q110. Which of the following statements best describes how your company's marketing efforts have been influenced by energy efficiency programs offered to the supermarket industry by utilities?

1. Such programs have not had any influence on our market efforts
2. Such programs have caused us to sell energy-efficient models of our equipment more aggressively
3. Such programs have caused us to emphasize energy efficiency in all our marketing efforts
4. Other _____

Q111. Have energy efficiency programs offered to the supermarket industry caused your company to design or offer new types of equipment?

1. Yes (please explain) _____
2. No (why not?) _____

Installation Trends

Now, I would like to ask a few questions regarding installation of energy efficient equipment in supermarkets.

Q116. Relative to your overall equipment sales, what percentage was accounted for by high efficiency equipment in 1997? In 1996? (Ask for both 1997 and 1996 sales)

Q116a. _____1997 High Efficiency
_____1997 Standard Efficiency

Q116b. _____1996 High Efficiency
_____1996 Standard Efficiency

Q117. Of your total equipment sales in 1997, what percentage was for replacement/remodeling rather than new stores?

Q117a. _____1997 Q117b. What about in 1996: _____1996

Of the total equipment sales equipment sales in 1997: what percentage was for new stores?

Q117c. _____1997? Q117d. What about in 1996? _____1996

IMPORTANCE OF ENERGY USAGE

Q303. Please tell me which of the following factors have influence your customers' equipment selection decision. (Mark 1 for all that apply)

a. _____ Marketing/presentation concerns
b. _____ Montreal Protocols/CFC/Refrigerant Issues
c. _____ Regulatory Requirements
d. _____ Availability of Rebates
e. _____ Declining cost of electricity
f. _____ Uncertainty about future electric market
g. _____ Uncertainty about the future structure of the supermarket industry (i.e., mergers and acquisitions)
h. _____ Availability of financing
i. _____ Other

Q304. Next, please rate for me on a six point scale, where 1 means "Not at all Important" and "6" means "Extremely Important" how your customers' rate each of the following equipment attributes. (Rotate)

a.	Appearance/contribution to sales	1 2 3 4 5 6
b.	Energy efficiency	1 2 3 4 5 6
c.	Initial cost	1 2 3 4 5 6
d.	Life cycle cost	1 2 3 4 5 6
e.	Ease of maintenance	1 2 3 4 5 6
f.	Availability of financing	1 2 3 4 5 6
g.	Eligibility for utility rebates	1 2 3 4 5 6
h.	Warranty	1 2 3 4 5 6
i.	Manufacturer's reputation/ relationship with vendor	1 2 3 4 5 6
j.	Reliability	1 2 3 4 5 6
k.	Compatibility with other equipment or other stores	1 2 3 4 5 6
l.	Immediate availability	1 2 3 4 5 6

Supermarket Energy Efficiency Trends

Q305. Over the past 2-3 years, has your emphasis on controlling, managing, or reducing energy demand in your sales approach to supermarket customers increased, decreased, or remained the same?

Q306 What were reasons behind those changes?

Q309. What kinds of programs do you think would be most helpful in increasing the level of awareness of energy efficient design and operations in the supermarket industry?

Q310. Do you think that the market place will provide these kinds of programs once utilities no longer do?

1. Yes 2. No 9. Don't Know

MARKET BARRIERS

Q312. What are the major reasons that your company did not offer/manufacture high efficiency equipment in the past? (Probe)

Q312a. What are the major barriers you face in selling high efficiency equipment today?

Q313. In the next 3 to 5 years, will demand for high efficiency equipment :

1. Increase
2. Decrease
3. Stay the Same
99. Don't Know

Q314. Why do you say that:

Q315. Do you think that the "deregulation" of the electric industry will have a positive or negative impact on energy efficiency in supermarkets?

Q316. Why do you say that?

Finally, I would like to ask you a couple of questions regarding your company.

Q401. _____ How many years has your company been in business?

Q402. _____ How many people are employed at your company?

Q403. _____ What is your position with the company?

PG&E SUPERMARKET REFRIGERATION CONTRACTORS SURVEY

Vendor Name: _____
Contractor Name: _____
Phone Number: _____
Service Territory: _____
Date: _____
Interviewer _____

Q1. Hello, this is _____. I'm calling from Quantum Consulting, a management consulting firm in Berkeley, California. I'm calling on behalf of PG&E. Does your company service supermarket refrigeration equipment within PG&E's service territory?

IF Q1=NO:
Thank you for your time.

IF Q1=YES:
Q2. Who would be the best person to talk with about your company's services to the supermarket industry?
(Record contact name)

Q3. May I speak with <CONTACT>?

IF Q3=NOT AVAILABLE:
Q4. When is usually a good time to reach <CONTACT>?
(**Record best time and try at a later date to interview)**

IF Q3=AVAILABLE, ASK Q5 TO <CONTACT>:
Q5. Hello, this is _____. I'm calling from Quantum Consulting, a management consulting firm in Berkeley, California. I'm calling on behalf of PG&E and was told that you were the best person to talk with about your company's servicing of refrigeration equipment for the supermarket industry. Is this correct?

IF Q5=NO:
Go to Q2 and repeat cycle.

IF Q5=YES:
Q6. PG&E is working with the California Public Utilities Commission to evaluate its existing energy-efficiency programs to help design more attractive programs for Californians in the future. To support this effort, we'd like to ask you a few brief questions regarding the effects of PG&E's programs on your business. This will only take 5-10 minutes. Is now a good time?

IF Q6=NO:
Q7. When is a good day and time to schedule this brief interview?
(Schedule best time and day)

Thank you very much. We look forward to talking with you on <DAY> at <TIME>.

First I'd like to get an idea of the structure of your industry and the services you provide.

Q100. Approximately how is your workload broken down among:

a) Supermarkets (%)_____ (defined as stores with central refrigeration)
b) Convenience stores (%)_____
c) Restaurants (%)_____
d) Refrigerated Warehouses (%)_____
e) Institutions (%)_____ (schools, hospitals, prisons, etc.)
f) Other (%)_____

Q101. Which of the following services does your firm provide to supermarkets (check all that apply):

a) Equipment maintenance and servicing
b) Equipment installation (new stores _____; existing stores _____)
c) Equipment sales
d) System design

Q102. When working with supermarkets, do you work on an as-needed basis or do you have an ongoing contract?

_____ As needed _____ Ongoing _____ Other (specify below)

_____

Q103. Who typically initiates a supermarket service call to you? (Do not read)

r) Store managers
s) The supermarket's in-house engineering/facilities management staff
t) Consulting engineers/designers
u) In-house design department
v) Corporate management
w) Energy Service Company
x) Equipment vendors
y) Other _____

Q104. When a service call results in equipment needing to be replaced, who has the greatest influence on the type of equipment selected? (Do not read, check all that apply)

j) Equipment Suppliers
k) Refrigeration Contractors
l) Consulting Engineers/Designers
m) In-house design department
n) In-house engineering/facilities management staff
o) Store managers
p) Corporate management
q) Energy Service Company
r) Other _____

Q105. Who makes the final decision on equipment purchases?

j) Equipment Suppliers
k) Refrigeration/lighting Contractors
l) Consulting Engineers/Designers
m) In-house design department
n) In-house engineering/facilities management staff
o) Store managers
p) Corporate management
q) Energy Service Company
r) Other _____

Energy Efficiency Awareness

Q108. What is your company's primary source of information for keeping up with trends in energy efficient refrigeration technologies? *(Enter 1 for all that apply – do not read)*

a. _____ Trade magazines focused on your customers' industries
b. _____ Trade magazines focused on equipment/refrigeration
c. _____ PG&E (Your utility, if out-of-area)
d. _____ The Internet
e. _____ Professional associations
f. _____ Conferences/trade shows
g. _____ Colleagues and friends
h. _____ Manufacturer technical data
g. _____ Manufacturer advertising
i. _____ Sales calls
j. _____ EPRI/Gas Research Institute
k. _____ Colleges and universities
l. _____ Other _____

Q109. Of the sources you just mentioned, which one is the most important? _____Letter from response above

Q110 (PG&E territory only) Are you familiar with the energy efficiency programs that PG&E has offered to supermarkets over the past several years?

No (Skip to 116 – Installations) Yes (Continue)

Q111. Which of the following statements best describes how your company's marketing efforts have been influenced by PG&E's energy efficiency programs offered to supermarkets.

5. Such programs have not had any influence on our marketing efforts
6. Such programs have caused us to identify opportunites for energy-efficient installations that could help the customer qualify for a rebate
7. Such programs have caused us to emphasize energy efficiency in all our marketing efforts

8. Other _____

Q112. Have PG&E programs offered to the supermarket industry caused your company to alter the services you offer or the parts and equipment you stock?

1. Yes (please explain – record verbatim)_____
_____
2. No (why not?)
_____

Installation Trends

Now, I would like to ask a few questions regarding energy efficient practices in the supermarkets you serve.

Q116. Approximately what percent of the stores with central refrigeration that you service use each of the following (enter % for each; 999 if don't know):

a) Multiplexed compressors _____%
b) High efficiency compressors _____%
c) Adjustable speed drives for compressor motors _____%
d) Floating head pressure controls _____%
e) Store dehumidification to reduce case load _____%
f) Energy management systems for refrigeration _____%
g) Cycling of anti-sweat heaters _____%
h) Permanent Split Capacitor (PSC) evaporator fan motors _____%

Importance of Energy Usage

Q303. Please tell me which of the following factors influence your customers' equipment selection decision. (Mark 1 for all that apply)

a. _____ Marketing/presentation concerns
b. _____ CFC/Refrigerant Issues
c. _____ Regulatory Requirements
d. _____ Availability of Rebates
e. _____ Declining cost of electricity
f. _____ Uncertainty about future electric market
g. _____ Uncertainty about the future structure of the supermarket industry (i.e., mergers and acquisitions)
h. _____ Availability of financing
i. _____ Other

Q304. Next, please rate for me on a six point scale, where 1 means "Not at all Important" and "6" means "Extremely Important" how your supermarket customers' rate each of the following equipment attributes. (Rotate)

a.	Appearance/contribution to sales	1	2	3	4	5	6
b.	Energy efficiency	1	2	3	4	5	6
c.	Initial cost	1	2	3	4	5	6
d.	Life cycle cost	1	2	3	4	5	6
e.	Ease of maintenance	1	2	3	4	5	6
f.	Availability of financing	1	2	3	4	5	6
g.	Eligibility for utility rebates	1	2	3	4	5	6
h.	Warranty	1	2	3	4	5	6
i.	Manufacturer's reputation/ relationship with vendor	1	2	3	4	5	6
j.	Reliability	1	2	3	4	5	6
k.	Compatibility with other equipment or other stores	1	2	3	4	5	6
l.	Immediate availability	1	2	3	4	5	6

MARKET BARRIERS

Q312. Over the past 3 to 5 years, do you think supermarket demand for energy efficient equipment has:

1. Increased
2. Decreased
3. Stayed the Same

99. Don't Know

Q313. In the next 3 to 5 years, do you think supermarket demand for high efficiency equipment will:

1. Increase
2. Decrease
3. Stay the Same

99. Don't Know

Finally, I would like to ask you a couple of questions regarding your company.

Q401. _____ How many years has your company been in business?

Q402. _____ How many people are employed at your company?

Q403. _____ About how many different supermarkets (stores, not chains) does your company service in a year?

Q403. _____ What is your position with the company?

Those are all the questions I have for you today. Thank you very much for your assistance.

PG&E SUPERMARKET REFRIGERATION CONTRACTORS SURVEY

Vendor Name: _____
Contractor Name: _____
Phone Number: _____
Service Territory: _____
Date: _____
Interviewer _____

Q1. Hello, this is _____. I'm calling from Quantum Consulting, a management consulting firm in Berkeley, California. I'm calling on behalf of PG&E. Does your company service supermarket refrigeration equipment within PG&E's service territory?

IF Q1=NO:
Thank you for your time.

IF Q1=YES:
Q2. Who would be the best person to talk with about your company's services to the supermarket industry?
(Record contact name)

Q3. May I speak with <CONTACT>?

IF Q3=NOT AVAILABLE:
Q4. When is usually a good time to reach <CONTACT>?
(**Record best time and try at a later date to interview)**

IF Q3=AVAILABLE, ASK Q5 TO <CONTACT>:
Q5. Hello, this is _____. I'm calling from Quantum Consulting, a management consulting firm in Berkeley, California. I'm calling on behalf of PG&E and was told that you were the best person to talk with about your company's servicing of refrigeration equipment for the supermarket industry. Is this correct?

IF Q5=NO:
Go to Q2 and repeat cycle.

IF Q5=YES:
Q6. PG&E is working with the California Public Utilities Commission to evaluate its existing energy-efficiency programs to help design more attractive programs for Californians in the future. To support this effort, we'd like to ask you a few brief questions regarding the effects of PG&E's programs on your business. This will only take 5-10 minutes. Is now a good time?

IF Q6=NO:
Q7. When is a good day and time to schedule this brief interview?
(Schedule best time and day)

Thank you very much. We look forward to talking with you on <DAY> at <TIME>.

First I'd like to get an idea of the structure of your industry and the services you provide.

Q100. Approximately how is your workload broken down among:

g) Supermarkets (%)_____ (defined as stores with central refrigeration)
h) Convenience stores (%)_____
i) Restaurants (%)_____
j) Refrigerated Warehouses (%)_____
k) Institutions (%)_____ (schools, hospitals, prisons, etc.)
l) Other (%)_____

Q101. Which of the following services does your firm provide to supermarkets (check all that apply):

e) Equipment maintenance and servicing
f) Equipment installation (new stores _____; existing stores _____)
g) Equipment sales
h) System design

Q102. When working with supermarkets, do you work on an as-needed basis or do you have an ongoing contract?

_____ As needed _____ Ongoing _____ Other (specify below)

_____

Q103. Who typically initiates a supermarket service call to you? (Do not read)

z) Store managers
aa) The supermarket's in-house engineering/facilities management staff
bb) Consulting engineers/designers
cc) In-house design department
dd) Corporate management
ee) Energy Service Company
ff) Equipment vendors
gg) Other _____

Q104. When a service call results in equipment needing to be replaced, who has the greatest influence on the type of equipment selected? (Do not read, check all that apply)

s) Equipment Suppliers
t) Refrigeration Contractors
u) Consulting Engineers/Designers
v) In-house design department
w) In-house engineering/facilities management staff
x) Store managers
y) Corporate management
z) Energy Service Company
aa) Other _____

Q105. Who makes the final decision on equipment purchases?

s) Equipment Suppliers
t) Refrigeration/lighting Contractors
u) Consulting Engineers/Designers
v) In-house design department
w) In-house engineering/facilities management staff
x) Store managers
y) Corporate management
z) Energy Service Company
aa) Other _____

Energy Efficiency Awareness

Q108. What is your company's primary source of information for keeping up with trends in energy efficient refrigeration technologies? *(Enter 1 for all that apply – do not read)*

a. _____ Trade magazines focused on your customers' industries
b. _____ Trade magazines focused on equipment/refrigeration
c. _____ PG&E (Your utility, if out-of-area)
d. _____ The Internet
e. _____ Professional associations
f. _____ Conferences/trade shows
g. _____ Colleagues and friends
h. _____ Manufacturer technical data
g. _____ Manufacturer advertising
i. _____ Sales calls
j. _____ EPRI/Gas Research Institute
k. _____ Colleges and universities
l. _____ Other _____

Q109. Of the sources you just mentioned, which one is the most important? _____Letter from response above

Q110 (PG&E territory only) Are you familiar with the energy efficiency programs that PG&E has offered to supermarkets over the past several years?

No (Skip to 116 – Installations) Yes (Continue)

Q111. Which of the following statements best describes how your company's marketing efforts have been influenced by PG&E's energy efficiency programs offered to supermarkets.

9. Such programs have not had any influence on our marketing efforts
10. Such programs have caused us to identify opportunities for energy-efficient installations that could help the customer qualify for a rebate

11. Such programs have caused us to emphasize energy efficiency in all our marketing efforts
12. Other _____

Q112. Have PG&E programs offered to the supermarket industry caused your company to alter the services you offer or the parts and equipment you stock?

2. Yes (please explain – record verbatim)_____
_____
2. No (why not?)
_____

Installation Trends

Now, I would like to ask a few questions regarding energy efficient practices in the supermarkets you serve.

Q116. Approximately what percent of the stores with central refrigeration that you service use each of the following (enter % for each; 999 if don't know):

i) Multiplexed compressors _____%
j) High efficiency compressors _____%
k) Adjustable speed drives for compressor motors _____%
l) Floating head pressure controls _____%
m) Store dehumidification to reduce case load _____%
n) Energy management systems for refrigeration _____%
o) Cycling of anti-sweat heaters _____%
p) Permanent Split Capacitor (PSC) evaporator fan motors _____%

Importance of Energy Usage

Q303. Please tell me which of the following factors influence your customers' equipment selection decision. (Mark 1 for all that apply)

a. _____ Marketing/presentation concerns
b. _____ CFC/Refrigerant Issues
c. _____ Regulatory Requirements
d. _____ Availability of Rebates
e. _____ Declining cost of electricity
f. _____ Uncertainty about future electric market
g. _____ Uncertainty about the future structure of the supermarket industry (i.e., mergers and acquisitions)
h. _____ Availability of financing
i. _____ Other

Q304. Next, please rate for me on a six point scale, where 1 means "Not at all Important" and "6" means "Extremely Important" how your supermarket customers' rate each of the following equipment attributes. (Rotate)

a.	Appearance/contribution to sales	1	2	3	4	5	6
b.	Energy efficiency	1	2	3	4	5	6
c.	Initial cost	1	2	3	4	5	6
d.	Life cycle cost	1	2	3	4	5	6
e.	Ease of maintenance	1	2	3	4	5	6
f.	Availability of financing	1	2	3	4	5	6
g.	Eligibility for utility rebates	1	2	3	4	5	6
h.	Warranty	1	2	3	4	5	6
i.	Manufacturer's reputation/ relationship with vendor	1	2	3	4	5	6
j.	Reliability	1	2	3	4	5	6
k.	Compatibility with other equipment or other stores	1	2	3	4	5	6
l.	Immediate availability	1	2	3	4	5	6

MARKET BARRIERS

Q312. Over the past 3 to 5 years, do you think supermarket demand for energy efficient equipment has:

1. Increased
2. Decreased
3. Stayed the Same

99. Don't Know

Q313. In the next 3 to 5 years, do you think supermarket demand for high efficiency equipment will:

1. Increase
2. Decrease
3. Stay the Same

99. Don't Know

Finally, I would like to ask you a couple of questions regarding your company.

Q401. _____ How many years has your company been in business?

Q402. _____ How many people are employed at your company?

Q403. _____ About how many different supermarkets (stores, not chains) does your company service in a year?

Q403. _____ What is your position with the company?

Those are all the questions I have for you today. Thank you very much for your assistance.

PG&E SUPERMARKET DESIGNERS SURVEY

Vendor Name: _____
Contact Name: _____
Phone Number: _____
Service Territory: _____
Date: _____
Interviewer _____

Energy Efficiency Awareness

Q103. What is your company's primary source of information for keeping up with trends in energy efficient technologies? *(Enter 1 for all that apply – do not read)*

a. _____ Trade magazines focused on supermarket industry
b. _____ Trade magazines focused on equipment/facilities management
c. _____ PG&E (Your utility, if out-of-area)
d. _____ The Internet
e. _____ Professional associations
f. _____ Conferences/trade shows
g. _____ Colleagues and friends
h. _____ Contractors/equipment suppliers
g. _____ Advertising from manufacturers
i. _____ Sales calls
j. _____ EPRI/Gas Research Institute
k. Other _____

Q 104. Of the sources you just mentioned, which one is the most important? _____Letter from response above

Q104a. Are you aware of the energy efficiency programs offered by (PG&E or your utility) to supermarket customers?

Energy Decision-Making

Now, I would like to ask you a few questions about how energy-related design decisions are made.

Existing Stores

Q105. What role does your organization play in decisions regarding the selection and installation of energy efficient equipment in **existing stores?**

a. Determines equipment to be installed
b. Installs equipment
c. Other (Probe)

Q106. How are equipment replacements/upgrades initiated?

Q107. Who is involved in the equipment selection process? (probe)

Q108. Who makes the final decision regarding equipment purchases?

Q110. What is your role relative to that of an in-house supermarket design and engineering department? Describe

Q111. What is your role relative to that of the equipment vendors? Describe

New Stores

Q112. What role does your organization play for new stores? Is it the same or different than for existing stores?

Q113.Do most supermarkets with whom you work have a master specification?
1. Yes
2. No

Q114. Does your firm develop those specifications?
1. Yes
2. No

Q115. How is energy efficiency handled for that specification?

Supermarket Specifications

Next, I would like to ask you a few questions about the specifications your company provides for supermarkets.

Q200. What percentage of the designs for supermarkets are for remodeling/renovations? What percentage are for new stores?
_____ % Remodeling _____ % New Stores

Q202.What percentage of your specifications are for stores within PG&E's Service Territory?
_____%

What percentage of your specifications are for stores outside of PG&E's Service Territory?
_____%

Q204. Do you consider PG&E's or other utility's programs when creating equipment specifications?

Q300. *Now, I am going to read a list of equipment. For each equipment type mentioned, please tell me if you include this equipment in your specifications for supermarkets within and outside of PG&E's service territory.*

Equipment Type	Specifications within PG&E's Territory	Specifications Outside of PG&E's Territory
Energy Management Systems		
Floating head pressure controls		
Multiplexed compressors		
ASD compressors		
Night covers for refrigerated cases		
(For in-store fluorescent lighting) T-8s with electronic ballasts		
(For in-store incandescent lighting) Halogen or HID bulbs		
Electronic ballasts for case lighting		
Cycling of anti-sweat heaters/humidistat controls for anti-sweat heaters		
Permanent Split Capacitor (PSC) evaporator fan motors		
Store humidity controls		
What percent of freezer (low temperature) cases have doors? _____		
What percent of (medium temperature) refrigerated cases have doors? What percent of case doors are low/no heat?		
Any other aspects of store design to minimize/manage energy use?		

Q301. Is it Easier, Harder, or About The Same to get capital for store design that it was five years ago?

Q302. It is Easier, Harder, or About the Same to get capital for cosmetic and other "marketing-related" investments compared to funding for energy-related investments?

IMPORTANCE OF ENERGY USAGE

Q303. When your customers replace equipment, please tell me which of the following factors have the greatest influence on the type of equipment selected. (Enter 1 for all that apply)

a.	_____	Marketing/presentation concerns
b.	_____	Montreal Protocols/CFC/Refrigerant Issues
c.	_____	Regulatory Requirements
d.	_____	Availability of Rebates
e.	_____	Declining cost of electricity
f.	_____	Uncertainty about future electric market
g.	_____	Uncertainty about the future composition of the supermarket industry
h.	_____	Availability of financing
I	_____	Other

Q304. Next, please rate for me on a six point scale, where 1 means "Not at all Important" and "6" means "Extremely Important," the importance of each of the following equipment attributes. (Rotate)

a.	Appearance/contribution to sales	1 2 3 4 5 6
b.	Energy efficiency	1 2 3 4 5 6
c.	Initial cost	1 2 3 4 5 6
d.	Life cycle cost	1 2 3 4 5 6
e.	Ease of maintenance	1 2 3 4 5 6
f.	Availability of financing	1 2 3 4 5 6
g.	Eligibility for utility rebates	1 2 3 4 5 6
h.	Warranty	1 2 3 4 5 6
i.	Manufacturer's reputation/relationship with vendor	1 2 3 4 5 6
j.	Reliability	1 2 3 4 5 6
k.	Compatibility with other equipment or other stores	1 2 3 4 5 6
l.	Immediate availability	1 2 3 4 5 6

Supermarket Design Trends

Q305. Over the past 2-3 years, have you changed your store designs to control, manage, or reduce energy demand?

Q306 What were reasons behind those changes?

Q307. Have utility rebate programs affected your equipment designs, if at all?

Q308. To what degree have these programs had any *long-term effects* on the way you specify energy-using equipment?

Q309. What kinds of programs do you think would be most helpful in increasing the level of awareness of energy efficient design and operations in the supermarket industry?

Q310. Do you think that the marketplace will provide these kinds of programs once utilities no longer do?

MARKET BARRIERS

Q311. What are some of the major reasons why your company did not specify high efficiency equipment in the past?

Q312. What are the major reasons that your company does not specify high efficiency equipment today?(Probe)

Q313. Do you believe specifying high efficiency equipment in the next 3 to 5 years will increase or decrease?

Q314. Why do you say that?

Finally, I would like to ask you a couple of questions regarding your company.

Q401. _____ How many years has your company been in business?

Q402. _____ How many people are employed at your company?

Q403. _____ Overall, approximately how many supermarket specifications did your company make during 1997?

Q404. _____ What is your position with the company?