

*Market Research Report*  
**Market Assessment of the  
Independently Owned Retail Food  
Sector in the Pacific Northwest**

*prepared by*

QUANTUM CONSULTING, INC.

*report #00-073*

December 2000



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***FINAL REPORT***

***MARKET ASSESSMENT OF THE INDEPENDENTLY OWNED RETAIL FOOD SECTOR IN THE PACIFIC NORTHWEST***

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## EXECUTIVE SUMMARY

### ES.1 OVERVIEW

The results of QC’s assessment of the independent retail food segment in the Pacific Northwest (PNW) are presented in this report. The research was designed to characterize the PNW retail food market, with a focus on how independent stores and rural areas fit into this overall market structure. The objectives of this research were to 1) provide a detailed market characterization of the PNW retail food sector, including market segmentation and a description of market actors, market trends, decision processes, and current energy use and savings potential, and 2) based upon the market characterization, provide recommendations for possible market transformation ventures that target one or more of the technologies, sectors, or actors.

The approach used for this study was the application of an integrated framework that incorporates (1) current and potential market actors and technologies, (2) market barriers to the adoption of the targeted technology, and (3) market interventions that are (or should be) targeted to overcome those barriers. Information for the above market assessment was drawn from a combination of existing secondary data and interviews with key market actors affecting the selection and purchase of energy using equipment in retail food stores. The sample frame for the data collection effort is shown in Exhibit ES-1.

***Exhibit ES-1  
Sample Frame***

Sector	Independents	Chains	Both	Total
Grocery Owners/Managers	<b>40</b>	<b>4</b>		<b>44</b>
W A	10	1		
OR	10	1		
ID	10	1		
MT	10	1		
C-Store Owners/Managers	<b>20</b>	<b>4</b>		<b>24</b>
W A	5	1		
OR	5	1		
ID	5	1		
MT	5	1		
Wholesalers/distributors/co-ops	<b>5</b>	<b>4</b>		<b>9</b>
Vendors/Associations				
Manufacturers/suppliers			4	4
Designers/consulting engineers			4	4
Contractors			4	25
lighting			2	
refrigeration			23	
Associations/industry experts	2	2	2	6
Totals				116

## *ES.2 MARKET SIZE AND STRUCTURE*

There are an estimated 126,000 grocery stores and supermarkets in the United States, with combined 1998 annual sales of \$449 billion. The 30,700 supermarkets (defined as grocery stores with more than \$2 million in annual sales) accounted for \$346 billion of this total. With some 4 percent of the U.S. population, the PNW accounts for a corresponding share of supermarket and grocery store sales, but a somewhat larger number of stores. According to Dun & Bradstreet data, there are about 7,000 retail food stores (SIC 5411) in the four-state PNW region classified as supermarkets, grocery stores, or convenience stores. We did not find any evidence that independent stores are necessarily rural or that rural stores are necessarily independent. For this study, we have focused on the independent rather than the rural retail food market.

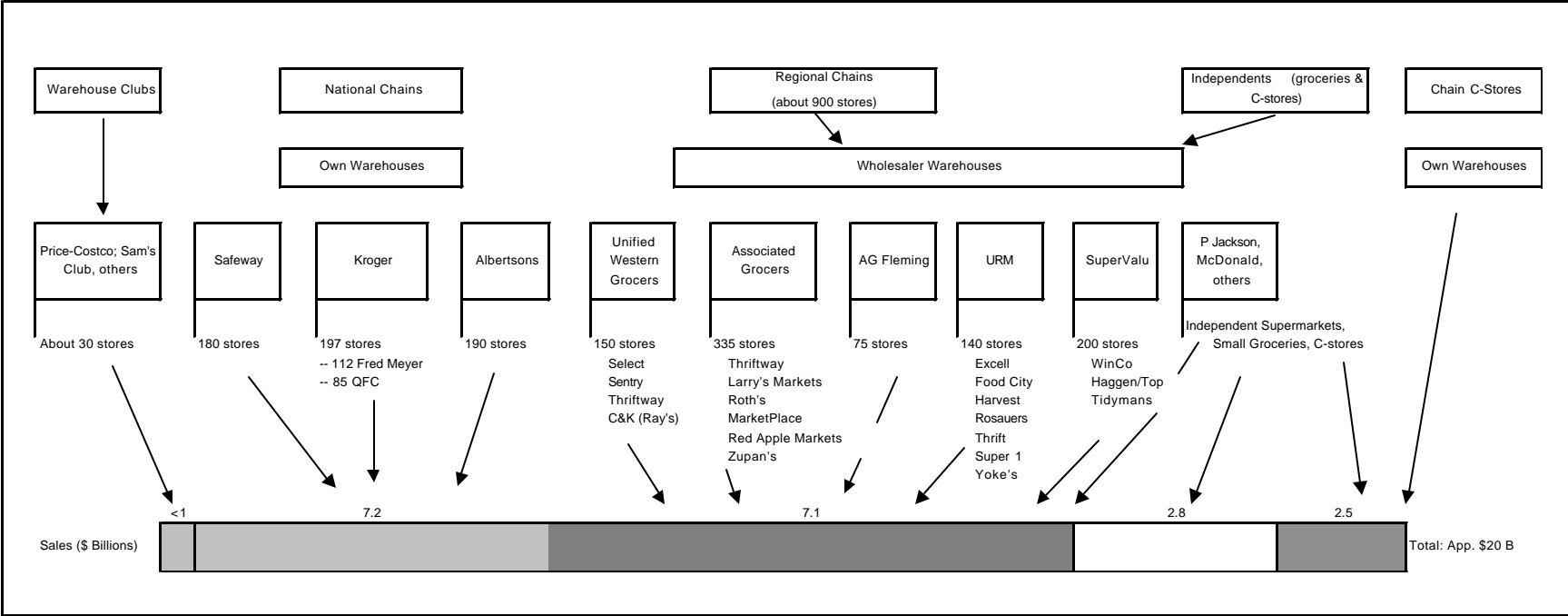
Nationally, there has been a wave of consolidation, with fewer and fewer players dominating the U.S. market. At the same time, traditional “grocery” stores face competition from convenience stores (C-stores) on the one hand and from huge supermarkets offering everything from banking to gourmet prepared foods on the other hand. And all “bricks-and-mortar” players face at least the potential of competition from electronic retailers – although none of the 68 store decision makers surveyed for this study cited electronic commerce as their “most significant competition over the next five years.”

Two of the largest PNW chains, Fred Meyer and QFC, have been bought by Kroger, and national-chain-owned stores account for almost 30 percent of sales. Compared to other parts of the country, however, the PNW appears to have a robust group of independent regional chains. Typically operating 5-15 stores, these chains rely on close ties to one of several large wholesalers to enjoy some of the same economies of scale reaped by the national chains. This suggests that regional PNW chains and larger independents may be well suited to a program that allows them to use improved energy efficiency as a tool in their struggle to remain competitive.

Exhibit ES-2 presents the overall structure of the market and the sales accounted for by various players. Perhaps because of the relatively dispersed population pattern in the PNW, national chains are somewhat less active here than elsewhere, with only three truly national chains (Safeway, Albertson’s, Kroger) participating in the market. We found a distinction both between national and regional chains and between these independent regional chains and independents who operate one or a few smaller stores.



**Exhibit ES-2**  
**Structure of the PNW Retail Food Sector**



A summary of the characteristics of each of these stores is presented in Exhibit ES-3.

**Exhibit ES-3**  
**Store Characteristics**

Type of Store	Large chains n=5	Regional chains & independents w/>20,000 total sq ft n=18	Independents w/<20000 total sq ft n=21	C-store chains (>10 stores) n=4	C-store independent n=20
Characteristics					
<b>Distribution of Space</b>					
Mean square footage	42,800	20,000	10,000	2,700	4,800
Percentage selling space	79%	84%	78%	79%	81%
Allocation of selling space					
Fresh produce	14%	20%	13%	2%	4%
Prepared foods	10%	9%	7%	4%	17%
Refrigerated food and beverages	14%	14%	10%	34%	28%
Frozen food and beverages	15%	13%	11%	2%	7%
Other food, beverages	29%	32%	48%	29%	18%
Non-food items	17%	12%	12%	29%	26%
Percent of respondents expecting this to	33%	28%	9%	25%	27%

For convenience stores, both sales per store and sales per resident were much higher in Montana and Idaho than in Washington and Oregon. Because it seems to indicate that C-stores are the primary source of groceries for at least some rural residents there, this finding suggests that efforts to reach rural areas with EE programs may be achieved by targeting C-stores.

**ES.3 MARKET STATUS**

Having determined the structure of the market, we identified key energy efficiency technologies for the retail food sector, estimated their penetration for each store type (using data from store decision makers as well as refrigeration contractors), and calculated the savings potential from increasing market penetration to 100 percent, as shown in Exhibit ES-4. This analysis helped us both to identify high potential measures overall and to focus on those measures that offer the greatest potential for the independently-owned market segments.

Based on average energy intensities of 50-60 kWh per square foot, PNW stores use an estimated 4,000-4,500 GWh of electricity per annum – an average load of 450-500 MW. To provide an indication of magnitude of potential energy savings, refrigeration alone accounts for slightly over half of food store energy usage, so a 10 percent improvement in refrigeration efficiency across all PNW store would reduce average load by 20-25 MW.

A key finding was that the regional chains, by virtue of their large store area and relatively low adoption of many technologies, show greater potential for many measures than do national chains and offer an excellent target for future market interventions.

**Exhibit ES-4**  
**Technical Potential of Energy Efficiency Measures — by Segment**

	"Consensus Estimates" of Penetration of Efficient Technologies (by segment -- %)					Potential Savings by Segment (MWh)*				
	National Chains	Regional Chains & Independent Supermktks	Small Groceries	C-store Chains	C-store Indeps.	National Chains	Regional Chains & Independent Supermktks	Small Groceries	C-store Chains	C-store Indeps.
	No. of PNW Stores									
Million Sq. Ft.	26	25	11	4	7	26	25	10	4	7
<b>Overall</b>										
Energy Management System	60	30	5	30	5	28,600	48,125	28,738	7,700	18,288
<b>Refrigeration</b>										
Central system (% of capacity)	92	80	50	0	0					
Floating head pressure control*	45	25	10	N A	N A	22,604	28,980	9,587	N A	N A
Variable Capacity Compressors										
HE or ASD compressors	30	10	5	N A	N A	26,790	33,600	10,340	N A	N A
Multiplexed compressors	45	20	10	N A	N A	35,306	53,280	17,622	N A	N A
<b>Cases</b>										
PSC evaporator fan motors	25	20	10	10	5	10,140	11,850	5,907	2,160	3,990
ECM Evaporator fan motors	10	0	0	0	0	19,422	21,938	9,851	3,600	6,300
Cycling of anti-sweat heaters	40	15	5	20	0	29,640	40,375	19,855	6,080	13,300
Night covers	5	20	30	0	5	23,254	18,460	6,978	416	0
Case doors on freezer cases	70	65	55	95	95	60,255	87,550	49,852	2,060	3,605
Case doors on refrigerated cases	30	20	20	95	95	61,750	75,050	33,022	760	1,330
No-heat doors	40	15	10	0	5	14,040	19,125	8,910	3,600	5,985
Electronic ballasts in cases	50	10	20	90	20	1,386	2,399	938	43	597
<b>Lighting</b>										
T-8 store lighting	70	30	40	85	35	32,760	73,500	27,720	2,520	19,110
Halogen or HID incandescents	15	10	10	0	25	51,935	52,875	23,265	9,400	12,338
<b>HVAC</b>										
High Efficiency HVAC	60	30	10	65	20	4,597	7,735	4,376	654	2,475
Fan speed controls for ventilation	20	5	0	80	15	27,040	30,875	14,300	936	7,735

\* Potential savings are calculated by applying impacts for each measure to the square footage (by store type) that does not yet have the measure installed.

Potential savings are net of increases in market penetration due to current EE activity for the following measures, where the following 5 year increases based on observed EE action percentages were used:

for FHP, increase of 2% per year for national, 1.2 for regional, 1.4 for independent

for ASD and multiplex, 2.8% per year for national, 1.2 for regional, .2 for independent

for night covers, calculated savings based on percent open cases; also used percent of stores installing any in 1 year as expected 5 year increase (14, 4, 2, 0, and 0)

for doors on open cases, used annual increases in percent closed of 1.5, .2, .2, 0, and 0

for PSC motors, used percent of stores installing any as expected 5 year increase in overall market penetration (10, 1, and .5 for PSC; 7, 25, and .5 for ECM)

#### *ES.4 MARKET BARRIERS AND OPPORTUNITIES*

As a next step in the market status assessment, barriers to the attainment of the potential described above were examined. First cost concerns remain a barrier for most end users; however, store decision makers clearly also face barriers in obtaining and evaluating technical information regarding efficiency measures. As would be expected, barriers were generally found to be lowest for the national chains; in fact, neither national supermarket nor C-store chains appear to see many significant barriers to the adoption of EE measures.

Just as there are some characteristics of market actors that make them more prone to barriers, there are also characteristics of players (or the market) that encourage them to adopt new technologies directly or that make it easier to influence them through a program or other market intervention. Knowledge of EE measures, willingness to accept longer paybacks, established relationships between market actors, and a limited number of players would all be expected to contribute to receptivity to program initiatives.

#### *ES.5 CONCLUSIONS AND RECOMMENDATIONS*

The characteristics of major players in the PNW retail food market, together with the evidence of EE actions being undertaken by all segments, suggest that there are, in fact, opportunities to move this market toward greater EE. Using estimates of savings potential, high-potential measures were identified and strategies developed to promote those measures, using the perceptions of program element effectiveness reported by contractors and store decision makers. Exhibit ES-5 summarizes some of the more promising measures and technologies that can be used to improve energy efficiency in the retail food sector, presents the potential savings estimate for each segment, and suggests a combination of program elements appropriate for increasing acceptance of the technology or measure in that segment. Note that, in some cases, a specific set of program elements is recommended for more than one segment (for example, similar program designs are often appropriate for national chain supermarket and national chain C-stores), in which case the associated impacts are presented on a single line.

The combinations of measures and market interventions can be broadly grouped into those that call for a resource acquisition approach and those that may be appropriate targets for the combination of elements typical of a market transformation effort.

- In general, there is no reason to think that market transformation program elements should be targeted to the largest players, the national chains. There is every indication that these players have extensive resources, access to knowledge and capital, and an understanding of the energy usage ramifications of their equipment purchase and store design decisions.
- Resource acquisition strategies may, however, be consistent with the goals of individual utilities in the PNW to reduce energy usage (and demand, although we have not focused on kW reductions in this report). Incentives could, for example, help to accelerate the adoption of already popular measures such as efficient lighting and doors on both medium and low temperature cases.

**Exhibit ES-5**  
**Proposed Measures and Program Strategies**

MEASURES	Potential Savings by Segment (GWh)*					Program Strategies												
	National Chains	Regional Chains & Indepdt Supermkt	Small Groceries	C-store Chains	C-store Indeps.	Market Transformation								Resource Acquisition				
						Technical Assistance	Training for staff	Training for Contractors	Financing	Incentives/rebates	Audits	Demonstration Programs	Informational Brochures	Web-based Information	Incentives/rebates	Audits	Financing	
Energy Management System	48.1				18.3	●	●	●	●			●	●	●	●			
Floating head pressure control	29.0					●	●	●	●			●	●	●	●			
HE or ASD compressors	26.8					●	●	●				●	○	●	●	●	●	●
Multiplexed compressors	35.3					●	●	●				●	●	●	●			
PSC evaporator fan motors	11.9				4.0		○	●			○		●	●	●			●
ECM Evaporator fan motors	19.4				3.6	●	●	●				●	●	●	●			●
Cycling of anti-sweat heaters	29.6				6.1	●	●	●				●	●	●	●			●
Night covers	18.5				13.3			●				●	●	●	●			
Case doors on open cases	122.1					●	●					●	●	●	●			●
No-heat doors	14.0				3.6	●	●	●				●	●	●	●			●
Electronic ballasts in cases	2.4				6.0	●		●				●	●	●	●			
T-8 store lighting	32.8				2.5	●	●					●	○	●	○			●
Halogen/HID incandescents	51.9				9.4	●	●	●				●	●	●	●			●
HVAC																		
High Efficiency HVAC	4.6	7.7										●	●	●				●
Ventilation fan speed controls	27.0	30.9	14.3		7.7	●		●				●	●	●				●

Other interventions would be targeted more specifically to helping transform the independent and rural retail food market; i.e., the smaller regional chains and independent supermarkets, small groceries, and independent C-stores. For these segments, we propose a mix of design elements that would help overcome the barriers identified earlier, so that permanent changes in the market might result.

The proposed combination of interventions targeted to specific market actors includes:

- Technical assistance for regional chains, as well as for contractors who serve the small independent stores, in addressing specific system design or measure implementation issues, such as floating head pressure control, unequal parallel compressors, cycling of anti-sweat heaters, or the use of high-efficiency lighting.

- Training for refrigeration contractors and their technicians in such topics as floating head pressure control, anti-sweat heater cycling, smart defrost, and the proper use of controls.
- Training for store owners and managers to assist them in making appropriate equipment selection decision and to help them properly manage more sophisticated EE systems, such as energy management systems or floating head pressure controls.
- One or more demonstration sites where EE measures are installed and evaluated – not in large chains, but in a smaller independent grocery and/or C-store
- Technical assistance and rebates to encourage refrigeration contractors to stock PSC or ECM motors, and rebates for smaller chains and independents that purchase such motors. Rebates for national chains might be appropriate as part of a resource acquisition strategy.
- Technical information and case studies, either in brochures/fact sheets or on the internet, describing various measures as they would apply to regional chains and independents, including costs, paybacks, and non-energy benefits.
- A high-visibility, system-specific audit program that would be promoted by participating wholesalers and co-ops through their store support departments.

Because of the significant potential that exists within the targeted independent retail food sector, it is recommended that these program elements receive serious consideration for future NEEA programs.

## 1. INTRODUCTION

The results of QC's assessment of the independent retail food segment in the Pacific Northwest (PNW) are presented in this report. This initial chapter recaps the grocery market assessment's objectives, describes the analytical framework that was used to guide the study, and presents the specific steps that were taken to complete the market assessment.

### 1.1 RESEARCH OBJECTIVES

From the study requirements set forth in the RFP and subsequent discussion at the project initiation meeting, the research effort was designed to characterize the PNW retail food market as a whole, with a focus on how independent stores and rural areas fit into this overall market structure. The objectives of this research were to:

- Provide a detailed market characterization of the PNW retail food sector, including market segmentation and a description of market actors, market trends, decision processes, and current energy use and savings potential.
- Based upon the market characterization, provide recommendations for possible market transformation ventures that target one or more of the technologies, sectors, or actors.

We see the first of these objectives as being met by finding answers to three key questions:

- Is the independent sector viable?
- Does sufficient technical potential exist for energy efficiency measures?
- Do market conditions exist to make a program possible?

We believe these questions can all be answered in the affirmative, based upon the research results presented in this document and achieved using the data sources and methodology described below. In light of these affirmative responses, a number of market interventions were analyzed, and specific program elements are recommended for consideration by the Northwest Energy Efficiency Alliance (the Alliance).

### 1.2 METHODOLOGY

#### 1.2.1 Overview

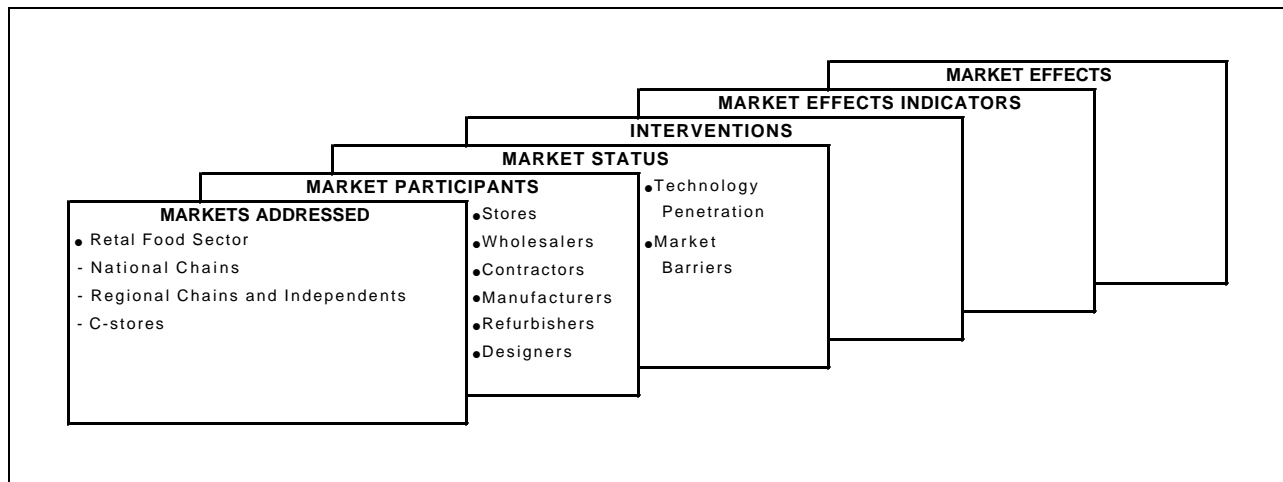
The approach used for this study was the application of an integrated framework for assessing MT market environments, program potential, and program and market effects. This approach features a standard (but flexible) template that incorporates (1) current and potential market actors, (2) market barriers to the adoption of the targeted technology, (3) market interventions that are (or should be) targeted to overcome those barriers, and (4) current or potential market effects indicators. The primary focus of this research has been on the first three of these steps,



with market effects indicators generally limited to the penetration of efficient technologies and the number of energy efficiency actions undertaken.

Exhibit 1-1 below summarizes the elements of the MT framework used for this study; it should be kept in mind that these dimensions are thought of as linked throughout, as will be shown in subsequent discussion.

**Exhibit 1-1**  
**Study Approach to Market Characterization**



### 1.2.2 Step 1 - Market Actor Identification/Verification

As a first step, each type of market participant in the targeted industry is identified. Market participants include all persons or entities affecting the operation of the market, either directly, or indirectly. Usually, these market actors are listed in order of importance to the targeted market. In the present example, independent food stores are the most important actor in the market of interest (although our subsequent analysis has identified a subset of the market — regional chains — that appears to hold the greatest promise.)

Although this market assessment focused primarily on end users, we recognize that characterizing the entire market and all market participants is also important to successful market transformation efforts. Our analysis therefore also included both direct suppliers of products and services (e.g., equipment manufacturers and refurbishers, contractors) and supporting players such as wholesalers, trade associations, and utilities.

### 1.2.3 Step 2 - Technology Characterization

Next, the technology applicable to the independent retail food sectors was characterized, both in terms of current energy usage and in terms of the energy savings that could be achieved through the adoption of available technologies. For a number of key energy efficiency measures relevant to food stores, per unit impacts were determined from secondary data sources and combined with primary survey data on measure penetration to estimate the

savings potential offered by these EE technologies. In addition, promising new technologies were investigated to determine their applicability to the independent retail food sector.

#### *1.2.4 Step 3– Market Status Assessment – Barriers and Opportunities*

Once the market actors were identified, the current status of each group of market actors relative to energy efficient store design and operation was assessed. This meant that barriers to adoption of the technology or measure in question — and to broader adoption of energy efficiency — were identified and prioritized for each market actor. Identifying the barriers as they apply to each market participant is the most essential portion of this step in the market characterization. How each group of market participants perceives a barrier determines, in part, the appropriate intervention strategies for those participants.

Barriers to adoption of EE technologies were analyzed on a segment-by-segment basis. For end users (retail stores), these barriers were measured quantitatively based on survey results; for other market actors, barriers were determined using the results of qualitative interviews, secondary data review, and researcher judgement.

In addition to market barriers, the market status assessment included an effort to identify the extent to which each group of market actors had characteristics that might make them receptive to EE initiatives. These characteristics conform in many ways to the stages in the adoption of new technologies; for example:

- Market actors are presumed to be more likely to accept (or facilitate) EE initiatives if they have moved through the awareness stage and have become knowledgeable about EE. Therefore, the extent of technical knowledge about EE was deemed to be a characteristic that would influence receptivity to EE initiatives.
- Market actors who have reached the evaluation stage are presumed to be actively seeking out and receptive to new information, and those who accept relatively long paybacks are presumed to systematically evaluate the costs and benefits of EE measures.
- While there was no direct counterpart to the intent stage, it was assumed that market actors who had well-established relationships with others in the product chain would be in a better position to influence (or be influenced by) others and have their intent translate into action.
- A small number of players in a market would not necessarily mean a greater likelihood for action, but it was assumed that a market segment or group of market actors with relatively few players would be easier to influence so that EE measures are adopted.
- Actions by relatively few players are also expected to be more likely to lead to permanent, sustainable change in the market, in part because competitive pressures in some segments would force players to adopt more efficient new technologies already installed by their rivals.

### 1.2.5 Step 4– Intervention Strategy Assessment

This step in the MT process not only identifies appropriate intervention strategies, but also links them to the targeted market actors, barriers, and adoption stages. The primary reason for the intervention and barrier linkage step is to ensure effective and efficient barrier reduction and associated movement toward the adoption of EE technologies. A clear picture of the linkages will show that some barriers can be significantly reduced or eliminated using one intervention strategy, while others may require a combination of interventions to be effective.

For this project, high-potential interventions targeted to each group of players in the independent retail food market were an explicit outcome of this approach. The market characterization therefore yields a “short-list” of potential *types* of interventions that could be useful for this market, providing an excellent basis for determining a) whether programs targeted to this market should be pursued, and b) where to begin in the program design process.

## 1.3 DATA SOURCES

Information for the above market assessment was drawn from a combination of existing secondary data and interviews with key market actors and influencers, as described briefly below.

### 1.3.1 Secondary Data

A number of existing information sources were used, including those presented in Exhibit 1-2 below. One of the most significant roles that secondary sources can play is to put the present study in a broader context, since these sources provided extensive information regarding national market trends in the food industry, industry dynamics, the role of new technologies, and energy usage and efficiency. Secondary sources also provided invaluable data regarding the structure of the market in the PNW; for example, it was possible through a review of data on the internet to develop a fairly detailed picture of the relationships between the region’s several largest wholesalers and dozens of regional chains, thereby helping to confirm the relative importance of regional chains in the PNW food sector.

Additional secondary data sources were reviewed for Phase 2 of this study to compare their reported market penetration of EE technologies to the Phase 1 findings; these sources included the Supermarket Market Effects study conducted by QC for PG&E in 1998, which included estimates of market penetration for a number of key technologies both in PG&E’s service territory and in a territory with no programs in the Midwest. Estimates in this study used both store interviews and surveys of refrigeration contractors. Also reviewed were the 1999 ADL study on market potential for efficient motors in refrigeration applications and a 1995 LBL/RER study of refrigeration energy usage and savings potential.

**Exhibit 1-2**  
**Associations and Secondary Data Sources**

**Associations**

EPRI  
DOE  
Food Marketing Institute  
Independent Grocers Alliance  
North American Wholesale Grocers Association  
American Frozen Food Institute  
American Institute of Food Distribution  
National Association of Specialized Food Trade  
National Association of Convenience Stores  
National Food Brokers Association  
National Food Distributors Association  
National Grocers Association  
Air Conditioning Contractors of America  
Air-conditioning and Refrigeration Institute (ARI)  
Commercial Refrigerator Manufacturers Association  
International Association of Refrigerated Warehouses  
Portland State University Food Industry Management Program  
Northwest Food Processors Association

**Publications**

Convenience Store News  
Progressive Grocer  
Supermarket Business  
Supermarket News  
Frozen Food Age  
Air Conditioning, Heating, and Refrigeration News  
Store Equipment and Design

**Web Sites and Industry Reports**

**Major Brokerage Houses (e.g., DLJ, Merrill Lynch)**

*1.3.2 Primary Data*

Information was collected from all major actors affecting the selection and purchase of energy using equipment in retail food stores. The sample frame for the data collection effort is shown in Exhibit 1-3. In keeping with the research objectives and the need to make optimum use of available resources, the greatest emphasis was initially placed on gathering information from end users, while the second phase of the research focused on refrigeration contractors. By virtue of their larger sample sizes, responses from these market actors were analyzed quantitatively; information from other market actor interviews was analyzed qualitatively.

Even for the end user and refrigeration contractor data, however, we would emphasize the small sample sizes for many of the segments studied — in part because we found two distinct segments within the independent grocery store segment and analyzed results accordingly.

Many differences between segments in, for example, importance ratings assigned to perceived barriers or decision influences are unlikely to be statistically significant. We believe these results are nonetheless very valuable in providing an indication of the relative importance of these barriers and other indicators of market effects for the various segments.

**Exhibit 1-3**  
**Sample Frame**

Sector	Independents	Chains	Both	Total
Grocery Owners/Managers	40	4		44
W A	10	1		
O R	10	1		
ID	10	1		
M T	10	1		
C-Store Owners/Managers	20	4		24
W A	5	1		
O R	5	1		
ID	5	1		
M T	5	1		
Wholesalers/distributors/co-ops	5	4		9
Vendors/Associations				
Manufacturers/suppliers			4	4
Designers/consulting engineers			4	4
Contractors			4	25
lighting			2	
refrigeration			23	
Associations/industry experts	2	2	2	6
Totals				116

#### 1.4. REPORT ORGANIZATION

The remainder of this report is organized as follows:

- In Chapter 2, an overview is presented of the retail food market, highlighting key national trends and issues that are also shaping the industry in the PNW.
- Chapter 3 provides an assessment of energy using technologies relevant to the retail food sectors, identifying key energy efficiency (EE) measures that were investigated in this study.
- Chapter 4 describes the key players and their roles in the retail food market.
- The current status of the market is discussed in Chapter 5, emphasizing the current penetration of EE technologies, the level of barriers faced by the independent food sector, and market characteristics that might facilitate the adoption of EE measures.

- Chapter 6 presents an overview of market interventions and their potential effectiveness as perceived by decision makers and refrigeration contractors.
- Chapter 7 offers conclusions and recommendations regarding potential program designs targeted to the independent retail food sector.

## 2. INDUSTRY OVERVIEW

### 2.1 MARKET SIZE AND STRUCTURE

According to the Food Marketing Institute, there are an estimated 126,000 grocery stores and supermarkets in the United States, with combined 1998 annual sales of \$449 billion. The 30,700 supermarkets accounted for \$346 billion of this total, with supermarkets defined as grocery stores with more than \$2 million in annual sales.

With approximately 4 percent of the U.S. population, the Pacific Northwest accounts for a corresponding share of supermarket and grocery store sales, but a somewhat larger number of stores. According to Dun & Bradstreet data (presented in Exhibit 2-1), there are over 12,000 retail food stores (SIC 5411) in the four-state PNW region, including about 7,000 classified as supermarkets, grocery stores, or convenience stores. Of the 3,258 stores for which “chain” or “independent” is specified, 2,340, or 71 percent, are classified as independent.

**Exhibit 2-1  
Pacific Northwest Food Stores**

*Non-Metro Area Stores*

	Supermarkets	Groceries	C-Stores	Totals
Independent	53	643	348	1044
Chain	119	53	115	287
Not Specified	82	821	546	1449
<b>Total</b>	<b>254</b>	<b>1517</b>	<b>1009</b>	<b>2780</b>

*Metro Area Stores*

Independent	60	689	547	1296
Chain	315	82	234	631
Not Specified	110	1490	755	2355
<b>Total</b>	<b>485</b>	<b>2261</b>	<b>1536</b>	<b>4282</b>

*Entire Region*

Independent	113	1332	895	2340
Chain	434	135	349	918
Not Specified	192	2311	1301	3804
<b>Total</b>	<b>739</b>	<b>3778</b>	<b>2545</b>	<b>7062</b>

About 39 percent of all stores in the PNW are located outside a metropolitan area. For grocery and convenience stores, the mix of independent and chain stores is not that different between metro and non-metro areas; for supermarkets, however, chain stores outnumber independents by more than 5:1 in the metro areas, but by only 2:1 in the non-metro areas, reflecting the tendency for chain stores to locate in those markets where buyers are most plentiful. There

does not appear to be any reason to assume either that independent stores are necessarily rural or that rural stores are necessarily independent. For this study, we have focused on the independent rather than the rural retail food market.

## 2.2 MARKET TRENDS

Nationally, the retail food industry has been going through turbulent times in the past several years. There has been a wave of consolidation, with fewer and fewer players (some of them foreign-based) dominating the U.S. market. At the same time, traditional “grocery” stores face competition from convenience stores (C-stores) on the one hand and from huge supermarkets offering everything from banking to gourmet prepared foods on the other hand. And all “bricks-and-mortar” players face at least the potential of painful price competition from electronic retailers.

### 2.2.1 Consolidation

The major issue in the grocery industry in 2000 and beyond is consolidation. The question is whether independent retailers can effectively compete in the new environment. By the end of this year, it is estimated that the three largest national chains — Kroger, Safeway, and Albertson's — together with WalMart, will represent 30 to 40 percent of the food business (Supermarket News, Jan. 25, 1999, pp. 11-14).

Meanwhile, the number of independents (defined by the Food Marketing Institute as companies with fewer than 10 stores) and their share of the market has dwindled steadily. The failure rate for independents has risen to its highest level ever, and many small operators throughout the country are fighting to keep their doors open. The National Grocers Association (NGA), a trade group for independents, has set an agenda intended to help propel independent grocers competitively into the new millennium. The two major goals aimed at fulfilling the agenda are:

- To strengthen the competitive position of the independent retail-wholesale system, particularly that of privately owned retail companies.
- To aggressively pursue a campaign to level the playing field with supercenters (Supermarket News, Jan. 25, 1999, pp. 16-21).

In addition, a number of independents continue to survive, and even thrive, by pursuing strategies that help them to establish a niche in their city or region. Several strategies emerge as the most frequently pursued:

- One is to provide a level of personalized service that is hard for chains to match. Jimmy Lee, the owner of Son's Supermarkets, says the only way independents can compete is to out-service the bigger grocers (Chain Store Age, Feb. 2000, p. 51).
- Another is to find unique business approaches that allow independents to compete on price. Jim Trucci, owner of Trucci's Supermarkets of Taunton, Mass., says that “one of the reasons we can compete is because we order direct and keep our prices down.



Although he has only five stores, Trucci has his own warehouses, which "enables us to stay competitive with the bigger chains" (Chain Store Age, Feb. 2000, pp. 52-54).

- Perhaps the most widely replicable approach is for independents to form partnerships.
  - Danny Wegman, president of Wegman's Food Markets (an independent grocery) and chairman of the Food Marketing Institute, says that "independents have an opportunity to form alliances that will replicate some of those economies." Wegman notes that "the megaretailer group has the economies of scale, but working against them is the ability to innovate....The smaller companies can innovate but the challenge is for them to be efficient." One way for independents to do that is to form alliances that help them to replicate some of the economies of scale of the large chains.
  - Thomas Zaucha, president of the National Grocers Association (NGA), also believes that partnerships are the future of independents. "The independent supermarket might be able to partner with a gasoline company and build a gasoline station in the store parking lot. Then a valet service could be set up so a shopper could leave the car at the gas pump where it could be fueled and washed. Meanwhile, the shopper would be inside the supermarket shopping and, depending on store services, selecting a video, dropping off dry cleaning, picking up a prepared meal previously selected by means of the Internet, and visiting a wellness center to sign up for an exercise class; all before retrieving the car. At the end of all that, the shopper will have spent more money, but will also have done all the family errands much more efficiently than was possible in the traditional supermarket" (Supermarket News, Jan. 25, 1999, pp. 16-21).

Tim Hammonds, former president of FMI, says, "given the efficiencies of some of the larger companies, probably it is true that smaller companies need to go in either of two directions. One is to become a high-service store with gourmet product and whole-health solutions; the other is to become very disciplined, featuring low service and low prices. Despite all that's happened, I still think this is an industry that has room for all types of operators. But, obviously its going to be necessary for family-owned companies to become more focused on a very specific strategy. They need to discover what niche they should occupy" (Supermarket News, Jan. 25, 1999, pp. 11-14).

Consolidation has also hit hard in the PNW. Two of the largest regional chains, Fred E. Meyer and QFC, have been absorbed by Kroger, leaving national-chain-owned stores accounting for almost 30 percent of sales. Consolidation has also taken place at the wholesale level, where a handful of large wholesalers and/or coops dominate the market.

A recent article in Chain Store Age notes that, "ironically, the recent consolidations in the Northwest region may have created a window of opportunity for one or two enterprising small chains, particularly in Montana, where only two major chains, Kroger and Albertsons, dominate the market and some areas remain under-stored (Chain Store Age, Feb. 2000, pp. 52-54). This opportunity for smaller chains in the PNW was confirmed by interviews with other players and review of other data.

Compared to other parts of the country, the PNW appears to have a robust group of independent regional chains. Typically operating 5-15 stores, these chains rely on close affiliation with one of several large wholesalers to enjoy some of the same economies of scale reaped by the national chains. This phenomenon is one of the key results of this study, and suggests that regional PNW chains and larger independents may be well suited to a program that allows them to use improved energy efficiency as a tool in their struggle to remain competitive.

These regional chains face competition both from larger and smaller stores. As shown in Exhibit 2-2, about 70 percent of these players see their strongest competition over the next five years as coming from national chains and mega-retailer; the remainder see specialty groceries, other independents, and C-stores as their primary rivals.

**Exhibit 2-2**  
**Perceived Competition**

Type of Store	Large chains	Regional chains & independents w/>20,000 total sq ft	Independents w/<20000 total sq ft	C-store chains (>10 stores)	C-store independent
	n=5	n=18	n=21	n=4	n=20
Competition					
Integrated mega-retailers (e.g., Wal-Mart)	57%	35%	35%		3%
Chain supermarkets	14%	35%	38%	17%	
Specialty groceries	29%	14%	14%	17%	
Independent supermarkets and groceries		8%	8%		
C-stores (general)		5%			42%
C-stores with gasoline				66%	45%
Electronic commerce					
Other		3%	5%		9%

Respondents were asked "which competitors do you see having the greatest potential impact on your business over the next five years?"

### 2.2.2 Technology

According to almost every published source reviewed, e-commerce will play a major role in the future. FMI Chairman Wegman believes that e-commerce will be much more than ordering over the Internet; he sees the Internet as a facilitator than can provide the communications between retailers and suppliers.

For example, Wegman notes that the Uniform Code Council is exploring a system, called UCCNet, that is seeking to establish a common standard for an industry extranet. The applications would include scan-based trading and collaborative planning, forecasting, and replenishment. There are currently three retailers and three manufacturers involved (Wegmans, Supervalu, Kroger, Proctor & Gamble, Ralston, and Frito-Lay) (Supermarket News, May 3, 1999, pp. 52-58).

Priceline.com, a company offering name-your-own-prices via the World Wide Web, has begun entering the market for groceries. An affiliate of Priceline, WebHouse Club, is currently offering

service to customers in Washington, DC, Baltimore, Philadelphia, Detroit, New York City, Connecticut, and Massachusetts. In New York City alone, 300,000 consumers signed up for the service in November and December of 1999 — representing 4 percent of the population in only two months.

As with Priceline, WebHouse Club consumers make offers on groceries on the Web site. If the prices are accepted, consumers go to the specific grocery store, pick items off the store shelves, and take their shopping carts through a checkout line. The fact that brick and mortar stores are included in this process means that Priceline.com is not competing with the stores, but actually working with them and boosting sales (Boston Globe, 3/16/2000, p. A1).

Despite initial interest in a number of markets, internet shopping for groceries has yet to significantly impact the independent retail food sector. It certainly has not yet affected the perceptions of the PNW retail food sector: as shown in Exhibit 2-2, of the 68 store decision makers surveyed for this study, not one cited electronic commerce as their “most significant competition over the next five years.” Several respondents did, however, cite electronic commerce as a major trend that would shape the industry over the next five years.

Evidence of this can be seen in the fact that most of the independent regional chains operating in the PNW have web sites. Most of these seem to be trying to build customer relationships, with coupons and store specials, recipes, and other information as well as information on store locations and hours. In addition, several PNW wholesalers say they are close to offering their customers the ability to enter orders electronically over the internet.

Electronics are also being used to improve all aspects of store management. Bill James, VP for Industry Affairs for the Grocery Manufacturers of America, believes that computer chips will be common in the interactive grocery store in the future. "Chips of the shelves will be the next big thing in retailing. With these micro-sensors embedded into product packaging, shopping carts, store shelves, and checkout counters, today's concept of "solution selling" will transform into tomorrow's interactive store — where ideas and solutions that make sense for your lifestyle will be the focal point of the shopping experience (GMA White Paper: Interactive Shopping — The Next Big Idea: Chips).

In addition, microchips are bringing added power and flexibility to the management of energy-using devices. As noted in the next chapter and described in greater detail in Appendix A, wireless sensors and controllers can now be easily installed anywhere in a store, providing a new level of control over lighting levels, case temperatures, and defrost cycles.

### *2.2.3 Regulation*

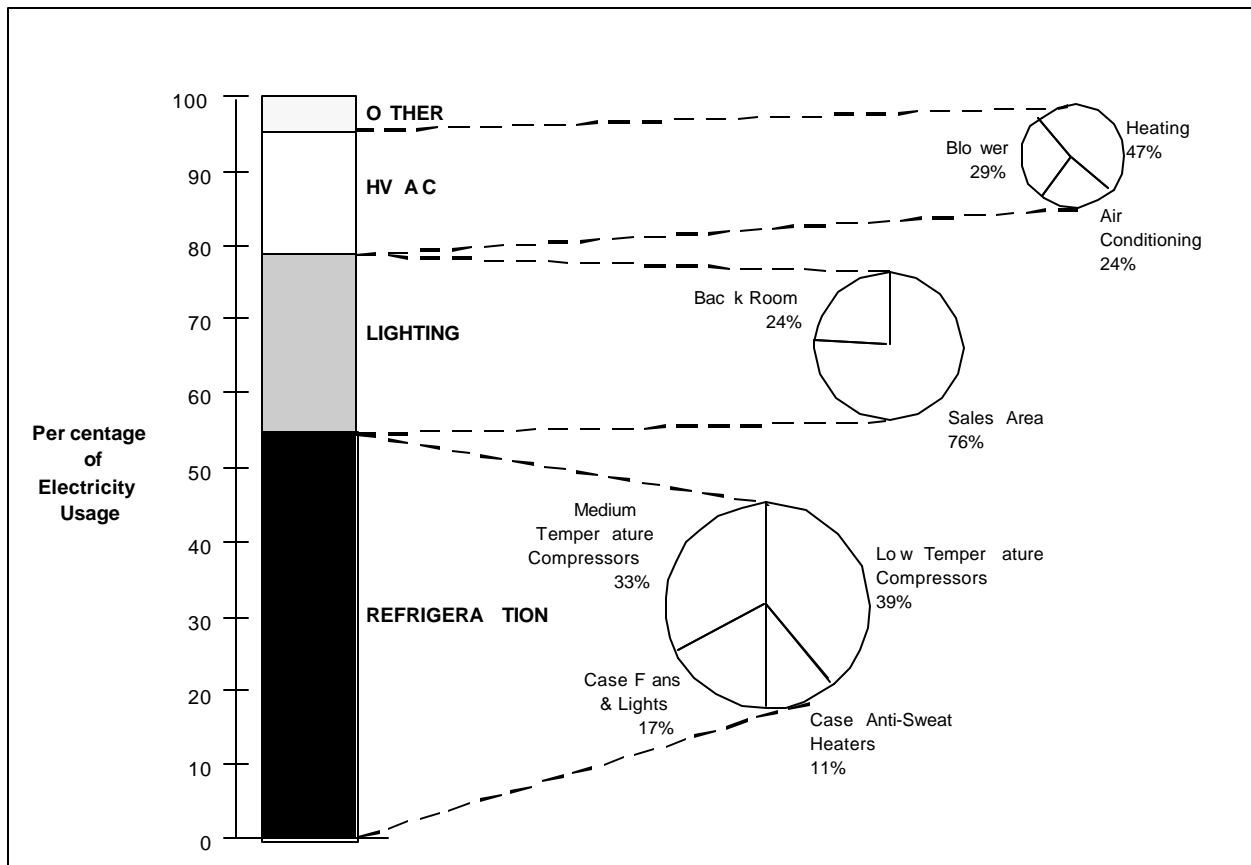
Finally, the retail food sector finds itself faced with increasingly complex, increasingly stringent regulations of everything from food temperature to refrigerant leakage to lighting levels. Individually, these regulatory requirements can be managed; collectively, they create another area where independent stores are at a disadvantage to national chains with their corporate and legal infrastructure.

The impact of all these trends on the roles of various market actors and on the level of energy efficiency pursued by store engineers, managers, and owners is discussed in the remainder of this report.

### 3. TECHNOLOGY CHARACTERIZATION

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 3-1 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 3-1  
Supermarket Electricity Usage**



Electricity usage in large stores currently averages 50-60 kWh per square foot per year. The overall trend in supermarket energy intensity had been downward until about 1995, but has been increasing since then. Explanations for the increase in energy intensity range from product mix (a growing share of food prepared on the premises) to regulatory factors (CFC-free refrigerants, food safety issues). While this trend can be viewed as creating additional barriers to energy efficiency, it can also be seen as offering significant opportunities in the retail food sector.

Nationally, utility costs amount to about 1.2 percent of a typical supermarket's sales, or about 5 percent of operating costs. Most of the store decision makers interviewed for this study overestimated the importance of electricity cost; on average, they reported that electricity represented about 10 percent of operating cost. Exhibit 3-2 provides a summary of the average breakdown of energy usage as perceived by store decision makers.

**Exhibit 3-2**  
**Self-reported Breakdown of Store Energy Usage**

Type of Store	Large chains n=5	Regional chains & independents w/>20,000 total sq ft n=18	Independents w/<20000 total sq ft n=21	C-store chains (>10 stores) n=4	C-store independent n=20
Energy Usage					
Energy as percent of operating cost	17%	10%	7%	12%	9%
Allocation of energy usage					
Indoor lighting	17%	20%	18%	6%	16%
Outdoor lighting	4%	3%	4%	5%	8%
Refrigeration	43%	50%	49%	46%	35%
Heating and Cooling	27%	18%	16%	27%	29%
Food preparation equipment	5%	5%	8%	10%	10%
Store computers/registers	4%	3%	4%	3%	4%
Other				2%	

Note that the 18 regional chains and independent supermarkets surveyed provided an average breakdown very similar to that shown in Exhibit 3-1. For independent C-stores, the breakdown of energy usage is perceived to be somewhat different, with less accounted for by refrigeration and more by outdoor lighting, HVAC, and food preparation equipment (the latter is reflected in the higher proportion of store space allocated to prepared foods by independent C-stores).

Based on average energy intensities of 50-60 kWh per square foot, PNW stores use an estimated 4,000-4,500 GWh of electricity per annum – an average load of 450-500 MW. To provide an indication of magnitude of potential energy savings, refrigeration alone accounts for slightly over half of food store energy usage, so a 10 percent improvement in refrigeration efficiency across all PNW store would reduce average load by 20-25 MW.

Energy efficiency initiatives have been (and continue to be) targeted to the largest end uses: refrigeration, lighting, and HVAC.

- Refrigeration in particular has offered numerous opportunities for improvements of energy efficiency, both in the operation of central systems and in the design and operation of display cases. While compressor technology improvements have been aggressively pursued for more than a decade, improvements to cases have been largely limited to enclosing a greater proportion of cases. This alone has had a significant impact, but there appear to be greater opportunities for increased efficiency in case design.

- Lighting improvements have typically been focused on the replacement of T12 fluorescents with T8s, both for overhead store lighting and for display cases, although lighting controls and daylighting also offer energy savings potential. In addition, T5 bulbs offer additional efficiency benefits, and may also provide an opportunity to rethink how fixtures are designed to make optimum use of this new technology.
- For HVAC, the installation of efficient heating and cooling systems, store dehumidification, and ventilation fan speed reduction measures can all help reduce energy usage. In the area east of the Cascades, where humidity is relatively low, evaporative cooling also appears to have significant potential.

Exhibit 3-3 presents a list of specific measures that were investigated for this study, along with estimated impacts, derived from secondary sources. Note that these impacts are not offered as detailed engineering estimates for the PNW; rather, they are meant to provide an indication of the magnitude of the potential each technology or measure offers. Note also that impacts from these measures are not necessarily additive; for example, several measures may be designed to reduce the amount of energy used by a central rack of compressors, and implementing two measures that would each reduce compressor usage by 10 percent is unlikely to reduce usage by 20 percent. The extent to which each of these measures has been adopted by PNW food stores is examined in the market status assessment in Chapter 5.

Much of the emphasis in store equipment design and selection in recent years has been driven by regulatory concerns, including refrigerant use and leakage and more precise temperature monitoring of foods in cases. While these concerns have indirectly benefited energy efficiency in that they have triggered equipment upgrades and replacement, there also continue to be advances in energy efficiency, such as smart defrosting, liquid pressure amplifiers or liquid refrigerant pumping, and “smart” case controllers. Several of these are discussed in a summary of energy related product offerings highlighted at the recent Food Marketing Institute Supermarket Show in Chicago. Prepared by Store Equipment and Design Technical Editor Marc Sandofsky, this summary is presented in Appendix A.

**Exhibit 3-3**  
**Energy Efficiency Measures and Estimated Impacts**

	Impacts
	Energy savings per 10,000 sq feet (kWh)
	Baseline usage 550,000 kWh
<b>Overall</b>	
Energy Management System	27,500
<b>Refrigeration</b>	
<i>Central system (% of capacity)</i>	
Floating head pressure control	21,000
Variable Capacity Compressors	
HE or ASD compressors	20,000
Multiplexed compressors	36,000
<b>Cases</b>	
PSC evaporator fan motors	6,000
ECM Evaporator fan motors	9,000
Cycling of anti-sweat heaters	19,000
Night covers	20,800
Case doors on freezer cases	103,000
Case doors on refrigerated cases	38,000
No-heat doors	9,000
Electronic ballasts in cases	1,066
<b>Lighting</b>	
T-8 store lighting	42,000
Halogen or HID incandescents	23,500
<b>HVAC</b>	
High Efficiency HVAC	4,420
Fan speed controls for ventilation	13,000

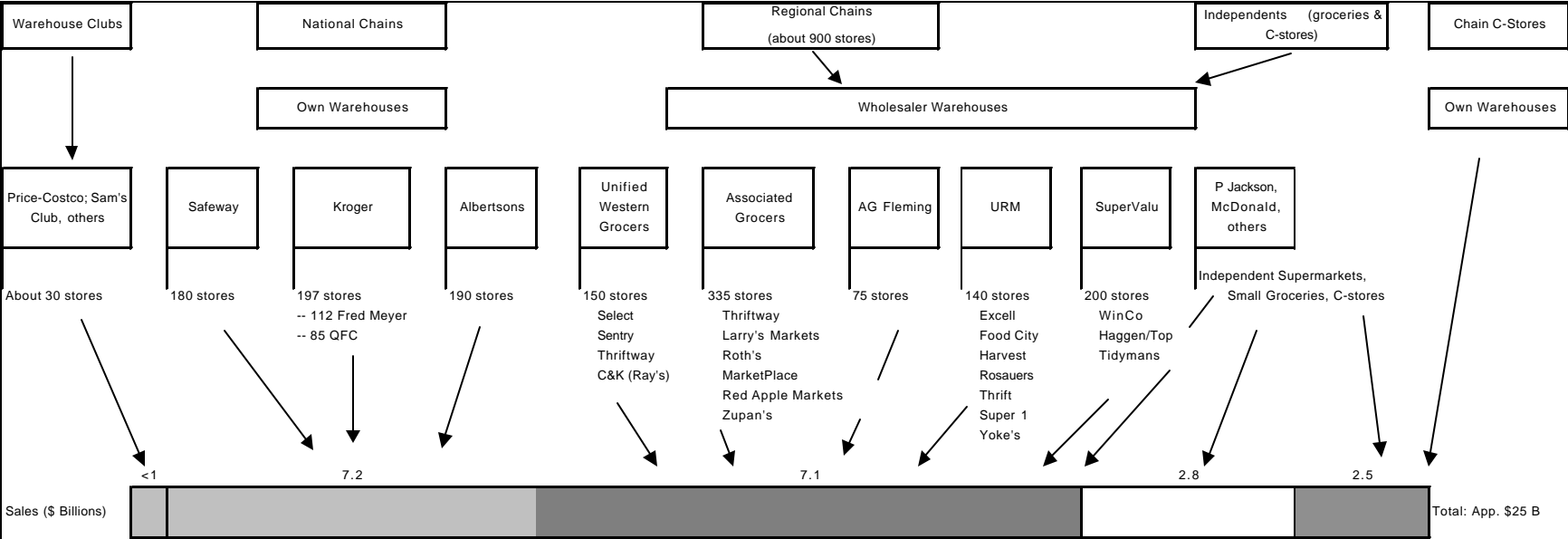


#### 4. MARKET ACTOR IDENTIFICATION

As a first step in the characterization of the PNW market (as in any market characterization), each type of market participant in the targeted industry is identified. Market participants include all persons or entities affecting the operation of the market, either directly, or indirectly. Note that for the present study, we are interested both in the overall retail food market and the market for energy efficiency related investments and improvements. Knowing about the size, structure, and growth of the former will help us determine whether the independent retail food sector is economically sound enough to warrant investments in EE; understanding the latter will help us to determine how EE improvements might be encouraged.

Exhibit 4-1 presents the overall structure of the market and the percentage of retail food sales accounted for by various players. Perhaps because of the relatively dispersed population pattern in the PNW, national chains are somewhat less active here than elsewhere, with only three truly national chains (Safeway, Albertson's, Kroger) participating in the market.

**Exhibit 4-1  
Structure of the PNW Retail Food Sector**



The following market actors are key players in the independent retail food sector.

#### 4.1 FOOD STORES

Our initial hypothesis was to divide the population of food stores into chains and independents, using the FMI definition of chains as having ten or more stores. What we found, however, was that there is a clear distinction between national chains (e.g., Albertsons and Safeway) and a number of regional chains operating in the PNW. Similarly, there is a clear distinction between these independent regional chains and those independents that operate one or a few smaller stores.

As a result, we have chosen to segment the supermarket/grocery store population somewhat differently than originally planned; we now divide the market into national chains, regional chains and larger independents, and smaller independents. A summary of the characteristics of each of these stores in terms of size and the allocation of store space is presented in Exhibit 4-2.

**Exhibit 4-2**  
**Store Characteristics**

Type of Store		Regional chains & independents w/ >20,000 total sq ft n=18	Independents w/ <20000 total sq ft n=21	C-store chains (>10 stores) n=4	C-store independent n=20
Characteristics	Large chains n=5				
<b>Distribution of Space</b>					
Mean square footage	42,800	20,000	10,000	2,700	4,800
Percentage selling space	79%	84%	78%	79%	81%
Allocation of selling space					
Fresh produce	14%	20%	13%	2%	4%
Prepared foods	10%	9%	7%	4%	17%
Refrigerated food and beverages	14%	14%	10%	34%	28%
Frozen food and beverages	15%	13%	11%	2%	7%
Other food, beverages	29%	32%	48%	29%	18%
Non-food items	17%	12%	12%	29%	26%
Percent of respondents expecting this to change	33%	28%	9%	25%	27%

##### 4.1.1 National Chains

As shown in the exhibit, there are just three truly national chains active in the PNW market, but they account for over one-third of retail food stores. As noted previously in Chapter 2, ongoing consolidation in the supermarket industry continues to reduce the number of players who dominate the national market. In the PNW, the presence of one of those three players — Kroger — has been through acquisition of established regional chains Fred Meyer and QFC.

Even though they were not the focus of this study, national chains play a significant role in the level of energy efficiency incorporated into the independent food sector. The adoption of EE technologies by national chains helps to validate the new technologies and acts as a sort of

demonstration project that regional chains and independents can observe. In addition, the adoption of more efficient technologies by the chains provides them with an operating cost advantage relative to the independents and smaller chains — who subsequently come under pressure to undertake similar cost saving measures.


The large chain stores in the PNW average more than 40,000 square feet, almost 80 percent of which is selling space. Non-refrigerated food and beverages account for the largest portion (29%) of store space, with other categories relatively evenly distributed. One of the three respondents to a question regarding changes to store space allocation thought this would change, citing an increase in space devoted to prepared foods.

With an extensive network of in-house resources, large chains say equipment selection is heavily influenced by corporate management and in-house design and engineering staff, as indicated in Exhibit 4-3. Among outside sources, only specialized consulting engineers and designers received higher than a 4 out of 6 average rating.

**Exhibit 4-3**  
**Decision Influencers**

Type of Store	Large chains	Regional chains & independents w/>20,000 total sq ft	Independents w/<20000 total sq ft	C-store chains (>10 stores)	C-store independent
	n=5	n=18	n=21	n=4	n=20
<b>Decision Influencers</b>					
<b>Own Staff</b>					
Corporate management (Owner, CEO, VP, etc.)	5.8	5.3	5.4	5.0	5.4
Store managers	3.2	4.2	5.5	3.0	4.9
In-house engineering/facilities management staff	5.6	3.1	2.6	4.8	3.5
In-house design department	5.6	3.4	2.3	4.5	3.2
<b>Product and Service Suppliers</b>					
Refrigeration Contractors	3.4	5.0	4.5	3.3	4.4
Consulting Engineers/Designers	4.6	4.4	4.1	4.0	3.3
Equipment Manufacturers Representatives	4.0	4.2	3.6	3.5	3.1
Equipment Dealers (independent)	3.2	3.4	3.6	3.0	3.7
Lighting Contractors	2.8	3.7	3.7	2.5	3.3
Equipment refurbishers/used equipment dealers	1.4	2.4	3.0	1.3	3.0
<b>Energy Suppliers</b>					
Electric Utility	4.0	4.7	4.5	2.8	3.6
Energy Service Companies (ESCOs)	3.0	3.3	3.5	2.5	2.7
Performance Contractors (ESPCs)	2.2	2.0	1.9	1.3	1.9

Respondents were asked to rate the importance of each in influencing the selection of energy using equipment in existing stores using a 1 to 6 scale, where 1 means not at all important and 6 means extremely important.

 highest rating in category


The decision criteria of national chains are driven by the highly competitive market in which they operate; the focus of all investments is on enhancing the chain’s competitive position by increasing market share. This is clearly illustrated in Exhibit 4-4; note that all 5 large chains gave importance rankings of 6 (out of 6) both to “marketing and presentation concerns” as a

decision factor and to “appearance/contribution to sales” as an equipment selection factor. One implication of the focus on marketing is that energy efficiency and other operational considerations are of secondary importance relative to the need to increase sales — even if an investment can be shown to improve profitability.

**Exhibit 4-4**  
**Decision Factors and Importance of Equipment Attributes**

Factors and Attributes	Type of Store	Regional chains & independents w/>20,000 total sq ft n=18	Independents w/<20000 total sq ft n=21	C-store chains (>10 stores) n=4	C-store independent n=20
	Large chains n=5				
<b>Decision Factors</b>					
Marketing/presentation concerns	6.0	5.2	5.0	4.5	4.9
Availability of rebates	5.3	4.8	4.6	3.8	5.1
Refrigerant issues (e.g., Montreal Protocols/CFC ban)	4.8	5.4	5.1	3.8	4.3
Regulatory requirements	4.5	4.6	4.6	3.8	3.9
Declining cost of electricity	4.5	3.8	4.3	3.5	4.4
Uncertainty about future electricity market	4.5	4.3	4.3	2.8	3.8
Uncertainty about the future of the industry	2.3	4.0	3.9	1.8	4.4
Availability of financing	1.8	3.7	4.4	2.3	3.9
<b>Importance of Equipment Attributes</b>					
Reliability	5.5	5.7	5.9	5.5	5.7
Appearance/contribution to sales	6.0	5.7	5.4	5.5	5.3
Energy efficiency	5.3	5.3	4.8	5.0	5.1
Initial cost	4.5	5.0	5.3	4.8	5.3
Ease of maintenance	4.5	5.1	5.0	4.5	5.5
Warranty	3.5	5.3	5.1	4.5	5.3
Life cycle cost	4.0	5.2	4.6	4.8	5.2
Manufacturer's reputation/relationship with vendor	4.3	4.4	4.7	4.5	4.1
Compatibility with other equipment or other stores	4.5	4.3	4.5	4.8	3.8
Immediate availability	3.5	3.4	3.7	3.3	4.1
Availability of financing	1.8	3.7	4.3	2.0	3.7

Respondents were asked to rate the importance of each in influencing the selection of energy using equipment in existing stores using a 1 to 6 scale, where 1 means not at all important and 6 means extremely important.

 highest rating in category

#### 4.1.2 Regional Chains and Independents

One of features of this market that stands out is the significant role played by regional chain and independent supermarkets in the PNW – which appears to be greater than the role of corresponding stores nationwide. In the four-state region, some about 1000 regional chain stores and large individual stores nearly match their national chain competitors in sales.

While there continue to be sales of individual stores and regional chains to the national chains as part of an ongoing consolidation process, a number of the regional chains appear to be expanding. Several report recent new store openings, and most of the respondents we spoke to appeared to feel that they can continue to do well in the current food retailing environment by

emphasizing service, their ties to the community, or specialized product offerings. As a result, we believe that regional chains and some of the larger independent stores will continue to serve the PNW market over at least the next decade, with ongoing consolidation resulting in fewer, larger regional chains as well as fewer, larger independents.

The regional chain stores in our survey sample average slightly over 20,000 square feet, of which almost 85 percent is selling space. Fresh produce accounts for about 22 percent of shelf space – more than for any other store type. On the other hand, regional chains devoted less space to frozen food and beverages and to nonfood items. Five of the 18 respondents expect the allocation of space to change over the next five years; as with national chains, the only significant anticipated change is toward more prepared foods.

With fewer internal resources, regional chains are more likely to rely on suppliers — although corporate managers are still considered most influential in equipment selection. Unlike national chains, regional chains are more likely to rely on local resources: both refrigeration contractors and utilities were considered more influential by this group than by any other segment, as shown in Exhibit 4-3.

This segment is less likely than the national chains to focus exclusively on marketing and sales issues – although these are considered important. Among overall decision factors, refrigerant issues outweighed all other concerns, and reliability was considered just as important as contribution to sales in the selection of equipment.

#### *4.1.3 Small Groceries*

Small groceries include those independent, single store operations that are typically 10,000 square feet or smaller in size, although they may include chains with a handful of stores. For our analysis, we included all stores with total square footage of less than 20,000, meaning that we included several small chains of 5-6,000 square foot stores as well as several larger 15,000+ square foot stores.

On average, the surveyed stores in this segment were just over 10,000 square feet. Almost half of the store space for these players is devoted to non-refrigerated, non-frozen food and beverages, far more than any other store type. Small independents also devoted less space to produce and prepared foods than the larger chain stores. Moreover, independents do not expect these patterns to change; only 2 of the 21 decision makers surveyed expect the allocation of selling space to change significantly over the next 5 years.

Because of their small average size, these stores are only a minor force in the market, accounting for about 11 percent of PNW food store square footage and sales. Stores of this type surveyed tended to be particularly concerned about competition from larger players, including supermarket chains in general as well as the large Wal-Mart-type stores. Several noted that they were repositioning themselves as specialty markets or differentiating their stores by offering a “personal touch,” but they also recognized that the combination of variety and low price that larger stores can offer is hard for most consumers to resist.

One of the characteristics of these stores is the independent mind-set of their owner/operators, which contributed to a relatively high refusal rate for these stores in the survey effort. In

addition to being “one-man shows” with little extra time on their hands these independent stores are often run by people who have an independent’s suspicion of surveys, utilities, and market interventions, making them poor candidates for most energy efficiency efforts.

Individual store owners/managers (who typically are also owners) were the most influential in equipment selection, and what they look for above anything else is reliability. Like regional chains, these stores are quite concerned about refrigerant issues — a concern that appears to be consistent with their lack of in-house design and engineering resources (which is reflected in the very low influence of in-house engineering and design staff.

#### 4.1.4 Convenience Stores

The number of convenience stores and the volume of sales per store for each of the four PNW states is presented in Exhibit 4-5.

**Exhibit 4-5  
Convenience Stores and Volume of Sales**

		1997		2000		
	Sales (\$million)	Number of C-stores	Sales per store per person	Sales (\$million)	Number of C-stores	Sales per store per person
Idaho	415	541	\$343	543	582	\$403
Montana	399	449	\$454	491	468	\$517
Oregon	531	1,000	\$164	628	1,034	\$185
Washington	687	1,641	\$122	809	1,694	\$138
PNW Total	2,032	3,631		2,471	3,778	

Note that sales per store vary across the region; the higher level of sales per store in Montana and Idaho seems to indicate that C-stores may be the primary source of groceries for at least some rural residents there. This finding suggests that efforts to reach rural areas with EE programs may be achieved by targeting C-stores.

#### 4.1.5 C-stores – Chains

At an average of less than 3,000 square feet, chain C-stores are significantly smaller than their independent counterparts, reflecting a corporate-level emphasis on optimizing store layout. Almost 30 percent of these stores are devoted to non-food merchandise (notably cigarettes), and the general decline in tobacco sales is a source of worry for much of the industry. Some C-store chains are using gasoline sales to make up for cigarettes; one of the most pronounced trends in the C-store segment is the proliferation of stores as an adjunct to a gas station, usually as part of an oil-company-owned chain. C-stores, including non-gas chains, see this as one of the trends

with which they must compete over the next five years. Each of the four chain C-store respondents cited C-stores with gasoline as significant competitors (two also listed a second source of competition).

Like national supermarket chains, C-store chains typically have in-house staff to support the development of purchase recommendations (in cooperation with consulting engineers and designers) that are ultimately approved by corporate management. Managers of individual stores have very little impact on the decision.

#### *4.1.6 C-stores – Independents*

In contrast to their chain counterparts, independent C-stores give a relatively high rating to uncertainty about the future of their industry when making decisions. A further indication of this concern may be the high rating they assigned to the availability of rebates as a decision driver. In equipment selection, reliability is highest ranked, with the closely related ease of maintenance only slightly lower.

The “cigarettes and beer” nature of C-store business is also evident in the allocation of space by independents, with non-food items accounting for 26 percent of space, and refrigerated food and beverages for 28 percent. Unlike chain C-stores, independents also devote an average of one-sixth of their space to prepared foods, a trend that some see as continuing over the next five years. An effort, reported on in the trade press a year or two ago, to increase C-store sales of fresh produce does not appear to have had a major impact to date.

#### *4.1.7 Warehouse stores and Mega-centers*

Although they only account for a relatively small portion of food sales in the PNW to date, warehouse stores like Costco and Sam’s Club are taking sales away from many of the other players. Moreover, their role is expected to increase over the next several years.

Discount department stores like Wal-Mart and K-mart who add groceries to their overall merchandise line are in a different category, but are seen as an even greater threat by conventional supermarkets. While these stores may not offer the complete lines of food products that supermarkets provide, they often capture enough of the consumer’s dollar to threaten sales volumes for more traditional stores.

## *4.2 WHOLESALERS*

Wholesalers would not normally play a central part in an assessment of the market for energy efficiency measures; they are included here not for their role as suppliers of merchandise, but in their role as “surrogate” chains who provide many of the store design and operations services that are provided by parent companies of chains.

In the PNW, a few large distributors play a pivotal role as suppliers to some 1,000 independent stores. The most important include Associated Grocers, SuperValu, Unified Western Grocers; URM, and AG Fleming. Several of these wholesalers (for example, Associated Grocers, URM, and Unified Western Grocers) are, in fact, coops owned by many of the stores they supply. By providing “member support” services such as advertising, store remodeling, financing, and



insurance, these coops act as one-stop sources for their members, creating a powerful relationship. Non-coops, such as SuperValue, AG Fleming (a joint venture between the AG coop and Fleming Companies), may offer some of the same services but, according to industry experts, are more likely to view these services as pure profit centers.

#### 4.3 CONTRACTORS

Contractors — for refrigeration, lighting, and HVAC — are the primary technical contact for many of the smaller independent groceries and C-stores. Refrigeration contractors in particular are viewed as the most important supplier influencing equipment selection not only by small independents, but also by regional chains. Local refrigeration contractors supplement (and often supplant) in-house food store maintenance organizations — particularly for smaller stores and independents. In the PNW, territory, there are about 140 specialized refrigeration contractors, ranging in size from one-person shops to affiliates of national vendors. Many of these contractors do little grocery store work, focusing instead on refrigerated warehouses, C-stores, restaurants, or institutions.

Across the retail food industry generally, contractors are said to 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.

Contractors claim to be knowledgeable about energy efficient equipment, but some industry observers note that contractor personnel may lack the training to deal with sophisticated electronic control systems, and as a result may override controls that help contribute to energy savings. In addition, contractors are responsive to customer first-cost concerns, and may fear losing sales to competitors if they emphasize energy efficient solutions that cost more up front but save money later.

For lighting contractors, interest in energy efficiency continues to be driven primarily by rebates. Several lighting contractors contacted said they used to do a lot of grocery store lighting retrofits when utilities offered rebates, but the interest simply isn't there when utility incentives are removed.

#### 4.4 EQUIPMENT SUPPLERS

Because of their depth of in-house expertise and their experience, major national manufacturers often exert considerable influence in equipment selection decisions, especially for specialized refrigeration equipment. The market for refrigeration cases and systems is dominated by three manufacturers (Hussman, Tyler, and Hill-Phoenix), while a small number of vendors also manufacture most compressors (e.g., Copeland, Carlyle); valves (e.g., Henry, Sporlan), and doors (Anthony and Ardco, the latter now owned by Hussman). These manufacturers work through local representatives, all of whom are knowledgeable about design issues and offer a full range of efficiency options.

The manufacturers' reps exert greater influence in equipment selection than independent dealers among national and regional chains. Independent groceries and C-stores, however, consider manufacturers representatives less influential. This may be because these smaller

players are less likely to buy new equipment from a manufacturer’s reps; 5 of 20 small groceries and 3 of 19 independent C-stores said they would purchase a refurbished case rather than a new one if they were replacing a case (see Exhibit 4-6). There are a handful of companies in the PNW who specialize in refurbishing cases. While these players were said to have little influence in equipment selection, they could play a role in encouraging energy efficiency for the small independent segment of the market.

**Exhibit 4-6  
Refrigerated Case Purchase Intentions**

Purchase Intentions	Type of Store				
	Large chains n=4	Regional chains & independents w/>20,000 total sq ft n=18	Independents w/<20000 total sq ft n=20	C-store chains (>10 stores) n=4	C-store independent n=19
We would buy a refurbished case		2	5		3
We would buy a new case at the lowest possible cost	2		2		3
We would buy a new case with the lowest life cycle cost		4	1	2	4
We would buy a new case with the most features given our budget	2	9	12	1	9
None of the above (explain)		3		1	

#### 4.5 ARCHITECTS/DESIGNERS

Within the context of the business requirements of the store owner, architects and design engineers say they enjoy significant latitude in specifying equipment. They usually have a well-established working relationship with either national chains or a regional wholesaler/coops, since both groups account for most of the design work in the market. For architects and store designers, the primary focus is on store layout and interior décor that will maximize sales, with lighting specialists called in to handle the specification of décor lighting, and engineers called in to make decisions on mechanical systems.

While store designers do have the opportunity to influence the degree to which energy efficiency is incorporated in new store construction or remodeling projects, they often play a more reactive role. Company management or internal corporate staff exercise considerably more influence — which typically translates into an emphasis on the sales and marketing concerns favored by the larger chains. Consulting engineers were perceived by survey respondents as having more influence than other suppliers for both supermarket and convenience store chains. This did not hold true, however, for regional chains and independent groceries and C-stores.

Several designers said that many energy efficiency measures are routinely incorporated in their new store designs – a view that is corroborated by the higher levels of adoption of EE measures reported by stores who were planning new facilities. An independent designer cited in Store Equipment and Design notes that “green” design elements — like EE measures — have become fairly common; as with energy efficient equipment and design, however, marketing concerns must not be compromised.

## 5. MARKET STATUS

Once the market actors have been identified, the status of the market can be assessed. In this case, the assessment of status comprises the following:

- Determining the level of adoption of energy efficiency measures to date by each of the retail food segments
- Estimating the remaining potential for those measures as well as the associated energy impact
- Identifying and evaluating barriers that exist to attainment of the potential that has been identified, as well as market (and market actor) characteristics that appear to facilitate measure adoption.

### 5.1 LEVEL OF ADOPTION

#### 5.1.1 Phase 1 Results

In Phase 1 of the research, the level of market penetration in each of the retail food segments was estimated for each of the energy efficiency measures identified, based upon store decision maker survey responses. Results were weighted by the total square footage for each respondent to ensure that we estimated the percentage of square footage with the technology or measure installed as accurately as possible. Despite these efforts, we would emphasize the extent to which these penetration numbers are estimates whose precision is limited by the small sample sizes. On the other hand, the number of PNW stores accounted for by all our respondents totals over 400, primarily because of the inclusion of Safeway, Albertsons, and 7-11.

It should also be emphasized, however, that these data provide a good indication of the relative penetration and potential of various kinds of measures. Since the goal of this study was to identify opportunities for energy efficiency; it was not to develop detailed estimates of expected impacts.

With that caveat, the percentage penetration of the technologies identified earlier in Chapter 3 is presented in Exhibit 5-1. In some cases (e.g., freezer cases with doors) penetration levels are relatively high across segments; in many (e.g., floating head pressure controls), the large chains show the largest adoption; and in some (e.g., case covers) penetration is higher because the measure is not well suited to large chain operations. Note that the percentage of refrigeration capacity accounted for by central systems declines with the average size of the store: from 92 percent for national chains to 80 percent for regional chains to 50 percent for small groceries. This tends to limit the potential for central system measures such as parallel systems or floating head pressure controls in the smaller stores.

**Exhibit 5-1**  
**Technical Potential of Energy Efficiency Measures — by Segment**

	PNW penetration of Efficient Technologies (by segment -- %)					Impacts		Potential Savings by Segment (MWh)*				
	National Chains	Regional Chains & Independent Supermktks	Small Groceries	C-store Chains	C-store Indeps.	Energy savings per 10,000 sq feet (kWh)	Energy savings per 1 mil sq feet (MWh)	National Chains	Regional Chains & Independent Supermktks	Small Groceries	C-store Chains	C-store Indeps.
						Baseline usage	Baseline usage					
No. of PNW Stores	650	1200	1100	1200	2400	Baseline usage	Baseline usage	650	1200	1100	1200	2400
Million Sq. Ft.	26	25	11	4	7	550,000 kWh	55,000 MWh	26	25	10	4	7
<b>Overall</b>												
Energy Management System	52	27	0	50	0	27,500	2,750	34,320	50,188	30,250	5,500	19,250
<b>Refrigeration</b>												
Central system (% of capacity)	92	80	50	0	0							
Floating head pressure control	32	14	0	NA	NA	21,000	2,100	34,158	36,120	11,550	NA	NA
Variable Capacity Compressors												
HE or ASD compressors	41	11	6	NA	NA	20,000	2,000	28,226	35,600	10,340	NA	NA
Multiplexed compressors	33	6	6	NA	NA	36,000	3,600	57,695	67,680	18,612	NA	NA
<b>Cases</b>												
PSC evaporator fan motors	22	5	1	24	0	6,000	600	12,168	14,250	6,534	1,824	4,200
ECM Evaporator fan motors	13	0	0	0	0	9,000	900	20,358	22,500	9,900	3,600	6,300
Cycling of anti-sweat heaters	45	16	4	24	0	19,000	1,900	27,170	39,900	20,064	5,776	13,300
Night covers	4	31	34	0	6	20,800	2,080	51,917	35,880	15,101	8,320	13,686
Case doors on freezer cases	77	58	57	98	98	103,000	10,300	61,594	108,150	48,719	824	1,442
Case doors on refrigerated cases	42	12	19	93	89	38,000	3,800	57,304	83,600	33,858	1,064	2,926
No-heat doors	42	16	10	0	4	9,000	900	13,572	18,900	8,910	3,600	6,048
Electronic ballasts in cases	51	12	20	88	19	1,066	107	1,358	2,345	938	51	604
<b>Lighting</b>												
T-8 store lighting	72	27	41	84	35	42,000	4,200	30,576	76,650	27,258	2,688	19,110
Halogen or HID incandescents	14	8	10	0	23	23,500	2,350	52,546	54,050	23,265	9,400	12,667
<b>HVAC</b>												
High Efficiency HVAC	58	32	11	63	22	4,420	442	4,827	7,514	4,327		2,413
Fan speed controls for ventilation	23	4	2	82	15	13,000	1,300	26,026	31,200	14,014		7,735

\* Potential savings are calculated by applying impacts for each measure to the square footage (by store type) that does not yet have the measure installed.

Among the technologies investigated, national supermarket and convenience store chains generally show the highest penetration. This provides a good indication of the extent to which regional chains and independent stores might be expected to adopt the measures studied in the relatively short term, since it shows the levels of penetration that are feasible given some of the characteristics of the larger chains (e.g., ready access to capital, in-house technical expertise as well as a network of outside resources.)

Note that some of the more technically sophisticated measures show the greatest differences in penetration between national chains and other segments.

- Floating head pressure control, for example, has been adopted at least twice as often by national chains as by regionals, and it is not being used by any of the independent stores surveyed.
- More efficient evaporator fan motors are far more common in large chains than in the regionals and independents; in fact, only the chains reported using the high-potential electronically commutated motors at all.
- Similarly anti-sweat heaters are cycled by almost half of national chains and one-fourth of C-store chains, but by only one-sixth of regional chains.

Case doors are installed on freezers by a majority of stores in all segments, but both low and medium temperature cases are reported to have doors by C-store chains. Even independent C-stores report a much higher percentage of refrigerated cases with doors, suggesting that (despite obvious differences in product mix) substantial potential exists to save energy by putting doors on more refrigerated cases in other segments.

More than 70 percent of national chain supermarkets store lighting and 80 percent of C-store chain store lighting is now T8 rather than T12. For regional chains, the percentage is only about one-third, although those store who reported new construction said T8 lighting is standard in their new stores. Small independents report a higher percentage of T8 lighting than did the regional chains.

Efficient lighting for cases exceeds 50 percent for the chain supermarket segment and is approaching 90 percent for chain C-stores, but lags in other segments.

High efficiency HVAC is reported by over half of national and C-store chains, but by only about 30 percent of regional chains and independents. Another HVAC measure, fan speed control for ventilation fans, is reported for almost 25 percent of national chains and over 80 percent of C-store chains. No other segment has more than 15 percent penetration, however.

In addition to the penetration of EE technologies, an indication of market status is provided by the number of specific EE actions undertaken in the past two years, shown in Exhibit 5-2. The results suggest that there is a significant level of activity for all segments; while it is not surprising that national and even regional chains would report EE actions for at least some of their stores, the level of activity among independent groceries is also relatively high. Two-thirds of these stores report having had a compressor tune-up, one-third purchased new efficient cases, and almost 25 percent had installed more efficient case doors.

**Exhibit 5-2**  
**Energy Efficiency Actions in the Past Two Years**

Energy Efficiency Actions	Type of Store				
	Large chains n=5	Regional chains & independents w/>20,000 total sq ft n=18	Independents w/<20000 total sq ft n=21	C-store chains (>10 stores) n=4	C-store independent n=20
Audit	4	7	6	3	2
Lighting retrofit	4	6	3	3	5
Compressor tune-up	4	9	14	1	8
Purchased one or more high efficiency cases	4	10	7	3	5
Installed more efficient case doors	3	8	5	1	4
Installed strip curtains on a walk-in cooler	3	1	1	1	3
Other	2	4	1	0	3

**5.1.2 Phase 2 Results**

**5.1.2.1 Secondary Data Results**

None of the previous studies distinguished between store types and sizes; most appeared to focus primarily on large supermarkets. On the other hand, almost all of the studies examined were conducted several years ago, so that the market penetration of some of the technologies would presumably have increased since then.

Results of the PG&E study are presented in Exhibit 5-3. As was pointed out earlier, comparisons of these penetration estimates to those obtained in Phase 1 are of questionable value, in as much as the do not distinguish between different kinds of stores. To the extent that these results can be compared to those for the national chains in the PNW, most key measures appear to show roughly comparable penetration for PG&E's service territory and for national chains in Phase 1, suggesting that the Phase 1 findings are, in fact, reasonable.

**Exhibit 5-3**  
**Estimates of Market Penetration from 1998 PG&E Study**

	Penetration of Efficient Technologies, by segment (rounded to nearest 5%)			
	PG&E Store Estimates	No-program Territory Store Estimates	California Contractor Estimates	No-program Territory Contractor Estimates
No. of Stores	553	427	604	265
Energy Management Systems	95	10	60	40
<b>Refrigeration</b>				
Floating head pressure control	60	50	50	20
HE compressors	50	15	50	15
ASD compressors	5	10	10	10
Multiplexed compressors			75	30
PSC evaporator fan motors	65	0	75	35
Cycling of anti-sweat heaters	80	40	60	20
Night covers	5	20		
Case doors on freezer cases	70	65		
Case doors on refrigerated cases	30	20		
No-heat doors	40	15		
Electronic ballasts in cases	60	5		
<b>Lighting</b>				
T-8 store lighting	80	45		
Halogen or HID incandescents	95	5		
<b>HVAC</b>				
High Efficiency HVAC	60	30		
Fan speed controls for ventilation	20	5		

### 5.1.2.2 Primary Data Results

Results from the Phase 2 contractor surveys were analyzed and compared to those from the Phase 1 store interviews, both for market penetration of efficient technologies and for energy efficiency actions taken in the past year (the latter included a broader range of actions than those covered in Phase 1 to help establish a market baseline.) It is worth noting that estimates of the number of rural and small town stores serviced by these contractors ranged from 0 to 100 percent, with a weighted average based on the number of stores serviced of nearly 48 percent. This figure suggests that the results that follow have direct relevance to efforts to target the rural as well as independent retail food sector.

#### *Market Penetration*

Estimates of market penetration for each store type, based on contractor responses and weighted by the number of various kinds of stores that each contractor services, are presented in Exhibit 5-4 alongside the comparable Phase 1 results. Note that for many technology/sector combinations, the results are very similar. Penetration of energy management systems, for

example, was estimated at 27 percent based on Phase 1 store decision maker interviews, and at 26 percent based on Phase 2 contractor interviews. The percentage of freezer cases with doors was also consistent for the two sets of results across all store types.

**Exhibit 5-4**  
**Comparison of Phase 1 and Phase 2 MP Estimates**

	PNW penetration of Efficient Technologies (by segment -- %)									
	National Chains		Regional Chains & Independent Supermktks		Small Groceries		C-store Chains		C-store Indeps.	
	Phase 1 estimate	Phase 2 estimate	Phase 1 estimate	Phase 2 estimate	Phase 1 estimate	Phase 2 estimate	Phase 1 estimate	Phase 2 estimate	Phase 1 estimate	Phase 2 estimate
No. of PNW Stores	650		1200		1100		1200		2400	
Million Sq. Ft.	26		25		11		4		7	
<b>Overall</b>										
Energy Management System	52	70	27	26	0	10	50	12	0	12
<b>Refrigeration</b>										
Central system (% of capacity)	92		80		50		0		0	
Floating head pressure control	32	59	14	39	0	30	NA		NA	
Variable Capacity Compressors										
HE or ASD compressors	41	18	11	5	6	2	NA		NA	
Multiplexed compressors	33	61	6	39	6	21	NA		NA	
<b>Cases</b>										
PSC evaporator fan motors	22	33	5	33	1	28	24	3	0	6
ECM Evaporator fan motors	13	14	0	4	0	3	0	0	0	0
Cycling of anti-sweat heaters	45	37	16	11	4	6	24	19	0	1
Night covers	4	4	31	10	34	24	0	2	6	1
Case doors on freezer cases	77	65	58	67	57	59	98	91	98	90
Case doors on refrigerated cases	42	15	12	25	19	37	93	95	89	96
No-heat doors	42		16		10		0		4	
Electronic ballasts in cases	51		12		20		88		19	
<b>Lighting</b>										
T-8 store lighting	72		27		41		84		35	
Halogen or HID incandescents	14		8		10		0		23	
<b>HVAC</b>										
High Efficiency HVAC	58		32		11		63		22	
Fan speed controls for ventilation	23		4		2		82		15	

For a number of other measures, however, results differ; in general, the Phase 2 results show higher market penetration among regional chains/independent supermarkets and small groceries than do the Phase 1 results. Contractor results show, for example, that 28 percent of small groceries had installed PSC evaporator fan motors, while the stores themselves reported an average of just 1 percent. In addition to relatively small sample sizes, a potential explanation for the disparity is the fact that some of these technologies (including evaporator fan motors) are relatively invisible and require little input from the store when installed. In addition, a few large respondents can influence results, as was the case with 7-11 for Energy Management Systems in chain convenience stores.

### *Energy Efficiency Activity*

Estimates of baseline EE activity from Phase 2 results are compared to those from Phase 1 in Exhibit 5-5. Note that some of these estimates are consistent with the relatively high percentages reported by (a limited number of) respondents in Phase 1. Again, this indicates that for some EE measures the level of awareness and activity is relatively high, and the



emphasis of any program should be on bringing some of these same higher levels to the smaller independents. For example, purchases of one or more high efficiency cases were far more likely among both national and regional chains than among small groceries.

**Exhibit 5-5**  
**Energy Efficiency Actions in Past Two Years**

Type of Store Energy Efficiency Actions	Large chains		Regional chains & independents w/>20,000 total sq ft		Independents w/<20000 total sq ft		C-store chains (>10 stores)		C-store independent	
	Phase 1 n=5	Phase 2 721 stores	Phase 1 n=18	Phase 2 125 stores	Phase 1 n=21	Phase 2 183 stores	Phase 1 n=4	Phase 2 674 stores	Phase 1 n=20	Phase 2 656 stores
	Audit	4	4.0%	7	4.0%	6	2.0%	3	15.0%	2
Compressor tune-up	4	24.0%	9	57.7%	14	68.6%	1	1.4%	8	13.0%
Purchased one or more high efficiency cases	4	76.0%	10	74.0%	7	22.0%	3	42.0%	6	27.0%
Installed more efficient case doors	3	13.0%	8	3.0%	5	1.0%	1	4.0%	4	4.0%
Installed strip curtains on a walk-in cooler	3	26.3%	1	52.7%	1	33.3%	1	4.5%	4	4.4%
Began floating head pressure control		1.9%		1.3%		1.4%		NA		NA
Installed ASD or multiplexed compressors		2.8%		1.2%		0.2%		NA		NA
Put night covers on refrigerated cases		14.2%		4.2%		1.8%		0.0%		0.0%
Installed doors on open cases		1.5%		0.2%		0.2%		0.0%		0.0%
Installed PSC evaporator fan motors		10.5%		1.2%		0.4%		0.0%		0.0%
Installed ECM evaporator fan motors		6.9%		2.4%		0.4%		0.0%		0.0%
Had cases retrofit with T8 lighting		2.6%		0.8%		0.3%		0.0%		0.0%

One of the things that is surprising is the low rate of energy audits among all kinds of stores, but particularly among the supermarkets and other groceries, all of which are said to have fewer than 4 percent of stores conducting audits in a given year. The fact that this number is higher for both chain and independent convenience stores may reflect the far greater complexity of such an audit in a supermarket than in a convenience store – which has a fraction of the square footage and no central refrigeration system.

Also surprising is the high percentage of stores reported by contractors to be having compressor tune-ups. Independent groceries in particular are said to have their compressors tuned up at a rate that matches or exceeds the national and regional chains. It may be that contractors routinely visit their independent food store customers for an annual inspection and system tune-up, which might be conducted by internal regional engineering staff for the larger chains.

The percentage of stores purchasing one or more high efficiency cases is high (about 75 percent) for both the national and regional chains; moreover, this percentage is even higher when only the 19 non-Hussman and non-Edison Source contractor estimates are considered. These results suggest that, at least for new stores and “natural” replacements, high efficiency cases are becoming standard practice for these kinds of stores.

- This does not appear to be the case for independent food stores, where the estimates with and without Edison Source and Hussman data range from 14 percent to 22 percent, suggesting that significant potential exists for improvement.
- The difference in estimates of stores buying efficient cases is even greater for C-stores. The striking difference between the Edison Source/Hussman and independent contractor estimates for chain stores may reflect sales made to the chain’s corporate

headquarters by one of these large firms – which would be unlikely to involve the independent contractors.

Estimates of the number of stores installing more efficient case doors are less than 5% for all but the national chains, and are zero across all segments based on the results for independent contractors only.

Installations of strip curtains on walk-in coolers was estimated to be significantly higher by independent contractors than by Hussman and Edison Source. For both estimates, however, the numbers of independent groceries and both independent and chain C-stores installing strip curtains is significantly lower than for regional or national chains, indicating that potential exists to increase penetration of this technology.

For all other actions investigated, the contractor interviews indicate that there is a very low level of EE activity in all but the national chains. According to the survey results:

- Fewer than 2 percent of stores initiate floating head pressure control in a given year
- Less than 3 percent of national chains and less than 1 percent of independents install variable speed or multiplexed compressors
- Fewer than 2 percent of independents, 4 percent of regional chains, and 14 percent of national chains install night covers on refrigerated cases
- 2 percent or less install doors on open cases
- Estimates of current installations of PSC and ECM motors range from nonexistent in all segments (based on the independent contractors) to a maximum of 10 percent PSC motors and 7 percent ECMs for national chains
- Only a fraction of 1 percent of independents and regional chains have cases retrofit with T8 lighting; for national chains the percentage is less than 3 percent if the Hussman and Edison Source results are included, less than 1 percent if they are not.

### *5.1.3 Integrated Results*

Overall, differences in market penetration between the Phase 1 and Phase 2 results do not appear to affect the relative potential of the measures under consideration for independent stores; that is, while the order of the top five or six measures for any sector may vary, the same technologies usually show up on the list. For the purpose of estimating overall measure potential, a “consensus” estimate of penetration was developed, usually by simply averaging the Phase 1 and Phase 2 results and rounding to the nearest 5 percent. In some cases, however, (for example, if one of the estimates was far out of line both with the Phase 1 estimate and with Phase 2 estimates for other sectors) analyst judgement was used to combine the two estimates. The consensus estimates and associated savings potential are shown in Exhibit 5-6.

**Exhibit 5-6**  
**Phase 1 and Phase 2 Consensus Estimates and Savings Potential**

	*Consensus Estimates* of Penetration of Efficient Technologies (by segment -- %)					Potential Savings by Segment (MWh)*				
	National Chains	Regional Chains & Independent Supermktks	Small Groceries	C-store Chains	C-store Indeps.	National Chains	Regional Chains & Independent Supermktks	Small Groceries	C-store Chains	C-store Indeps.
No. of PNW Stores	650	1200	1100	1200	2400	650	1200	1100	1200	2400
Million Sq. Ft.	26	25	11	4	7	26	25	10	4	7
<b>Overall</b>										
Energy Management System	60	30	5	30	5	28,600	48,125	28,738	7,700	18,288
<b>Refrigeration</b>										
Central system (% of capacity)	92	80	50	0	0					
Floating head pressure control*	45	25	10	N A	N A	22,604	28,980	9,587	N A	N A
Variable Capacity Compressors										
HE or ASD compressors	30	10	5	N A	N A	26,790	33,600	10,340	N A	N A
Multiplexed compressors	45	20	10	N A	N A	35,306	53,280	17,622	N A	N A
<b>Cases</b>										
PSC evaporator fan motors	25	20	10	10	5	10,140	11,850	5,907	2,160	3,990
ECM Evaporator fan motors	10	0	0	0	0	19,422	21,938	9,851	3,600	6,300
Cycling of anti-sweat heaters	40	15	5	20	0	29,640	40,375	19,855	6,080	13,300
Night covers	5	20	30	0	5	23,254	18,460	6,978	416	0
Case doors on freezer cases	70	65	55	95	95	60,255	87,550	49,852	2,060	3,605
Case doors on refrigerated cases	30	20	20	95	95	61,750	75,050	33,022	760	1,330
No-heat doors	40	15	10	0	5	14,040	19,125	8,910	3,600	5,985
Electronic ballasts in cases	50	10	20	90	20	1,386	2,399	938	43	597
<b>Lighting</b>										
T-8 store lighting	70	30	40	85	35	32,760	73,500	27,720	2,520	19,110
Halogen or HID incandescents	15	10	10	0	25	51,935	52,875	23,265	9,400	12,338
<b>HVAC</b>										
High Efficiency HVAC	60	30	10	65	20	4,597	7,735	4,376	654	2,475
Fan speed controls for ventilation	20	5	0	80	15	27,040	30,875	14,300	936	7,735

\* Potential savings are calculated by applying impacts for each measure to the square footage (by store type) that does not yet have the measure installed. Potential savings are net of increases in market penetration due to current EE activity for the following measures, where the following 5 year increases based on observed EE action percentages were used:

- for FHP, increase of 2% per year for national, 1.2 for regional, 1.4 for independent
- for ASD and multiplex, 2.8% per year for national, 1.2 for regional, .2 for independent
- for night covers, calculated savings based on percent open cases; also used percent of stores installing any in 1 year as expected 5 year increase (14, 4, 2, 0, and 0)
- for doors on open cases, used annual increases in percent closed of 1.5, .2, 0, and 0
- for PSC motors, used percent of stores installing any as expected 5 year increase in overall market penetration (10, 1, and .5 for PSC; 7, 25, and .5 for ECM)

Note that the estimates in the exhibit incorporate current energy efficiency activity, as discussed above, where this is significant, reducing the total potential savings by the increase in market penetration that would be expected to occur over the next five years based on current activity. The potential impact of floating head pressure control, for example, was reduced based on the finding that this technology is being implemented by about 2 percent of national stores, and 1.5 percent of regional chains and small groceries every year, so that penetration would increase by 10 and 7.5 percent, respectively, over the next five years.

**5.2 TECHNICAL POTENTIAL**

Also shown in Exhibit 5-6 is the remaining technical potential for each measure analyzed. Using secondary sources to derive impacts per 10,000 square feet of store space, the savings that would result from 100 percent penetration of each measure were estimated. This analysis is useful both for identifying high potential measures overall and for focusing on those measures that offer the greatest potential for the independently-owned market segments.

Note that the regional chains, by virtue of their large store area and relatively low adoption of many technologies, show greater potential for most measures than do national chains. As such, this segment appears to offer an excellent target for future market interventions.

### *5.3 MARKET BARRIERS*

As a next step in the market status assessment, barriers to the attainment of the potential described above are examined. For each of the end user segments interviewed, ratings of mean perceived barriers were calculated and mapped to solid, half, and empty balls based on their value. The results are shown in Exhibit 5-7.

Note that first cost concerns remain a barrier for most end users; however, store decision makers clearly also face barriers in obtaining and evaluating technical information regarding efficiency measures. As would be expected, barriers are generally lowest for the national chains; in fact, neither national supermarket nor C-store chains appear to see many significant barriers to the adoption of EE measures.

Barriers for other market actors were based on qualitative data from interviews as well as the perceptions of industry experts and other players. For these players, too, justifying first cost and gathering and analyzing information on measure savings and other technical data were two broad categories of barriers. In addition, split incentives are a concern for some players. Wholesalers who provide design assistance to an independent store, for example, face the risk that those investments will make the store an attractive target for takeover by a competing national chain.

**Exhibit 5-7**  
**Independent Retail Food Sector Market Assessment — Barriers and Opportunities**

Market Participants	Market Status														
	Barriers									Opportunities					
	High first cost/does not meet payback criteria	Unavailability	Hard to find information on savings	Hard to get reliable technical advice	Market uncertainty	Reliability concerns (performance uncertainty)	Impact on sales (hidden cost)	Lack of financing	Split incentives (decisions made at HQ)	Knowledgeable	Receptive to information	Established relationships	Accept Longer Paybacks	Competitive pressures	Relatively Few Players
National Chain Supermarkets	●		●	●		○	○			●	●	●		●	●
Regional Chains/Independents	●	○	●	○	○	●	●		○	●	●	●	●	●	●
Small Groceries	●	○	●	●	○	●	●	●					●	●	
C-stores (chain)	○		●	○						●	●	●			●
C-stores (independent)	●	●	●	○	●	●	○	○					●	●	
Wholesalers	●		●		●		●	○	●	●	●	●		●	●
Contractors	●	●			●	●				●		●		○	
Equipment Manufacturers		●			●					●		●		●	●
Equipment Refurbishers	●		●		●				●	●	○	○			●
Design Firms	●		●	○			●		●	●	●	●			

**KEY**

- High
- Moderate
- Low

Note: Assessing Importance for Market Barriers, Relevance and Potential Effectiveness for Intervention Strategies

#### 5.4 OPPORTUNITIES

Just as there are some characteristics of market actors that make them more prone to barriers, there are also characteristics of players (or the market) that encourage them to adopt new technologies directly or that make it easier to influence them through a program or other market intervention. Several such characteristics are shown along with the market barriers in Exhibit 5-7.

As described in Chapter 1, these characteristics conform in many ways to the stages in the adoption of new technologies; for example:

- Market actors are presumed to be more likely to accept (or facilitate) EE initiatives if they have moved through the awareness stage and have become knowledgeable about EE. Therefore, the extent of technical knowledge about EE was deemed to be a characteristic that would influence receptivity to EE initiatives. For example, wholesaler store support representatives are often quite familiar with the range of EE options.
- Market actors who have reached the evaluation stage are presumed to be actively seeking out and receptive to new information, and those who accept relatively long paybacks are presumed to systematically evaluate the costs and benefits of EE measures. National supermarket and C-store chains, for example, actively seek information; regional chains are receptive to information; and independent groceries and C-stores are relatively unconcerned about collecting information.
- While there was no direct counterpart to the intent stage, it was assumed that market actors who had well-established relationships with others in the product chain would be in a better position to influence (or be influenced by) others and have their intent translate into action. Wholesalers, contractors, and equipment manufacturers' reps all have well-established relationships with various categories of stores, which might be leveraged by a well-designed program.
- A small number of players in a market would not necessarily mean a greater likelihood for action, but it was assumed that a market segment or group of market actors with relatively few players would be easier to influence so that EE measures are adopted. There are, for example, very few refrigerated case refurbishers.
- Actions by relatively few players are also expected to be more likely to lead to permanent, sustainable change in the market, in part because competitive pressures in some segments would force players to adopt more efficient new technologies already installed by their rivals. One of the factors encouraging regional chains and the larger independents to adopt EE measures is the continuing pressure from national chains that are adopting such measures and using them to reduce their operating costs.

The characteristics of major players in the PNW retail food market, together with the evidence of EE actions being undertaken by all segment, suggest that there are, in fact, opportunities to move this market toward greater EE. Potential market interventions are discussed in Chapter 6.

## 6. MARKET INTERVENTIONS

### 6.1 INTERVENTIONS

This step in the market assessment process identifies appropriate intervention strategies and links them to the targeted market actors, barriers, and facilitating characteristics. This chapter therefore yields a “short-list” of potential *types* of interventions that could be useful for this market, providing a good basis for determining where to begin in the program design process.

Working from a list of market interventions developed from previous experience in MT effects in the retail food industry, a list of potential program design elements was included in both the Phase 1 end user survey and the Phase 2 contractor survey to gauge market perceptions. Results of the surveys, together with input from other market actors and industry experts, was used to assign importance levels to each of the interventions considered.

The perceptions of the effectiveness of various types of interventions are presented in Exhibit 6-1. It is immediately clear that financial incentives continue to be highly regarded by virtually all types of retail food stores, and incentive-based programs offer a means of addressing first-cost concerns directly. Moreover, several wholesalers, design engineers, and industry experts said that rebates are equally important as a demonstration of commitment by the utilities or other funding organizations. In addition, incentives have always been powerful tools for internal engineering staff in large organizations to “sell” a product to upper management — in part because a rebate helps validate the measure being proposed by the engineers.

**Exhibit 6-1**  
**Perceived Effectiveness of Interventions (Including Contractors)**

Interventions (mean on 1-6)	Type of Store					
	Large chains n=5	Reg chains & indep. w >20,000 sq ft total n=18	Indep. <20000 sq ft total n=21	C-store chains (>10 stores) n=4	C-store indep n=20	Refrigeration Contractors n=22
Rebates/incentives	5.4	4.9	5.2	4.8	5.2	<b>4.4</b>
Audits	4.8	4.6	4.3	4.8	3.8	<b>3.8</b>
Demonstration programs	4.2	4.7	4.3	4.0	4.1	<b>4.0</b>
Informational brochures	3.8	3.8	4.2	3.8	4.6	<b>3.7</b>
Technical assistance	3.4	4.3	4.5	3.8	4.2	<b>4.6</b>
Training for staff	3.6	3.8	4.0	4.0	3.6	<b>4.6</b>
Financing	1.6	3.1	4.5	2.0	3.4	<b>4.2</b>
Web-based information	2.2	3.1	3.9	2.5	2.6	<b>2.9</b>
Required Payback	3.0	4.9	6.5	3.6	4.7	

Although not as highly rated as incentives, information-based interventions are also seen as effective by store decision makers. Program elements such as audits, technical assistance, and demonstration projects also directly address the information-related barriers, including the

difficulty of finding good technical information and the difficulty in evaluating estimates of energy savings.

The responses of refrigeration contractors regarding the effectiveness of various program elements are also presented in Exhibit 6-1. In contrast to the top rating given to rebates and incentives by every store type, contractors rated the value of rebates below both technical assistance and training. Note also that contractors, like smaller independents, perceive financing to be more effective than do other types of stores.

Comments provided by contractors regarding the effectiveness of various program elements are also instructive:

- For technical assistance, the most highly rated program element, contractors offered the following comments:
  - *Independent grocers are grocers, not technicians. They don't have technicians like the larger chains.*
  - *Once aware, people need technical help to implement any measures*
  - *As new products need to be installed, we need assistance to take advantage of their potential*
  - *Technical assistance phone lines could be used in diagnostics, tune-up*
  
- For training, the following observations were recorded:
  - *Technicians are not generally trained in energy efficiency*
  - *Equipment-specific training is useful, as are updates on new equipment. Training sessions integrate well with actual work if they are local.*
  - *Technicians usually are not trained in new equipment*
  - *Training programs' usefulness cannot be overstated; "if we're sold on it, we can sell it."*
  - *Sales training would be effective in helping technicians introduce energy efficient equipment*
  - *There's always new technology coming out, so technicians can definitely use training. But it's also a matter of re-educating the industry, since EE is not a focus in traditional technician training. Instead, there's a perceived trade-off between EE and food integrity.*
  - *We all need training; it's an ongoing requirement*
  - *And one dissenting opinion: Training is too expensive, both in training costs and in time foregone at work*
  
- Contractors had fewer comments on rebates and incentives, other than to note that *It's obvious that money talks and People always respond to this.*
  
- Many of the comment about financing emphasized its relevance to the small independents.
  - *Smaller customers need financing*



- *Especially with Mom and Pop operations, not having to come up with a big chunk of change would help them buy the equipment.*
  - *For small customers, financing or leasing can help them get the equipment they need now and then pay for it over time*
  - *Financing can help pay for the difference in equipment cost over time out of savings*
  - *This is the first thing customers ask for*
  - *The person approving the project usually does not understand finance or net present value, they just make decisions based on straight payback. If you can get around this process by offering financing, you can convince the customer.*
- Both demonstration programs and audits were rated somewhat lower than the measures described above. About, demonstrations, contractors said the following:
    - *This is crucial; you must demonstrate the equipment to the customer*
    - *You can see the equipment working and judge for yourself whether it's any good*
    - *One contractor who thought demonstrations could be effective nevertheless added that These are most useful at a convention, where you have a captive audience.*
  - Audits were perceived as being effective, and at least one respondent noted that the local utility already provides this service. Other observations were:
    - *People don't know how much energy is being used by any one component; an audit makes them take notice.*
    - *They'll listen to an audit sooner than they'll listen to a technician*
  - Both informational brochures and web-based information were perceived as being less useful, although a few contractors emphasized the value of graphics and clear calculations of payback in convincing customers.

In addition to commenting on the above strategies, contractors were asked if they could suggest any other steps that could be taken to promote energy efficiency in food store refrigeration. About half of respondents either offered specific suggestions or elaborated on the program elements they had rated earlier.

- *No other suggestions besides rebates or cost amelioration. We've reached a plateau now, and will need more money to promote EE any further.*
- *Increase the lifespan of EE compressors; durability is attractive*
- *Provide life cycle information for EE measures; payback is important to customers*
- *Training store managers in the working of the equipment will provide an impetus to replace equipment when needed*

- *On-the-job training by factory representatives for technicians, sales people, and even utility reps to point out EE opportunities; sort of a min-audit*
- *Encourage maintenance contracts, especially for the compressor, so that you get regular cleaning and maintenance to ensure efficient operation*
- *Newspaper ads promoting EE equipment, tied in with rebates and financing from the utility*
- *Articles or advertising in trade magazines like Progressive Grocer would help build word of mouth in the close-knit grocer community*
- *Take advantage of retrofits to solicit use of EE equipment.*

## *6.2 INTERVENTIONS MAPPED TO BARRIERS AND OPPORTUNITIES*

The combination of contractor responses with Phase 1 findings regarding the value of various interventions as perceived by store decision makers suggests that several strategies should play a central role in future program design. As shown in Exhibit 6-2, potential interventions can be mapped to the previously discussed market barriers and opportunities for each group of market actors to suggest what types of interventions might be appropriate to address the specific barriers faced by each group. As noted above, incentives remain a viable method of intervening in the market, particularly for smaller organizations that may lack access to capital.

**Exhibit 6-2**  
**Interventions Mapped to Barriers and Opportunities**

Market Participants	Market Status												Intervention Strategies									
	Barriers						Opportunities						Intervention Strategies									
	High first cost/does not meet payback criteria	Unavailability	Hard to find information on savings	Hard to get reliable technical advice	Market uncertainty	Reliability concerns (performance impact on sales (hidden cost))	Lack of financing	Split incentives (decisions made at HQ)	Knowledgeable	Receptive to information	Established relationships	Accept Longer Paybacks	Competitive pressures	Relatively Few Players	Incentives/rebates	Demonstration Programs	Technical Assistance	Audit	Informational Brochures	Training	Access to Financing	Web-based information
National Chain Supermarkets	●								●				●		●				○	○		
Regional Chains/Independents	●		●	●						●	●		●					●				
Small Groceries	●							●	●	●		●	●		●		●	●			●	
			●	●								●				●		●	●	●		
					●	●					●	●			●			●	●			
C-stores (chain)			●						●	●	●		●			○	●	○				
C-stores (independent)	●						○					●		●								
		●	●		●	●									●	●			●			○
Wholesalers	●	●					○	●	●	●		●	●	●	●				○	●		○
Contractors	●	●								●		○		●								
					●			●												●		
Equipment Manufacturers		●			●			●	●			●	●								●	
Equipment Refurbishers	●	●	●		●		●	●	○	○		●	●	●	●	●				●		
Design Firms	●		●			●	●	●	●	●				●						●		

**KEY**

● High  
● Moderate  
○ Low

Note: Assessing Importance for Market Barriers, Relevance and Potential Effectiveness for Intervention Strategies

Information-based interventions ranging from audits and technical assistance to demonstration sites appear to be particularly suitable for independently owned stores. Provision of information can, as shown, also be used to leverage the established relationships between end users and other market actors such as wholesalers or utilities. Information or training from a highly regarded, unbiased source could be an effective means of addressing a variety of information barriers.

A recommended mix of technologies and potential intervention strategies is discussed in Chapter 7.

## 7. CONCLUSIONS AND RECOMMENDATIONS

Using estimates of savings potential derived by combining the Phase 1 and Phase 2 result, high-potential measures can be identified and strategies can be developed to promote those measures, using the perceptions of program element effectiveness reported by contractors as well as store decision makers.

Exhibit 7-1 summarizes some of the more promising measures and technologies that can be used to improve energy efficiency in the retail food sector, presents the potential savings estimate for each segment, and suggests a combination of program elements appropriate for increasing acceptance of the technology or measure in that segment. Note that, in some cases, a specific set of program elements is recommended for more than one segment (for example, similar program designs are usually appropriate for national chain supermarket and national chain C-stores), in which case the associated impacts are presented on a single line.



on kW reductions in this report). Incentives could, for example, help to accelerate the adoption of already popular measures such as efficient lighting and doors on both medium and low temperature cases.

Other interventions would be targeted more specifically to helping transform the independent and rural retail food market; i.e., the smaller regional chains and independent supermarkets, small groceries, and independent C-stores. For these segments, we propose a mix of design elements that would help overcome the barriers identified earlier, so that permanent changes in the market might result.

The proposed combination of interventions targeted to specific market actors include several of the promising program design elements presented at the conclusion of chapter 6. Specifically, we would recommend the following.

- Technical assistance for regional chains, as well as for contractors who serve the small independent stores, in addressing specific system design or measure implementation issues, such as floating head pressure control, unequal parallel compressors, cycling of anti-sweat heaters, or the use of high-efficiency lighting.
- Training for refrigeration contractors and their technicians in such topics as floating head pressure control, anti-sweat heater cycling, smart defrost, and the proper use of controls.
- Training for store owners and managers to assist them in making appropriate equipment selection decision and to help them properly manage more sophisticated EE systems, such as energy management systems or floating head pressure controls.
- One or more demonstration sites where EE measures are installed and evaluated – not in large chains, but in a smaller independent grocery and/or C-store
- Technical assistance and rebates to encourage refrigeration contractors to stock PSC or ECM motors, and rebates for smaller chains and independents that purchase such motors. Rebates for national chains might be appropriate as part of a resource acquisition strategy.
- Technical information and case studies, either in brochures/fact sheets or on the internet, describing various measures as they would apply to regional chains and independents, including costs, paybacks, and non-energy benefits.
- A high-visibility, system-specific audit program that would be promoted by participating wholesalers and co-ops through their store support departments.

Because of the significant potential that exists within the targeted independent retail food sector, we believe these program elements deserve serious consideration for future Alliance programs.

**APPENDIX A. FMI 2000 ENERGY EFFICIENCY TECHNOLOGY RECAP**



*APPENDIX A  
FMI 2000 ENERGY EFFICIENCY TECHNOLOGY RECAP  
BY: MARC SANDOFSKY*

*OVERALL IMPRESSION*

The consolidation of both supermarket chains and manufacturers was much in evidence at FMI 2000. Although no figures were released, attendance appeared to be off. Many attributed this to there being fewer supermarket chains and therefore fewer people to attend.

The consolidation among the manufacturers was exemplified by the themes at their booths. Kysor/Warren, for example, was being promoted as a division of Welbilt rather than as a well-engineered line of refrigeration equipment. During a tour of their display, rather than speaking of technical improvements, Kysor spoke on how an entire supermarket could be constructed from Welbilt equipment: racks, cases, cooking equipment, ice machines, and utensils.

At Tyler's booth, its connection to Carrier was being heavily promoted, with the Carrier president expounding at length about the synergies that were being achieved through vertical integration. Honeywell had a similar approach in their booth.

I believe this trend will have a very profound effect on the industry, independent supermarkets and convenience stores included. With fewer supermarket chains, competition for their business will be severe. With fewer manufacturers, there will be fewer bidders. The question is, will they concentrate so heavily on the larger chains that they will give little effort or service to the independents and convenience stores.

*ENERGY PROVIDERS*

With the deregulation of the electric utility industry, recent FMI shows were inundated with energy suppliers and ESCOs looking to peddle their goods and services to supermarket chains. This year these companies were all but absent except for DTE Energy, and Niagara Mohawk, neither of which is a significant force.

In recent shows, these companies were making extremely enticing offers to supermarkets: guaranteed savings, fixed monthly utility expenses, and design/build-leaseback services. These have disappeared as the energy suppliers have discovered they can't make money on these types of deals. The one exception is a startup company, Energy Direct (877) 646-1068, which is guaranteeing 15% energy savings by installing generators that they will finance.

*OPPORTUNITIES*

Controls, when combined with operating changes, controls may represent the single greatest and most cost-effective opportunity for energy savings today.

The entire supermarket industry is going to electronic controls. These allow store operators to fine-tune their systems from the comfort of a computer, without having to call in a refrigeration

mechanical to make physical changes. Recently manufacturers have started to promote wireless controls. These are particularly ideal for retrofit applications in that **wiring costs are virtually eliminated**. Wiring costs are also minimized in new applications, particularly with the new interoperable controls.

The following are just a few examples of electronic control capabilities.

- Electronic expansion valves allow head pressures to be lowered to otherwise unheard of levels without fear of slugging liquid to compressors and ruining them. Changing from a fixed to a floating head pressure can reduce refrigeration costs during the winter months by as much as 35% in northern locals, and over 20% in the course of the year.
- Electronic suction regulators sized for a 1 pound pressure drop, can reduce case pulldown times after defrost from 22 minutes to 2 minutes. This both saves energy and increases product life.
- When electronic controllers are added to freezer door emulsion heaters, emulsion heater energy use can be reduced by upwards of 80%.

The following control companies had positive responses when interviewed on the applicability of their systems to independent supermarkets and convenience stores and their interest in these areas:

Computer Process Controls (CPC), Kennasaw, GA  
(770) 425-2724  
Herb Rippe-General Manager

CPC markets the Einstein refrigeration controller and a host of other electronic controls and software that tie into this system. Mr. Rippe said he is definitely interested in independent and convenience store business and that CPC systems are applicable to these areas. CPC is also a sister company to Emerson Retail Services, which is one of the few companies still specializing in energy conservation for food markets.

Energy Controls International, (ECI) Hunt Valley, MD  
(410) 403-4000  
Patrick Fitzgerald, President.

ECI is a competitor of CPC and manufactures similar types of controllers. ECI co-developed the Degree-Master with Hill PHOENIX. It works to improve food safety, product quality, shrinkage, ease of installation, case management, operating costs, and maintenance costs. Hill was heavily promoting that at the show along with its Vantagepoint software.

Honeywell Elm Controls, Bel Aire, MD  
(410) 838-8006  
Bryan Hetrich, National Accounts Manager

While Honeywell is larger than CPC and ECI, it is relatively new to the supermarket industry and therefore, hungry for business. Honeywell is also offering “total Supermarket Solutions”, which deals in most aspects of supermarket operation including electronic case controls and solutions for HVAC, energy, and maintenance.

Invensys Climate Controls, Plain City, OH  
(614) 873-9421  
Daniel Wesner, Director Marketing

Wesner seemed to have the greatest number of products specifically applicable to convenience stores: Siteminder Monitoring System, Com-Trol Anti-Sweat Heat Control Panel, Ranco Electronic Temperature Controls, Com-Trol MCS-4000 Controller. Wesner expressed a strong interest in independents and convenience stores.

Danfoss Automatic Controls, Baltimore, MD  
(410) 931-8250  
Mark Purcell, Director Sales and Marketing

Danfoss is active in the industry and aggressively tries to compete with CPC and ECI with a broad line of innovative technologies. They were promoting their new “**low cost**” EKC 201 Compact Electronic Temperature Display and Multi-function Control. The EKC201 can work in a standalone or network mode.

Johnson Controls, Milwaukee, WI  
(800) 715-5040

Johnson, like Honeywell, is a giant known more for its building controls than its supermarket controls. Among other items, Johnson was promoting its wireless sensors. Johnson also has a very active ESCO division, but it does not do food stores.

### *REFRIGERATION SYSTEMS*

The major manufacturers have been concentrating on low-charge systems in recent years. In some instances, energy use has also been reduced.

Tyler Enviroguard II: Reduces refrigerant charge by about 60%. Also allows head pressures to float to very low levels. They claim as much as 35% reductions. With work, this could be retrofitted into some existing systems.

Hussmann: Protocol systems are catching on in Europe but not as quickly in the US. These reduce refrigerant charges by about 70%, but since they use scroll compressors, energy use is about the same. However, there are tremendous efficiencies to be picked up in Hussmann cases with their new door frames that reduce emulsion heater energy use, with their modular defrost, and reduced lighting load in some cases.

Hill Phoenix: They are pushing secondary coolant systems that reduce refrigerant charge by about 75%, but energy use may be higher. Hill claims energy use is not higher though.

Kysor/Warren: They are testing the Impulse System, which may reduce refrigerant charge by about 60%, but they do not claim any energy reductions.

#### *SELF CONTAINED CASES*

EPRI has been championing self contained cases tied into a water loop, but it is still just a concept and will be for some time until the proper compressors are developed. The present self-contained cases may add energy use to a store.

#### *AIR CONDITIONING*

No air conditioning manufacturers were at FMI 2000. These are typically custom made for supermarkets (Octagon, Seasons 4). While the tendency would be to recommend economizers for supermarkets, many engineers believe they are useless in supermarket environments since supermarkets don't need cooling until the outside air is above 75° (approximately). At that temperature, outside air is incapable of providing any cooling and adds to the humidity load.

#### *DEHUMIDIFICATION*

There were no desiccant cooling manufacturers at the show, nor were there any heat pipe manufacturers. Dehumidification has been found to be extremely beneficial to supermarket energy use, but desiccant units and heat pipes are too expensive, even for most of the larger chains. EPRI has been pushing dual path systems, which work off air conditioners. Those have more promise.

#### *CONDENSERS*

There were a few condenser manufacturers there, but they were part of other booths and there was no startling news.

VFDs have been found to work well on condenser fans, and VFD prices have come down a great deal, so that is worth considering.

Evaporative condensers have been found to work extremely well in food store applications, even in cool Northern climates, as they allow head pressures to be reduced a great deal in the summer. Operators are afraid of freezeups though, so that has limited their application.

#### *COMPRESSORS*

Copeland and Carlisle were at the show, and they are interested in whatever business they can get, independents, convenience stores, or whatever. However, they have made no great energy saving advances as of late, although some of the new compressors are slightly more efficient and Copeland is working hard to get the Glacier scroll as efficient as the discus.

VFDs have also been found to work well on compressors, particularly the lead one, and with VFD prices coming down, this may present an opportunity. Aspen Systems of Marlborough, MA has even done work which shows that VFDs have a payback when placed on every compressor in a rack. That payback was 7 years when VFD prices were high. It will obviously be lower today.

## *REFRIGERANTS*

Changeouts continue, but as a general rule, the newer refrigerants are less efficient than the old ones and have higher pressures.

## *CASE COVERS*

These, of course save energy by reducing heat loss at night. Prices seem to be coming down. Eliason Econo-Cover of Kalamazoo, MI (616) 327-7003 claims to be roughly 50% of the cost of the competition. They are interested in independents and convenience stores.

## *FUEL SWITCHING*

Several years ago, Hussmann and Hill Phoenix were both working hard on gas-fired compressors. Hill in particular has made headway in this area, with a number of systems installed in the New York area.

Self-generation would seem to be a better option as stores can use traditional refrigeration systems while reducing their electric costs by generating their own power. Hussmann even has a control system out now which allows stores to make use of backup generators. This may be a valid opportunity for supermarkets, although I don't believe the Hussmann systems can be retrofitted into older facilities.

## *OTHER BENEFITS*

For much of the early 90's increasing efficiencies was a prime focus among manufacturers. While it is still a consideration, it has taken a back seat lately to food safety, product life, and refrigerant containment.

On the positive side, many of these benefits go hand in hand. For instance, floating head pressures to save energy simultaneously increases cooling capacity. That provides the ability to lower case temperatures, lengthen product life, and reduce maintenance costs, while saving enormous amounts of energy in the process.

Many of today's control systems work the same way. Once the hardware is installed, food safety, energy conservation, product life, and maintenance go hand in hand. Quite often, the other benefits far outweigh the reduction in energy costs.